DRAFT REPORT

Project ANKA - G4-Viranşehir-5,7,8 Solar Power Plant Project, Şanlıurfa

Environmental and Social Impact Assessment

Submitted to:

KALYON YEKA GES 3 ve 4 GÜNEŞ ENERJİSİ YATIRIMLARI A.Ş.

Mimar Sinan Mah. Çavuşdere Cad. No: 41A İç Kapı No: 30 Üsküdar / İstanbul, Türkiye

Submitted by:

WSP Danışmanlık ve Mühendislik Ltd. Şti.

Hollanda Cad. 691. Sok. Vadi Sitesi No:4, Yıldız 06550 Ankara, Türkiye

+90 312 4410031

23591787-draft_R2

September, 2023

Distribution List

1 copy - Lenders

1 copy - KALYON YEKA GES 3 ve 4 GÜNEŞ ENERJİSİ YATIRIMLARI A.Ş.

1 copy - WSP Danışmanlık ve Mühendislik Ltd. Şti.

1 copy - WSP S.r.l (Italy)

Record of Issue

Company	Client Contact	Version	Date Issued	Method of Delivery
KALYON YEKA GES 3 ve 4 GÜNEŞ ENERJİSİ YATIRIMLARI A.Ş.	Defne Arısoy	Draft_R0	21.08.2023	e-mail
KALYON YEKA GES 3 ve 4 GÜNEŞ ENERJİSİ YATIRIMLARI A.Ş.	Defne Arısoy	Draft_R1	01.09.2023	e-mail
KALYON YEKA GES 3 ve 4 GÜNEŞ ENERJİSİ YATIRIMLARI A.Ş.	Defne Arısoy	Draft_R2	11.09.2023	e-mail

Table of Contents

TABLES

FIGURES

APPENDICES

Abbreviations

Abbreviation	Definition
AC	Alternating Current
AFAD	Disaster and Emergency Management Authority
AoI	Area of Influence
APL	Allocation in Return for Domestic Production
AZE	Alliance for Zero Extinction
CCTV	Closed-circuit television
CDP	Community Development Plan
CH	Critical Habitat
CHA	Critical Habitat Assessment
CIA	Cumulative Impact Assessment
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
Client	Kalyon YEKA GES 3 ve 4 Güneş Enerjisi Yatırımları A.Ş., subsidiary of Kalyon Enerji
CLO	Community Liasion Officer
CLS	Community Level Survey
CMC	Continuous Monitoring Center
CO	Carbon Monoxide
CSP	Concentrating solar-thermal power
CVD	Chemical Vapour Deposition
dBA	Decibels A
DC	Direct Current
DD	Data Deficient
EAAA	Ecologically Appropriate Area of Analysis
EBRD	European Bank for Reconstruction and Development
EHSS	Environment, Health and Safety, Social
E&S	Environmental and Social

Abbreviation	Definition
EIA	Environmental Impact Assessment
EMRA	Energy Market Regulatory Authority
EN	Endangered
EOO	Extent of Occurrence
EP	Equator Principles
EPC	Engineering, procurement, and construction
EPA	Environmental Protection Agency
EPFI	Equator Principles Financial Institution
EPRP	Emergency Preparedness and Response Plan
ESGA	E&S Gap Assessment
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System
EU	European Union
EUNIS	European Nature Information System
FGD	Focus Group Discussion
GHG	Greenhouse Gas
GIIP	Good International Industry Practice
GN	Guidance Note
ha	hectare
HC	Hydrocarbon
HH	Household Survey
HR	Human Resources
hPA	Hectopascal
HR	Human Resources
HSE	Health and Safety and Environment

Abbreviation	Definition
IBA	Important Bird Area
ICOMOS	The International Council on Monuments and Sites
ICP	Informed Consultation and Participation
IFC	International Finance Corporation
IFI	International Financial Institutions
IPA	Important Plant Area
IUCN	International Union for Conservation of Nature
Kalyon Enerji	Kalyon Enerji Yatırımları A.Ş. (the Project Owner)
KBA	Key Biodiversity Area
km	Kilometer
KPI	Key Performance Indicator
L	Liter
LC	Least Concern
LNG	Liquefied Natural Gas
LRP	Livelihood Restoration Plan
m	Meter
m^3	Cubic meter
MEDAŞ	MERAM Electricity Distribution Inc. Co.
mm	Milimeter
MoAF	Ministry of Agriculture and Forestry
MoC	Management of Change
MoEUCC	Ministry of Environment, Urbanisation and Climate Change
MWe	Megawatt Electric
MWp	Megawatt Power
N/A	Not Applicable
N-CP	Non-Compliance

Abbreviation	Definition
NGO	Non-governmental Organization
NO_x	Nitrogen Oxide
NT	Near Threatened
NTS	Non-Technical Summary
OBS	Observation
OECD	The Organization for Economic Cooperation and Development
OHS	Occupational Health and Safety
OHTL	Overhead Transmission Line
PA/CA	Preventative Actions/Corrective Actions
PAP	Project Affected Person
PCB	Polychlorinated Biphenyls
PDoEUCC	Provincial Directorate of Environment, Urbanization and Climate Change
PGA	Peak Ground Acceleration
PM	Particulate Matter
PPM	Public Participation Meeting
PS	Performance Standard
PV	Photovoltaic
RAP	Resettlement Action Plan
RCIA	Rapid Cumulative Impact Assessment
R&D	Research and Development
RIV	Residual Impact Value
RLE	Red List of Ecosystems
RMU	Disconnector -Breaker Unit
RSA	Regional Study Area
RWIHC	Regulation of Water Intended for Human Consumption
SCADA	Supervisory Control and Data Acquisition

Abbreviation	Definition
Sec	second
SEA	Strategic Environmental Assessment
SEP	Stakeholder Engagement Plan
SF	Safety Factor
SHW	State Hydraulic Works
SIA	Social Impact Assessment
SO_2	Sulphur dioxide
SP	Sampling Point
SPA	Special Provincial Administration
SPP	Solar Power Plant
sqm	Square Meter
SYDV	Social Assistance and Solidarity Foundation
TCFD	Task Force on Climate-related Financial Disclosures
TEDAŞ	Turkey Electricity Distribution Inc.
TEİAŞ	Turkish Electricity Transmission Corporation
TGFZ	Tuz Gölü Fault Zone
TOE	Tonne of oil equivalent
TS	Turkish Standard
TURKSTAT	Turkish Statistical Institute
TÜBİVES	Turkish Plants Data Service
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNGP	United Nations Guiding Principles on Business and Human Rights
VEC	Valued Ecosystem Component
VU	Vulnerable
WB	World Bank
WB ESF	World Bank Environmental and Social Framework

Abbreviation	Definition
WHO	World Health Organisation
WSP Türkiye	WSP Danışmanlık ve Mühendislik Ltd. Şti.
WWF	World Wildlife Fund
WWTP	Wastewater Treatment Plant
YADES	Ministry of Family and Social Services Elderly Support Program
YEKA	Renewable Energy Resource Area

Assumptions and Limitations

This report has been prepared based on the documentation provided to WSP Türkiye by the Client. WSP Türkiye cannot confirm the accuracy of the information provided by third parties during the ESIA process.

IMPORTANT: This section should be read before reliance is placed on any of the opinions, advice, recommendations, or conclusions herein set out.

a) The purpose of this Environmental and Social Impact Assessment ("ESIA") report was to undertake ESIA pursuant to the appointment of WSP Türkiye to act as consultant.

b) Except for Kalyon Enerji Yatırımları A.Ş. ("Kalyon Enerji") and Kalyon YEKA GES 3 ve 4 Güneş Enerjisi Yatırımları A.Ş. ("Client"), a subsidiary of Kalyon Enerji, any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of the third parties. Should additional parties require reliance on this report, written authorization from WSP Türkiye will be required. WSP Türkiye disclaims responsibility of consequential financial effects on transactions or property values, or requirements for follow-up actions and costs. No duty is undertaken, nor warranty nor representation made to any party in respect of the opinions, advice, recommendations, or conclusions herein set out.

c) The report is based on data and information provided to WSP Türkiye by the Client and data and information collected up to issue date. It is based solely on a review of information and data obtained by the Client as described in this report, and discussion with representatives of the Client, as reported herein. Except as otherwise may be requested, WSP Türkiye disclaims any obligation to update this report for events taking place, or with respect to information that becomes available to WSP Türkiye after the time during which WSP Türkiye developed the ESIA report.

d) It should be noted that not all the associated facilities were determined before physical, biological, and social field studies. Additional field studies and additional social and biological component baseline data collection studies might be necessary to cover the associated facilities not previously investigated during the baseline collection.

e) In evaluating the Project, WSP Türkiye has relied in good faith on information provided by other individuals noted in this report. WSP Türkiye has assumed that the information provided is factual and accurate. In addition, the findings in this report are based, to a large degree, upon information provided by the Client. WSP Türkiye accepts no responsibility for any deficiency, misstatement or inaccuracy contained in this report as a result of omissions, misinterpretations or fraudulent acts of persons interviewed or contacted.

f) WSP Türkiye makes no other representations whatsoever, including those concerning the legal significance of its findings, or as to other legal matters touched on in this report, including, but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation. These interpretations may change over time; thus, the client should review these issues with appropriate legal counsel.

g) This Report is prepared by WSP Türkiye for the benefit of the Kalyon Enerji Yatırımları A.Ş. and Kalyon YEKA GES 3 ve 4 Güneş Enerjisi Yatırımları A.Ş. provision of this Report to any party other than the Client is on a strictly non-reliance basis and cannot be construed as establishing a duty of care, or any form of contractual relationship, between the Consultant and the non-reliant recipient. Any party receiving this Report other than

the Client must independently, and without reliance upon this Report or upon WSP Türkiye, make its own analysis and decision in relation to the subject matter of this Report.

1.0 INTRODUCTION

1.1 Project Background

G4-Viranşehir-5,7,8 Solar Power Plant Project ("the Project") having a capacity of 195 MWp/150MWe, is planned by Kalyon Enerji Yatırımları A.Ş. ("Kalyon Enerji") and Kalyon YEKA GES 3 ve 4 Güneş Enerjisi Yatırımları A.Ş. ("Client"), a subsidiary of Kalyon Enerji. The Project will be located in Şanlıurfa Province, in the Viranşehir District, Kadıköy Neighbourhoods in Türkiye.

The Project area had been declared as an area suitable for the development of a solar project: a Renewable Energy Resource Area ("YEKA"). Consequently, Ministry of Energy and Natural Resources had launched the "Competition Announcement on the Allocation of Renewable Energy Resource Areas and Connection Capacities Based on Solar Energy"; YEKA SPP-4 Erzin-Viranşehir (including G-4-Viranşehir-5,7,8) competitions were held on 28.06.2022. YEKA Right of Use Agreements were signed on 08.08.2022 with Kalyon Enerji Yatırımları A.Ş., which won the competition held by the Ministry.

The Project consists of three sub-projects namely, G4-Viranşehir 5 Solar Power Plant Project, G4-Viranşehir 7 Solar Power Plant Project and G4-Viranşehir 8 Solar Power Plant Project. Individual Environmental Impact Assessment (EIA) reports have been prepared for these sub-projects as per the requirements of national EIA Regulation and the "EIA Positive" decisions for each Project have been acquired as shown in the table below.

Table 1: The details of sub-projects

Name of Sub Project	Allocated area (ha)	Capacity	National EIA Status	Type of the Land
G4-Viranşehir 5 Solar Power Plant Project	90	65 MWp/65 MWm/50 MWe	EIA Positive Decision Acquired (Decision No: 6998)	Pastureland and Grassland
G4-Viranşehir 7 Solar Power Plant Project	90	65 MWp/65MWm/50MWe	EIA Positive Decision Acquired (Decision No: 6996)	Pastureland and Grassland
G4-Viranşehir 8 Solar Power Plant Project	90	65 MWp/65MWm/50MWe	EIA Positive Decision Acquired (Decision No: 6997)	Pastureland and Grassland
TOTAL	**270**	**195 MWp/65MWm/150MWe**	**-**	**-**

A Gap Analysis Study, previously prepared by WSP Danışmanlık ve Mühendislik Ltd. Şti. ("WSP Türkiye") in May 2023, has identified gaps in the existing national EIA Report and available documentation obtained from Kalyon Enerji and suggest actions to close these gaps to reach a full bankable Environmental and Social Impact Assessment ("ESIA") in line with the International Conventions, IFIs Performance Standards (Equator Principles IV (EP), International Finance Corporation (IFC) Performance Standards (PS), Organisation for Economic Co-operation and Development (OECD)'s Common Approaches and Guidelines, and the best practices in the industry along with the national legislation).

Kalyon Enerji retained WSP Türkiye to prepare the ESIA for the Project in compliance with the national and international requirements detailed above and in Chapter 2.

The main components of the plant consist of solar panels, a panel carrier system, an inverter station (inverter, transformer, ring main unit and the substation). Infrastructure and utilities can be listed as the administrative building, Supervisory Control and Data Acquisition (SCADA) System and the overhead transmission line (OHTL). Once the Solar Power Plant is put into operation, it is planned to produce 390000 MWh-electricity in

annual basis, and the electricity produced will be transferred to the Viranşehir Substation via a new ~26.7 km length 154 kV OHTL. Details of the Project components are provided in Chapter 3 of this report.

The Project pre-construction activities, namely, mobilization of temporary site facilities, site preparation, grading and levelling, material delivery and storage and certain early trenching activities for cable laying have been started in August 2023. The construction period of the Project is estimated to be 10 months, test and commissioning period will be 7 months and the total operation period will be 30 years.

The Project will be established on a pasture land of 270 hectares. Adıyaman-Şanlıurfa-Diyarbakır Planning Region 1/100.000 Scaled Environmental Master Plan Amendment (M44, N42 and N43 Plan Plots, Plan Amendment Explanation Report) was approved on 07.07.2020 in accordance with Article 102 of the Presidential Decree No. 1. This Environmental Master Plan is located within the borders of "Grassland-Pastureland" as land uses in the 1/100.000 scale N43 Plan. The Project areas are also classified as "Pastureland" in terms of title deed.

Background on the Project

It is of great importance to create a balanced portfolio in electricity generation by increasing the share of renewable energy resources and resource diversity in total electricity generation. With the Renewable Energy Resource Area model realized in this context, the cost of electricity purchased from renewable energy generation facilities will be reduced while developing domestic production in renewable energy technologies and increasing the capacity of qualified human resources.

The Regulation on Renewable Energy Resource Areas was published in the Official Gazette dated 09/10/2016 and numbered 29852. With this Regulation, a new investment model for the utilization of renewable energy resources was introduced.

YEKAs are determined within the scope of administrative and technical studies conducted by the Ministry of Energy and Resources and announced in the Official Gazette. In this case, those who will participate in YEKA competitions know for which area they will apply.

In addition to this method, after the contract is signed by the winner of the "Competition for Connection Capacity Allocation for YEKA Purposes", candidate YEKAs (project sites) are proposed to be located in the connection region where the connection right is acquired, and these areas can be announced as YEKA and allocated to the investor if deemed appropriate by the Ministry.[1]

The legal status of the plot of the Project area was formerly pastureland, and it was declared an area suitable for the development of a solar project: a Renewable Energy Resource Area. Consequently, it was launched the "Competition Announcement on the Allocation of Renewable Energy Resource Areas and Connection Capacities Based on Solar Energy"; YEKA SPP-4 Erzin-Viranşehir (including G-4-Viranşehir-5,7,8) competitions were held on 28.06.2022. YEKA Right of Use Agreements were signed on 08.08.2022 with Kalyon Enerji Yatırımları A.Ş., which won the competition held by the Ministry of Energy and Natural Resources.

Construction activities are planned to be started in August 2023.

Background on the Project Owner, Kalyon Enerji

Kalyon Enerji is a renewable energy investment company established in 2016. As of August 2022, 50% facilities of Kalyon Enerji belongs to International Energy Holding, which is affiliated with International Holding Company, one of the largest investment companies of the United Arab Emirates and the Gulf Region, and the remaining

[1] https://enerji.gov.tr/eigm-yenilenebilir-enerji-uretim-faaliyetleri-yeka-modeli

50% belongs to Kalyon İnşaat, which is one of the leading construction companies of Türkiye and has signed many essential construction works.

Kalyon Enerji's top priority is to make energy accessible to everyone, including disadvantaged groups, by using clean and renewable energy sources. In this respect, Kalyon Enerji focuses on solar and wind power plant investments considering Turkey's and the world's ever-increasing energy needs with a sustainable perspective and playing a leading role in the fight against climate change.

1.2 Purpose of the ESIA Report

1.2.1 Objectives

A bankable ESIA needs to comply with both the national legislation and international standards. IFC Performance Standard 1 (IFC, 2012) lists the overall objectives for an ESIA, including:

- to identify and assess social and environmental impacts, both adverse and beneficial, in the project's area of influence;
- to follow the mitigation hierarchy of avoidance, minimization and mitigation of impacts and if needed compensation, with respect to adverse impacts to workers, other affected people, and the environment;
- to conduct meaningful consultation; and
- to promote improved social and environmental performance of companies through the effective use of management systems.

As described in IFC Performance Standard 1, the main components of the assessment will include:

- the potential environmental and social impacts of the Project throughout the full development cycle – preconstruction, construction, operation, decommissioning;
- a public consultation and disclosure plan to ensure that local communities and other key stakeholders are informed of the Project and have an opportunity to express their opinions concerning the Project;
- proposed mitigation activities to minimize adverse environmental impacts;
- the nature and significance of residual impacts (those adverse impacts that occur after mitigation has been applied) and ongoing monitoring and management plans to address them;
- the nature and significance of cumulative impacts;
- a social management plan to maximize benefits to the local community and promote a sustainable economy.

This ESIA Report has been prepared by WSP Türkiye for the following objectives:

- Identification and assessment of social and environmental impacts, both adverse and beneficial, in the Project's area of influence;
- Evaluation of the main environmental and social risks and potential impacts of the Project;
- Presentation of Environmental and Social Management Plan ("ESMP"), Stakeholder Engagement documentation, and grievance mechanism in line with the Equator Principles ("EP") IV, and International Finance Corporation ("IFC") Performance Standards ("PSs");
- Description of the management, mitigation, monitoring and compensation measures, including the Environmental and Social Management System ("ESMS"), the ESMP, and the thematic action or management plans;

- Cumulative impact assessment (as required by the EP IV and IFC PSs); and
- Assessment of associated facilities.

1.2.2 Categorization of the Project

According to the IFC's Policy on E&S Sustainability (January 2012), as part of the review of environmental and social risks and impacts of a proposed investment, IFC uses a process of environmental and social categorization to reflect the magnitude of risks and impacts. The resulting category also specifies IFC's institutional requirements for disclosure in accordance with the IFC's Access to Information Policy. Accordingly, all projects are divided in four categories:

- Category A: business activities with potential significant adverse ES risks and/or impacts that are diverse, irreversible, or unprecedented;
- Category B: business activities with potential limited adverse ES risks and/or impacts that are few in number, generally site-specific, largely reversible, and readily addressed through mitigation measures;
- Category C: business activities with minimal or no adverse ES risks and/or impacts; and
- Category FI: business activities involving investments in financial intermediaries or through delivery mechanisms involving financial intermediation. This category is further divided into three risk categories (FI-1, FI-2, FI-3).

As per the environmental and social categorization criteria of the applicable standards given above, based on the discussions held with the Lenders and Lenders' Advisor, available data, the National EIA, the Project is categorised as "Category A".

Table 1-2: Project Categorisation According to Applicable Standards

Applicable Standard	Category Explanation
IFC PSs (2012)	Category A: Business activities with potential significant adverse environmental or social risks and/or impacts that are diverse, irreversible, or unprecedented.
EPIV (2020)	Category A: Projects with potential significant adverse environmental and social risks and/or impacts that are diverse, irreversible, or unprecedented.

1.2.3 Key Steps in the ESIA Process

1.2.3.1 Gap Analysis

Several documents have been prepared to support the National EIA approval and the international ESIA process. The first stage of the ESIA process was the preparation of the gap analysis to identify gaps in the national EIA Report and existing documentation provided by the Client with respect to the relevant international standards, and to suggest actions to address these gaps. The overall objective of the study was to review existing technical documents, reports and studies to evaluate the possibility of using the already available data in the preparation of the international ESIA.

1.2.3.2 Review of Additional Documentation

An additional step in the ESIA preparation has been the review of supplementary documentation that has become available with the progress of the Project design. The review of the documentation allowed the ESIA team to complete the gap analysis of the existing data and information as well as to define the methodology and structure of the ESIA and related documents.

1.2.3.3 Baseline Data Collection

Baseline information to be used in the ESIA is obtained from the Project-specific social and environmental baseline studies that have been initiated during Gap Analysis process and carried out as part of this ESIA, utilising both desktop study and field-based approaches. However, as mentioned in Section 1.3, due to the opposition of the local communities, a robust social baseline study and biodiversity study could not be conducted up to this stage of the ESIA. Therefore, social impact assessment part of this ESIA Report was written based on media analysis, Mukhtar interview, key institution interview and expert judgement since the local community had not participated to such a social survey and the biodiversity baseline was written based on the information given in the national EIA report and literature research. On the other hand, within the scope of the environmental baseline study, baseline measurements for water, soil, air, groundwater, surface water, noise, vibration and settled dust were carried out in April 2023. E&S pre-construction survey including biodiversity component was carried out by the Client on February 21, 2023 and survey report was provided to WSP Türkiye.

1.2.3.4 Stakeholder Engagement

IFC requires that the Project sponsor consults with the relevant stakeholders;

a) During scoping and before the terms of reference for the ESIA are finalized, and

b) Once a draft ESIA report is prepared. The ESIA report must be made accessible to the public once completed, however it is recommended to consult and inform local stakeholders in earlier phases of the process.

Stakeholder mapping and consultation activities have been initiated during Gap Analysis process and carried out as part of this ESIA resulting in a Stakeholder Engagement Plan (SEP) and grievance mechanisms that are presented in the chapters and sections of this report.

1.2.3.5 Impact Assessment

The general methodology adapted by WSP Türkiye for the ESIA has been designed to be highly transparent and to allow an analysis of the impacts on the various environmental and social components. The steps in WSP Türkiye's Impact Assessment Methodology are the following:

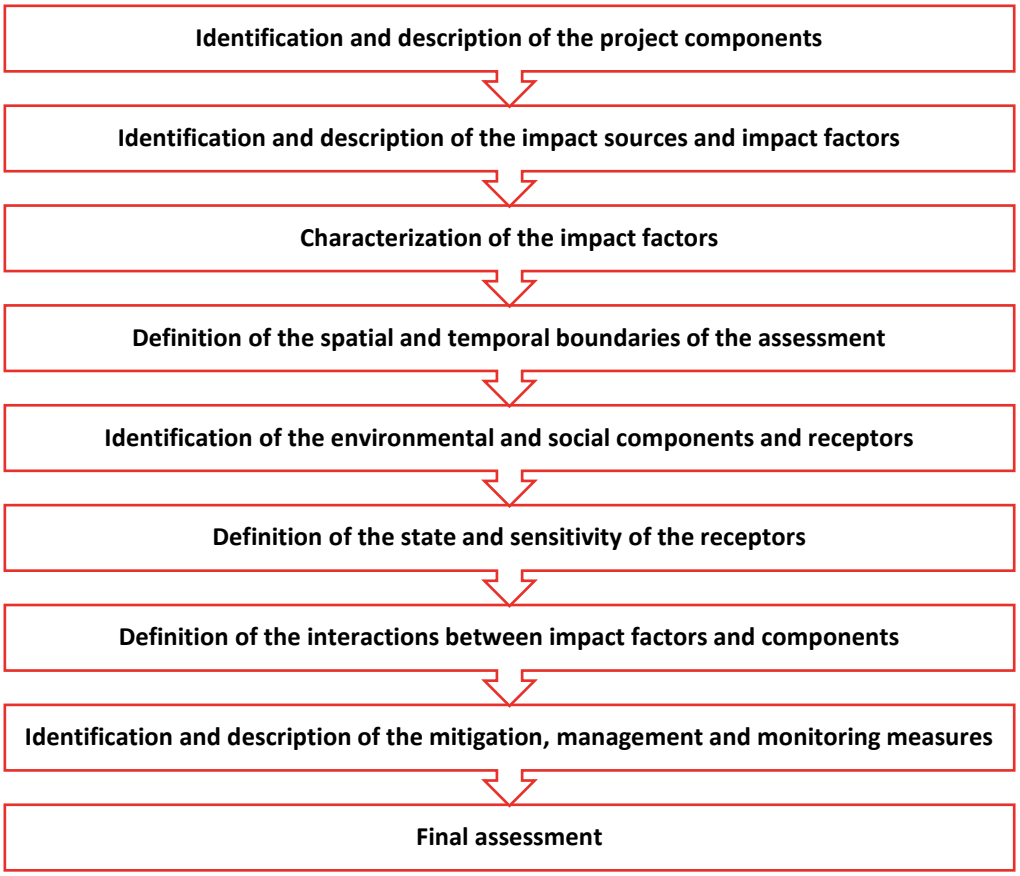


Figure 1-1: Steps of WSP Türkiye's Impact Assessment Methodology

WSP Türkiye's impact assessment methodology is described in detail in Chapter 5 of this report.

1.2.3.5.1 Environmental and Social Components

The impact assessment on individual valued environmental and social components ("VEC"s) affected in the different Project phases is completed through the use of specific environmental and social impact matrices which compare the component state, expressed in terms of sensitivity, with the relevant impact factors, quantified on the basis of a series of parameters which include:

- Duration (very short, short, medium, long, very long)
- Frequency (single event, infrequent, recurrent, frequent, continuous)
- Geographic extent (Project site, local, regional, national, international); and
- Intensity (negligible, low, medium, high, very high).

The quantification of impacts resulting from each factor acting on the environmental component is obtained by assigning a score to each feature.

Each of the parameters listed above can have a value between 1 and 5. The severity of the impact is determined through an Impact Factor Score which sums the score of each of the 4 parameters, hence it can assume a

value between 5 and 20. An Impact Value is then calculated by multiplying the Impact Factor Score and Sensitivity of the component. A final Residual Impact Value is calculated after reversibility and predicted effectiveness of mitigation is also considered.

The semi-quantitative methodology described above allows for an analytical assessment of impacts caused by individual impact factors on individual components. The process therefore ends with a table presenting several residual impacts from different impact factors for each component. It is a synthesis of the impacts on a component from all the impact factors generated by the Project actions.

The impact assessment is expressed based on the assessor's experience, assigning higher weight to the values less favorable to the component's protection, in order to guide the assessment in a conservative manner.

Impacts are presented in separate tables for negative and positive impacts to avoid automatic trade-offs.

The impact assessments for both components are presented in Chapter 7.

1.2.3.5.2 Identification of Mitigation Measures

Mitigation measures were identified through the application of the mitigation hierarchy of avoid, minimize, or, where residual impacts remain, compensate/offset providing the framework for developing a checklist of mitigation measures for risks and adverse environmental and social impacts. This approach implies that priority have been given to preventive actions mainly related to Project design, location, and implementation rather than curative interventions that handle adverse outcomes after the emergence of the anticipated problems.

Realistic and affordable (cost-effective) mitigating measures have been proposed to prevent, reduce, or minimise the impacts to acceptable levels and address other issues such as the need for e.g., worker health and safety improvements, community engagement, institutional involvement.

Given the fact that changes would be possible in the course of the development of the Project, mitigation measures have been designed to adapt to the changes readily through an adaptive management in which the implementation of mitigation and management measures are responsive to changing conditions and the results of monitoring throughout the Project's lifecycle. With this flexibility of the proposed mitigation measures sufficiently considered, it would prevent any unnecessary delay due to further assessment.

1.2.4 Environmental and Social Management System

The applicable Project standards require that an Environmental and Social Management System ("ESMS") for the Project is prepared and implemented through the Project lifecycle. The general framework for the environmental and social management system to be developed and implemented by the Project throughout the Project lifecycle has been described in Chapter 10.

1.3 Limitations

According to the information obtained from an in-depth interview, held with the Kadıköy Neighbourhood Mukhtar at the District Governor's Office on April 27, 2023, there is an opposition in the region against all solar power plants planned to be built in the area due to the fact that the size of their pastureland will decrease. Villagers do not want to see any activity in the region and do not want to participate any social studies. Due to oppositions of the local communities to the Project, a robust social baseline study and biodiversity study could not be conducted. Therefore, the research methods that should be applied during social impact assessment process such as household surveys, field observations or focus group studies could not be applied. In addition to this, biodiversity field studies could not be carried out due to these explained limitations. Therefore, social impact assessment section of this ESIA Report was written based on media analysis, Mukhtar interview, key institution interview and expert judgement since the local community had not participated to such a social survey and the

biodiversity baseline was written based on the information given in the national EIA report and literature research.

1.4 Uncertainties

Like most ESIAs, the current ESIA faced a number of challenges in terms of retrieving baseline information, the level of accuracy of predicting impacts, and developing appropriate mitigation. Furthermore, even with a firm Project design and an unchanging environment, predictions are by definition uncertain.

This ESIA is prepared based on the Project information provided by the Client and the information collected during the site visits. The Project is progressing in parallel with the ESIA studies. Assessments made within the scope of this ESIA Report are based on the most current design.

1.5 Structure of the ESIA Report

This document is the ESIA Report for the Project prepared in compliance with the national and international requirements. This document presents the following Chapters:

- Introduction (Chapter 1)
- Regulatory and Policy Framework (Chapter 2)
- Project Description (Chapter 3)
- Alternatives Analysis (Chapter 4)
- ESIA Methodology (Chapter 5)
- Environmental and Social Baseline (Chapter 6)
- Environmental and Social Impact Assessment (Chapter 7)
- Climate Change Risk Assessment (Chapter 8)
- Cumulative Impact Assessment (Chapter 9)
- Environmental and Social Management Plan (Chapter 10)
- Conclusions (Chapter 11)
- References
- Appendices

2.0 REGULATORY AND POLICY FRAMEWORK

This chapter describes the legal framework to be considered in the ESIA Report, management plans and other related documents while describing the management of environmental and social impacts and risks related to the Project. Applicable Environmental and Social Requirements of the Project are defined based on the IFC Performance Standards, Guidance Documents, IFC General EHS Guidelines, Equator Principles, Organisation for Economic Co-operation and Development's Common Approaches and the National Turkish legislation.

Türkiye is on the accession path to EU membership and is in the process of aligning its national environmental legislation and standards to meet EU requirements. For the management of certain environmental media, such as air quality, noise management, Turkish standards are already converging with those of the EU.

The Project will be in compliance with the most stringent requirement between national legal requirements and international requirements.

This chapter details the following in particular:

- The relevant institutional framework in Türkiye involved in the regulation of the Project;
- Relevant Turkish environmental and social laws and regulations that are applicable to the Project;
- International treaties, conventions, and protocols relevant to the Project and to which Türkiye is a signatory;
- Environmental and social guidelines and standards developed by international organizations; the EP and IFC PSs;
- Other international guidelines and standards, directly applicable to construction sites, powerlines, associated facilities, etc. which are considered international best practice.

2.1 National Legal and Regulatory Framework

2.1.1 Environmental Legal and Regulatory Framework

The Turkish legal framework for environmental protection was developed in line with national and international initiatives and standards, and some of them have been revised recently to be harmonized with the EU Directives in the scope of pre-accession efforts of Türkiye to the EU. In the following sections, related institutions, legislation, processes, and procedures that are related to the environmental and social aspects of the proposed Project are described.

The Ministry of Agriculture and Forestry ("MoAF") is the responsible organization for the issuing and implementation of policies and legislation adopted for the agricultural areas, forestry areas and protected areas.

The Turkish Environment Law No. 2872, which came into force in 1983, deals with environmental issues on a very broad scope. According to the basic principles that govern the application of the Environment Law, and as stated in the Constitution, citizens as well as the state bear responsibility for the protection of environment. Complementary to the Environment Law and its regulations, other laws also govern the protection and conservation of the environment, the prevention and control of pollution, and the implementation of measures for the prevention of pollution.

The Environment Law of 1983 has a comprehensive structure that has a holistic and integrated vision for the environment. "Polluter pays" and "user pays" principles and carrying capacity concepts form the basis of regulatory tools in the Environmental Law. The Law is supported by numerous Regulations and decrees prepared or updated in the process of alignment with EU legislation, thus contributing significantly to compensating the gaps within the former legislative system of Türkiye.

The EIA Regulation, which dates originally from 1998, has had several revisions and was most recently amended on July 29th, 2022. Although the EIA Regulation has been derived from the European Union EIA Directive, the integration of various Turkish conventions, sub-laws and governmental decrees makes the EIA Regulation distinctive in certain respects.

The lead government agency, responsible for environmental protection in Türkiye is the Ministry of Environment, Urbanization and Climate Change ("MoEUCC"). MoEUCC is the responsible organization for the issuing and implementation of policies and legislation adapted for protection and conservation of the environment and for sustainable development and management of natural resources.

The main responsibilities of the MoEUCC, relevant to the Project are:

- implementation of the EIA regulations and decision-making in the EIA approval processes,
- setting policies and principles for environmental management in Türkiye, including the administrative framework for environmental enforcement,
- defining and applying environmental quality standards,
- supervision of the network of environmental laboratories in Türkiye,
- pollution control and inspection activities,
- agroforestry support, soil management and erosion control, and
- protection of Türkiye's natural heritage including national parks, areas of conservation interest, biodiversity and wildlife.

Turkish National Regulations that are applicable to the Project are provided in Appendix-A.

2.1.2 Environmental Impact Assessment Procedure in Türkiye

The "EIA Regulation" was published in the Official Gazette on July 29th, 2022. According to the regulation, the industries or facilities listed in Annex 1 and Annex 2 of the regulation should obtain an EIA permit. The EIA process is carried out by companies licensed by the MoEUCC. The report submission and official correspondence process is carried out online.

The EIA submission and approval process of the Project listed in Annex 1 is more detailed and longer. It includes scoping and public participation steps, and is directed by the MoEUCC, the central authority. During the process, an application report and an EIA Report are prepared by a licensed company. The "EIA Positive" or "EIA Negative" decision is obtained at the end of the process.

The projects listed in Annex 2 have shorter EIA processes and comprise of smaller industries. The EIA submission and approval process does not include the scoping and public participation steps and is directed by the Provincial Directorate of Environment, Urbanization and Climate Change ("PDoEUCC"). During the process, a Project Introduction File (Pre-EIA Report) is prepared by authorized licensed company. If the "EIA is not required" decision is obtained, the Project can be implemented. However, if "EIA is required" decision is obtained, the same process for the Annex 1 projects, needs to be initiated.

The Turkish EIA procedure follows a process of selection and elimination criteria, with the final decision of the MoEUCC. The MoEUCC, establishes a "EIA Commission", which has considerable influence on the review and supervision of the EIA report. The EIA commission comprises representatives from relevant institutions and establishments and Ministry authorities. This commission is responsible for defining all required studies for the EIA report.

The MoEUCC, when deciding regarding the EIA Report, takes into consideration the studies and decisions made by the EIA Commission.

As so required, the MoEUCC may invite research and specialist organizations, professional associations/chambers, trade unions, associations, and Non-Governmental Organization (“NGO”) representatives to the commission meetings. Main steps in the Turkish EIA Process to be followed are as follows:

- First site visit by informing the PDoEUCC before the EIA Application File studies,
- Submission of the EIA Application File to the MoEUCC,
- Public Participation Meeting (announcements in one national and one local newspaper need to be given and other notifications need to be made before the meeting),
- Issuing of the special EIA format by the MoEUCC for the Project (the special EIA format defines baseline and impact assessment studies required specifically for the Project) based on the comments of the EIA commission and outcomes from the Public Participation Meeting,
- Submission of the EIA Report to the MoEUCC,
- Commission meetings during the EIA process,
- Revision and finalization of the EIA Report,
- Public disclosure of the Final EIA Report by PDoEUCC,
- Obtaining final decision from the MoEUCC (EIA Positive or EIA Negative).

An EIA process was carried out for the Project per the requirements of national EIA Regulation and the “EIA Positive” decision has been acquired on January 25, 2022 (Decision no: 6996, 6997 and 6998).

2.1.3 Land Acquisition Legislation

Fundamental provisions regarding land ownership in Türkiye are set out under the Land Registry Law no 2644. Cadastral arrangements are subject to the Cadastre Law no 3402. Nevertheless, both land registry and cadastre laws have provisions concerning miscellaneous laws. Some of the laws concerning the land acquisition and registry are as follows:

- Expropriation Law (No.2942, 1983, amended in 2022)
- Forest Law (No. 6831, 1956, amended in 2021)
- Pasture Law (No. 4342, 1998, amended in 2018)
- Cadastral Law (No. 3402, 1987, amended in 2020)
- Land Registry Law (No. 2644, 1934, amended in 2021)
- Village Law (Law No. 442, 1924, amended in 2022)
- Law on the Protection of Cemeteries (Law No. 3998, 1994, amended in 2018)
- Civil Code (Law No. 4721, 2001, amended in 2023)
- Settlement Law (Law No. 5543, 2006, amended in 2022)

- Law on Supporting the Development of Forest Villagers, Valuation of Areas Taken out of Forest Area Borders on behalf of the Treasury and Vending of Agriculture Lands Owned by the Treasury (Law No. 6292, 2012, amended in 2023)

Cadastre Law also defines the process related to identification of owners of land without title deeds or circumstances where there is a confusion on the matter of land possession.

Industrial Zones Law (No: 4737 Published in Official Gazette : Date : 19/1/2002 Number : 24645) regulates the principles regarding the establishment, management and operation of industrial zones. This Law covers the establishment and announcement of industrial zones, the investment permit process, incentive measures and the provisions determining the duties and powers of the management company.

The Project will be established on a pastureland-grassland of 270 hectares. The Project area has been classified as pastureland-grassland in the 1/100.000 Scale Environmental Plan. The Project areas are also classified as "Pasture" in terms of title deed. The Project area was declared an area suitable for the development of a solar project: a Renewable Energy Resource Area. Consequently, it was launched the "Competition Announcement on the Allocation of Renewable Energy Resource Areas and Connection Capacities Based on Solar Energy"; YEKA SPP-4 Erzin-Viranşehir (including G-4-Viranşehir-5,7,8) competitions were held on 28.06.2022. YEKA Right of Use Agreements were signed on 08.08.2022 with Kalyon Enerji Yatırımları A.Ş., which won the competition held by the Ministry of Energy and Natural Resources.

2.1.4 Permitting Framework

The main permits and approvals applicable to the scope of works are given below.

Table 2-1: The Main Permits and Approvals Required

Subject	Permit / Approval	Relevant Regulatory Framework	Status
Project Implementation	Making Pre-licence Applications for Projects	Energy Market License Regulation	Obtained
	Immovable Procurement Application	Regulation on Management, Pursuing and Collecting of Treasury Receivables	Pending for Completion of Change of Purpose of Allocation of Pasturelands
	Preliminary and Final Project Approvals	Electric Facilities Project Regulation (Official Gazette: 29221(repeated))	The preliminary project has been submitted for approval.
Land Use	Land use agreements for state owned lands - Preparation and Approval of 1/25000 and 1/5000 Master Development Plan - 1/1000 Implementation Development Plan Approval - Cadastral Control	Relevant laws and regulations specific to the land use type - Industrial Zones Law (No: 4737, 2002) - Regulation on the Management of Treasury Properties	1/25000, 1/5000, 1/1000 plans are approved. Cadastral controls are in progress.
	Permit for the use of agricultural lands for non-	Law on Soil Protection and Land Use (No: 5403, 2005)	Not required.

Subject	Permit / Approval	Relevant Regulatory Framework	Status
	agricultural purposes (if required)		
	Approval of expropriation plans (if required)	Expropriation Law (No: 2942, 1983)	Not required.
	Permit for the use of forest lands (if required)	Forestry Law (No. 6831,1956) Implementation Regulation of 16th Article of the Forestry Law Implementation Regulation of 17/3rd and 18th Articles of the Forestry Law	Not required.
	Permit for the use of pasture lands (change of the purpose of allocation) (if required)	Pasture Law (No: 4342, 1998)	Pending approval from Ministry of Agriculture and Forestry. Awaiting board decision.
Construction	EIA Approval	Regulation on Environmental Impact Assessment	Obtained.
	Permits and approvals for roads, water bodies, canals, energy supply lines, pipelines, utilization of municipal infrastructure etc.	Protocols/approvals/official letters of related state authorities	In progress
	Workplace notification for construction	Regulation on Starting Up and Operating a Workplace	In progress
	Construction permit	Industrial Zones Law (No: 4737, 2002)	In progress
	Building permits, Occupancy permits	Zoning Law No. 3194 and its sub-legislation	To be obtained once the construction commences.
	Permit for on-site fuel storage	Regulation on Environmental Permits and Licenses	To be obtained if required.
	Approval of wastewater treatment plant application project	Wastewater Treatment/Deep Sea Discharge Facility Project Approval Circular No. 2018/14 Communiqué on Technical Procedures for Wastewater Treatment Plants	To be obtained if required. Not required as of today.
	Temporary operating certificate/environmental permit (discharge, emission, etc.) for camp site wastewater	Regulation on Environmental Permits and Licenses Regulation on Water Pollution Control	To be obtained if required. Not required as of today.

Subject	Permit / Approval	Relevant Regulatory Framework	Status
	discharge, emission due to heating		
	Water use agreement with the Municipality (if required)	-	To be obtained after construction permit if required.
	Groundwater use permit (if required)	Law on Groundwater Resources (No. 167, 1960)	To be obtained prior to construction if required
	Wastewater acceptance letter from the Viranşehir Municipality confirming that Municipality WWTP is capable of handling the load (if required)	-	Not required.
	Waste management plan approval,	Regulation on Waste Management	To be obtained prior to construction
	Temporary storage permit (If a thousand kilograms or more of hazardous waste will be produced per month)	Regulation on Waste Management	To be obtained prior to construction
	Agreements with licensed waste management and disposal companies	Regulation on Waste Management	To be obtained prior to construction
	Night work permit (if required)	Regulation on Assessment and Management of Environmental Noise	To be obtained prior to construction
	Private security permit	Regulation on the Implementation of the Law Concerning Private Security Services	To be obtained prior to construction
	Temporary land use permit for Camp Site	Permit of Governorship and Ministry of Agriculture and Forestry	Ongoing
Operation	License Application	Electricity Market License Regulation	In progress, to be obtained once Preliminary Project was approved.
	Facility Provisional Acceptance	-	In progress
	Energy identity certificate (for buildings)	Regulation on Energy Performance in Buildings	To be obtained prior to operation
	Fire report approval	Regulation on Fire Protection of Buildings	To be obtained prior to operation
	Temporary operating certificate/environmental permit for wastewater discharge (if required)	Regulation on Environmental Permits and Licenses	To be obtained prior to operation

Subject	Permit / Approval	Relevant Regulatory Framework	Status
	Groundwater use permit (if required)	Law on Groundwater Resources (No. 167, 1960)	To be obtained prior to operation
	Waste management plan approval, Temporary Storage Permit (If a thousand kilograms or more of hazardous waste will be produced per month) Agreements made with licensed waste management and disposal companies	Waste Management Regulation	To be obtained at the start of operation
	Trial permit /Business license	Regulation on Business License	To be obtained prior to operation
	Private security permit	Regulation on the Implementation of the Law Concerning Private Security Services	To be obtained at the start of operation
	OHTL Connection Agreement	Regulation on Electricity Market Connection and System Utilization	To be obtained prior to operation

2.2 Applicable International Legislation

Türkiye is a party to many international agreements regarding multiple social and environmental subjects. These are listed in in Appendix A and their applicability will be further discussed in the relevant chapters of this ESIA.

Türkiye has also ratified the following international conventions and agreements related to human rights that apply may apply to this Project.

Council of Europe Documents

- European Convention for the Protection of Human Rights and Fundamental Freedoms (As Amended by Protocol No. 11)
- Council of Europe Convention on the Prevention of Terrorism
- European Convention on the Exercise of Children's Rights
- Protocol No. 4 to the Convention for The Protection of Human Rights and Fundamental Freedoms Securing Certain Rights and Freedoms Other Than Those Already Included in the Convention and in the First Protocol Thereto
- Protocol to the Convention for the Protection of Human Rights and Fundamental Freedoms
- European Social Charter

United Nations Documents

- The Statute of The Council of Europe

- Report of The Office of The United Nations High Commissioner for Human Rights on the International Workshop on Enhancing Cooperation Between International and Regional Mechanisms for The Promotion and Protection of Human Rights
- The Role of The Ombudsman, Mediator and Other National Human Rights Institutions in the Promotion and Protection of Human Rights
- International Covenant on Civil and Political Rights
- The Universal Declaration of Human Rights

The ILO Conventions Ratified by Türkiye

- C 2 Unemployment Convention, 1919
- C 11 Right of Association (Agriculture) Convention, 1921
- C 14 Weekly Rest (Industry) Convention, 1921
- C 15 Minimum Age (Trimmers and Stokers) Convention, 1921
- C 26 Minimum Wage-Fixing Machinery Convention, 1928
- C 29 Forced Labour Convention, 1930
- C 34 Fee-Charging Employment Agencies Convention, 1933
- C 42 Workmen's Compensation (Occupational Diseases) Convention (Revised), 1934
- C 45 Underground Work (Women) Convention, 1935
- C 53 Officers' Competency Certificates Convention, 1936
- C 55 Shipowners' Liability (Sick and Injured Seamen) Convention, 1936
- C 58 Minimum Age (Sea) Convention (Revised), 1936
- C 59 Minimum Age (Industry) Convention (Revised), 1937
- C 68 Food and Catering (Ships' Crews) Convention, 1946
- C 69 Certification of Ships' Cooks Convention, 1946
- C 73 Medical Examination (Seafarers Convention, 1946
- C 77 Medical Examination of Young Persons (Industry) Convention, 1946
- C 80 Final Articles Revision Convention, 1946
- C 81 Labour Inspection Convention, 1947
- C 87 Freedom of Association and Protection of the Right to Organise Convention, 1948
- C 88 Employment Service Convention, 1948
- C 92 Accommodation of Crews Convention (Revised), 1949
- C 94 Labour Clauses (Public Contracts) Convention, 1949
- C 95 Protection of Wages Convention, 1949

- C 96 Fee-Charging Employment Agencies Convention (Revised), 1949
- C 98 Right to Organise and Collective Bargaining Convention, 1949
- C 99 Minimum Wage Fixing Machinery (Agriculture) Convention, 1951
- C100 Equal Remuneration Convention, 1951
- C102 Social Security (Minimum Standards) Convention, 1952
- C105 Abolition of Forced Labour Convention, 1957
- C108 Seafarers' Identity Documents Convention, 1958
- C111 Discrimination (Employment and Occupation) Convention, 1958
- C115 Radiation Protection Convention, 1960
- C116 Final Articles Revision Convention, 1961
- C118 Equality of Treatment (Social Security Convention, 1962
- C119 Guarding of Machinery Convention, 1963
- C122 Employment Policy Convention, 1964
- C123 Minimum Age (Underground Work) Convention, 1965
- C127 Maximum Weight Convention, 1967
- C133 Accommodation of Crews (Supplementary Provisions) Convention, 1970
- C134 Prevention of Accidents (Seafarers) Convention, 1970
- C135 Workers' Representatives Convention, 1971
- C138 Minimum Age Convention, 1973
- C142 Human Resources Development Convention, 1975
- C144 Tripartite Consultation (International Labour Standards) Convention, 1976
- C146 Seafarers' Annual Leave with Pay Convention, 1976
- C151 Labour Relations (Public Service) Convention, 1978
- C152 Occupational Safety and Health (Dock Work) Convention, 1979
- C153 Hours of Work and Rest Periods (Road Transport) Convention, 1979
- C155 Occupational Safety and Health Convention, 1981
- C158 Termination of Employment Convention, 1982
- C159 Vocational Rehabilitation and Employment (Disabled Persons) Convention, 1983
- C161 Occupational Health Services Convention, 1985
- C164 Health Protection and Medical Care (Seafarers) Convention, 1987
- C166 Repatriation of Seafarers Convention (Revised), 1987

- C167 Safety and Health in Construction Convention, 1988
- C176 Safety and Health in Mines Convention, 1995
- C182 Worst Forms of Child Labour Convention, 1999
- C187 Promotional Framework for Occupational Safety and Health Convention, 2006.

Other International Standards

The following standards are referred to within the IFC Guidelines:

- WHO Ambient Air Quality Standards, and
- WHO Drinking Water Standards.

In addition, the following guidelines and standards may be utilized:

- Dutch Intervention Values for Soil Quality, as/if needed, and
- IUCN Red Data Book for protected species (fauna and flora).
- Guidance on Heritage Impact Assessments for Cultural World Heritage Properties, ICOMOS 2011

2.3 International Financing Institutions' Guidelines

For the preparation of the present document, international conventions and agreements, ESIA International Standards (i.e., Equator Principles, and IFC Performance Standards and guidelines) have been analysed and considered together with national standards.

The Equator Principles Financial Institutions (EPFIs) emphasize that they will not provide loans to projects where the borrower will not or is unable to comply with the EPFIs social and environmental policies and procedures that implement the Equator Principles.

In addition, the Equator Principles endorse the applicable IFC Performance Standards, IFC General EHS Guidelines and IFC Industry Specific EHS Guidelines. The Performance Standards establish the standards that the project is to meet throughout the life of an investment by the IFC or other relevant financial institutions. General and Industry Specific EHS Guidelines provide implementation guidelines and environmental quality limits that projects should comply with.

The Equator Principles, the IFC Performance Standards and Other Guidelines are listed below.

2.3.1 Equator Principles IV (2020)

EPs are a set of voluntary environmental and social guidelines that have been adapted by a significant number of financial institutions influential in the Project finance market (collectively the EPFIs). The EPs comprise a set of ten broad principles that are underpinned by the environmental and social policies, standards and guidelines.

The EPFIs emphasize that they will not provide loans to projects where the borrower will not or is unable to comply with the EPFIs social and environmental policies and procedures that implement the Equator Principles.

The EPFIs have ten (10) principles:

- Equator Principle 1: Review and Categorization
- Equator Principle 2: Environmental and Social Assessment
- Equator Principle 3: Applicable Environmental and Social Standards
- Equator Principle 4: Environmental and Social Management System and Equator Principles Action Plan

- Equator Principle 5: Stakeholder Engagement
- Equator Principle 6: Grievance Mechanism
- Equator Principle 7: Independent Review
- Equator Principle 8: Covenants
- Equator Principle 9: Independent Monitoring and Reporting
- Equator Principle 10: Reporting and Transparency

The client is expected to include assessments of potential adverse Human Rights impacts and climate change risks as part of the ESIA. The client should refer to the e United Nations Guiding Principles on Business and Human Rights (UNGP) when assessing Human Rights risks and impacts, and the Climate Change Risk Assessment should be aligned with Climate Physical Risk and Climate Transition Risk categories of the Task Force on Climate-related Financial Disclosures (TCFD). A Climate Change Risk Assessment is required: For all Category A and, as appropriate, Category B Projects, and will include consideration of relevant physical risks as defined by the TCFD. For all Projects, in all locations, when combined Scope 1 and Scope 2 Emissions are expected to be more than 100,000 tonnes of CO_2 equivalent annually. Consideration must be given to relevant Climate Transition Risks (as defined by the TCFD) and an alternatives analysis completed which evaluates lower Greenhouse Gas (GHG) intensive alternatives. The depth and nature of the Climate Change Risk Assessment will depend on the type of Project as well as the nature of risks, including their materiality and severity.

2.3.2 IFC Performance Standards

The eight IFC PSs establish the standards that a project is to meet throughout the life of an investment by the IFC or any other relevant financial institution. These are the following:

- Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts
- Performance Standard 2: Labour and Working Conditions
- Performance Standard 3: Resource Efficiency and Pollution Prevention
- Performance Standard 4: Community Health, Safety, and Security
- Performance Standard 5: Land Acquisition and Involuntary Resettlement
- Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
- Performance Standard 7: Indigenous Peoples
- Performance Standard 8: Cultural Heritage

2.3.2.1 IFC General EHS Guidelines

The General EHS Guidelines (dated April 30th, 2007) provide guidance to users on common EHS issues potentially applicable to all industry sectors. During the design, construction, operation, and decommissioning of a project (the Project lifecycle) the Project owner will consider ambient conditions and apply pollution prevention and control technologies and practices (techniques) that are best suited to avoid or, where avoidance is not feasible, minimize or reduce adverse impacts on human health and the environment while remaining technically and financially feasible and cost-effective. The Project-specific pollution prevention and control techniques included in General EHS Guidelines involve the subjects listed below:

- Air emissions and ambient air quality,
- Energy conservation,
- Wastewater and ambient water quality,
- Water conservation,
- Hazardous materials management,
- Waste management,
- Noise,
- Contaminated land,
- Occupational Health & Safety,
- Community Health & Safety, and
- Construction and Decommissioning.

2.3.2.2 Performance Indicators and Monitoring, Documents Pertaining to Human Rights

The IFC's Sustainability Framework – consisting of the Policy on Environmental and Social Sustainability, Performance Standards on Environmental and Social Sustainability, and Access to Information Policy – were released publicly on August 1st, 2011, with an effective date of January 1st, 2012.

The external context has evolved rapidly in certain thematic areas, including increased attention towards climate change, ecosystem services, financial intermediaries, and human rights. With regard to the latter, the consultation process confirmed that human rights are now a major sustainability issue for businesses and their stakeholders. The IFC's commitment to respecting human rights in its business activities is captured in the Sustainability Policy, while IFC Owners' responsibility to respect human rights is captured in Performance Standard 1. Other provisions in the Performance Standards also support various human rights relevant to business. In that context, many human rights risks for business can be effectively addressed through social and environmental considerations. Some major items in that respect will be under the categories of:

- Labour and Working Conditions;
- Community Health, Safety, and Security;
- Land Acquisition and Involuntary Resettlement;
- Indigenous Peoples (not applicable to the Project); and
- Cultural Heritage.

2.3.2.3 Other IFC Guidelines

IFC Guidelines that are applicable to the Project are provided as follows:

- IFC's Good Practice Note on Addressing Grievances from Project-Affected Communities (2009)
- IFC's Good Practice Note on Managing Contractors' Environmental and Social Performance (2017)
- IFC's Good Practice Handbook on Use of Security Forces: Assessing and Managing Risks and Impacts (2017)

- IFC's Handbook for Addressing Project-Induced In-Migration (2009)
- IFC's Introduction to Health Impact Assessment (2009)
- IFC and EBRD's Guidance Note on Workers' Accommodation: Processes and Standards (2009)
- IFC's Good Practice Handbook on Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets (2013)
- IFC's Environmental and Social Management System Implementation Handbook: Construction (2014)
- IFC's Environmental and Social Management System Implementation Handbook: General (2015)
- IFC's Stakeholder Engagement Handbook: A Good Practice Handbook for Companies Doing Business in Emerging Markets (2007)
- Interim Advice for IFC Clients on Supporting Workers in the Context of COVID-19

2.3.3 OECD's Common Approaches

The OECD Common Approaches recognizes that the primary role of ECAs is to promote trade in a competitive environment (in contrast to development banks and agencies which focus primarily on development assistance) and that ECAs have a responsibility to consider the positive and negative Environmental and Social Human Rights risks (ESHR) and impacts of projects, in particular those in sensitive sectors and/or located in or near sensitive areas, and the ESHR risks associated with existing operations, in deciding whether to offer support.

2.3.4 Environmental Limits

A list of potentially applicable limits and criteria derived from the applicable requirements are presented in Appendix B for each environmental component. According to the recommendations of the IFC guidelines, when national regulations differ from levels and measures presented in the international standards, the Project is expected to achieve whichever is more stringent where possible.

Project Standards are presented in Appendix B. The criteria used to define Project Standards are as follows:

- In the presence of different limits in national and international standards the most stringent one is adopted as Project Standard.
- In the absence of the IFC limits, national limits are adopted as Project Standards.

3.0 PROJECT DESCRIPTION

3.1 Project Overview

G4-Viranşehir-5,7,8 Solar Power Plant Project having a capacity of 195 MWp/150MWe, is planned by Kalyon Enerji Yatırımları A.Ş. (“Kalyon Enerji”) and this Project will be developed and constructed by Kalyon YEKA GES 3 ve 4 Güneş Enerjisi Yatırımları A.Ş (“Client”), a subsidiary of Kalyon Enerji. The Project will be located in Şanlıurfa Province, Viranşehir District, Kadıköy Neighbourhoods in Türkiye. Once the Project is put into operation, it is planned to produce -390000 MWh electricity in annual basis, and the electricity produced will be transferred to the Viranşehir Substation via a new ~26.7 km-length 154 kV OHTL.

The Project pre-construction activities, namely, mobilization of temporary site facilities, site preparation, grading and levelling, material delivery and storage and certain early trenching activities for cable laying was planned to be started in August 2023. On the other hand, according to the latest information given by the Client, pre-construction activities have not started in the ESIA Report preparation phase.

Project layout is presented in Figure 3-4. The figures below represent the baseline site conditions.

Figure 3-1: Project Site Photos (EN-ÇEV Enerji Çevre Yatırımları ve Danışmanlığı Haritacılık İmar İnşaat A.Ş., 2022)

Figure 3-2: Project Site Photos (EN-ÇEV Enerji Çevre Yatırımları ve Danışmanlığı Haritacılık İmar İnşaat A.Ş., 2022)

Figure 3-3: Project Site Photos (EN-ÇEV Enerji Çevre Yatırımları ve Danışmanlığı Haritacılık İmar İnşaat A.Ş., 2022)

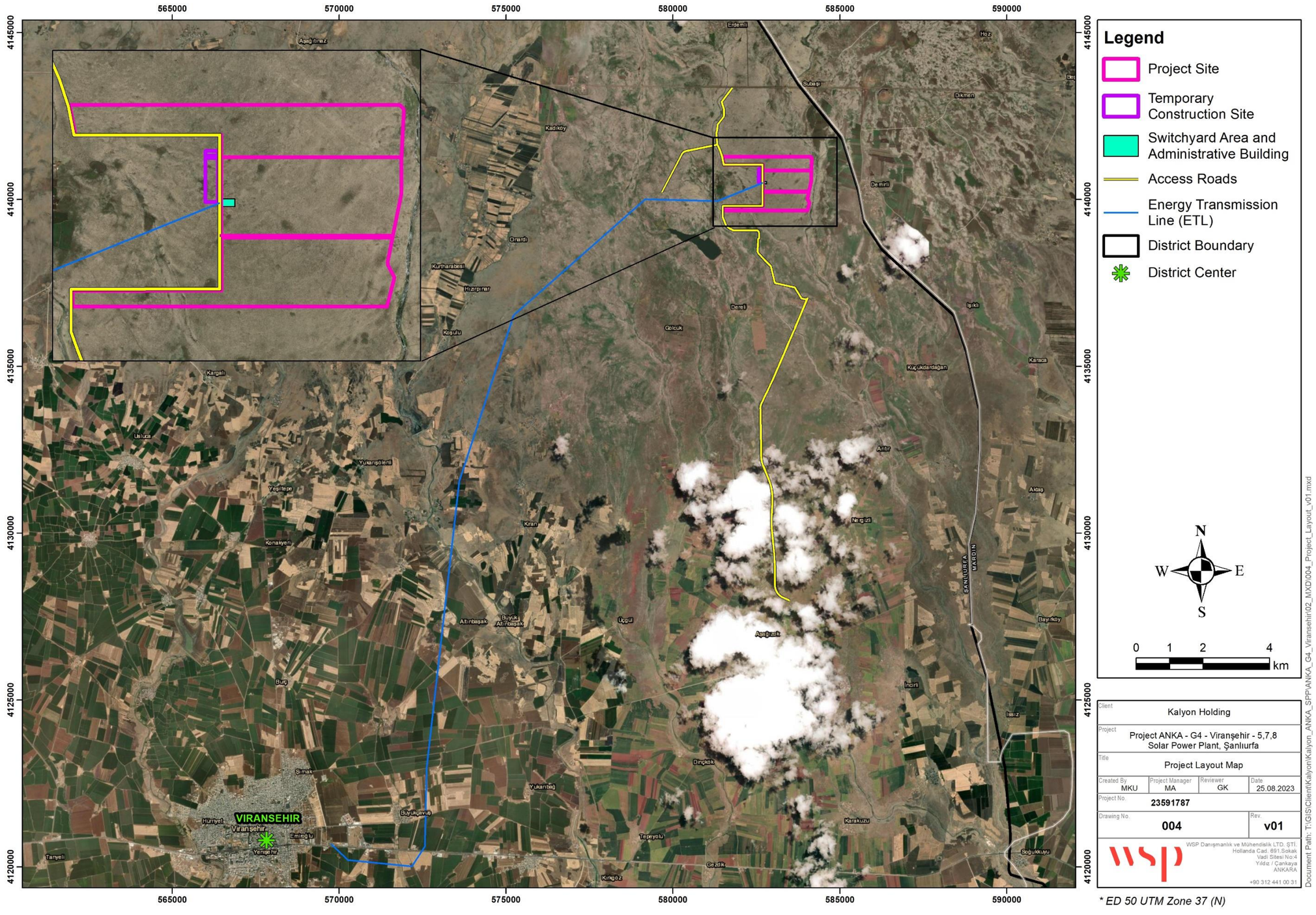


Figure 3-4: Project Layout

3.2 Project Components

The main components of the plant consist of solar panels, PV module carrier system (one-axis solar tracker), DC Combiner Boxes, inverter stations and a substation. Other infrastructure and utilities can be listed as the Transformer Center Building (Supervisory Control and Data Acquisition (SCADA)), administration buildings (including dining hall, security building, personnel workshop).

Main components, their arrangements and working principles are presented in Figure 3-5.

Cables

Cables

Cables

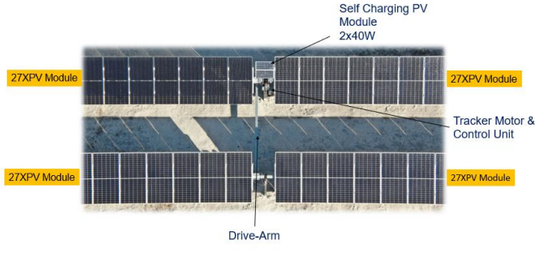
PV Module & Tracker (Panel Carrier) System

- PV Cells converts the sunlight into electricity.
- Parallel and serial connections PV Cells creates the PV Modules.
- PV Modules are mounted on tracker system. One Axis Tracker System supports PV Modules produce more energy with following up the sun during the daytime from East to West direction.

MONOPERC PV MODULE kalyon PV

Panel Power: 400 W
Panel QTY: 487,728 PCS

SINGLE AXIS TRACKER SYSTEM PVH



DC Combiner Box

- Electricity produced by PV Modules are collecting trough DC Combiner Boxes.
- DC Combiner Boxes able to provide the information of the PV Module series Current/Voltage values for the monitoring purpose to check status of the PV Module Strings.

Inverter Station

- Inverter Station combines the electricity from the DC Combiner Boxes.
- Inverter convert the electricity from DC form to the AC form which is the national grid transmission form.
- Inverter injects the electricity to transformer with 690V voltage level, Transformer placed in the Inverter Station step-up the voltage level to the 34.5kV.
- Through the RMU (Ring Main Unit) switchgears the AC electricity combining together from couple of Inverter Stations and sending to the Substation.

4.73 MW CENTRALIZED INVERTER STATION

154/34.5 kV Substation and Switchyard

- Combined AC electricity from the Solar feeders is collecting with MV Switchgears in the Substations.
- Main Transformers in the substation steps-up the AC electricity voltage level required in the system connection agreement. (154kV)

154 kV Overhead Transmission Line

- HV electricity injecting to the national grid trough the overhead transmission line.

Figure 3-5: Project Illustration

PV Module

Photovoltaic panels are the environment where currents and voltages are formed by movements such as the jumping of electrons and displacement between poles due to the effect caused by the photons that form the light hitting the solar panel cells. Or if there is a voltage due to photons, it is the name of a system in a photovoltaic panel.

Solar panels consist of many solar cells. These cells are made of an element called silicon, which is very abundant in our world. Almost every cell consists of a positive and a negative layer to create an electric current, as seen in batteries. In addition, when photons from the sun are absorbed by this cell, which is also located on the solar panel, the energies released cause the electrons to move freely.

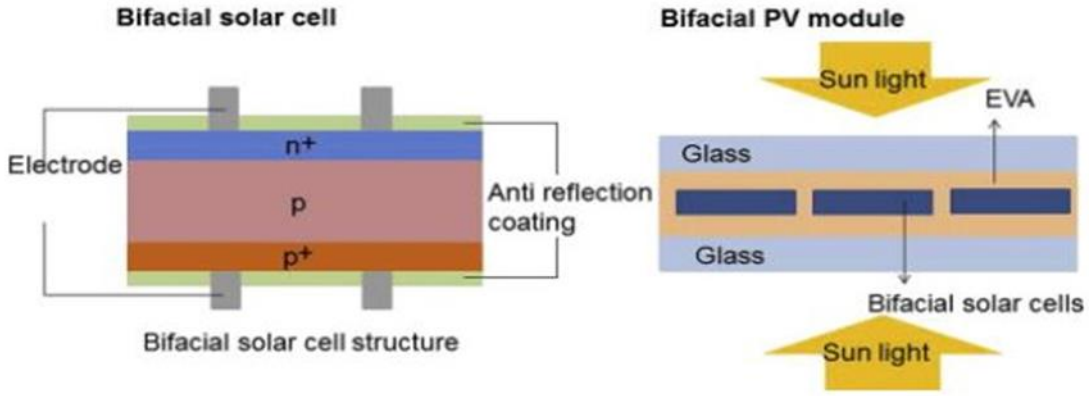


Figure 3-6 Bifacial Cell Structure

As shown in Figure 3-6, the panels are actually formed by connecting small solar cells in series. These solar cells are composed of semiconductor materials. The electron detached by the photon hitting the negative pole goes towards the positive pole. This path is traveled through the cable connected to the end of the circuit.

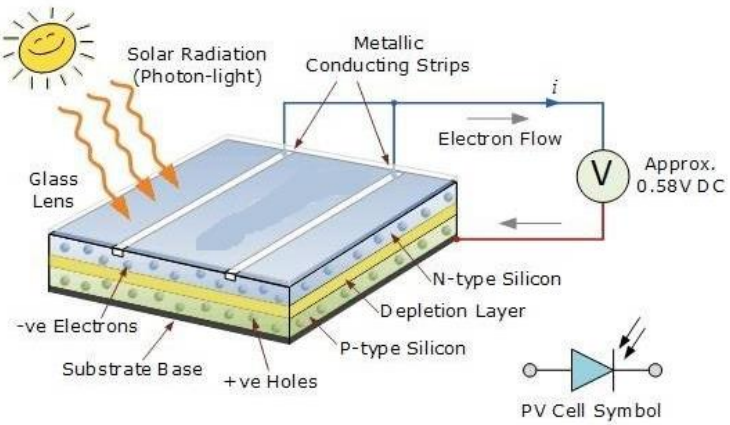


Figure 3-7 Cell Structure

DC Combiner Box

It allows the cables from certain panel groups to be collected in the appropriate junction box and collected in two main cable lines with thicker sections than this box. Taking many solar cables consisting of plus and minus lines to the inverter leads to both cable waste and energy loss. For this reason, a certain panel group should be gathered on a single plus/minus line. PV Array or String is called the panel groups with their specific voltage and current values adjusted by means of the PV junction box or the combiner box in general terms. The PV

combiner box can also be equipped with DC breakers and switches, facilitating on-line service/maintenance and ensuring that the line is de-energized in the event of a problem.

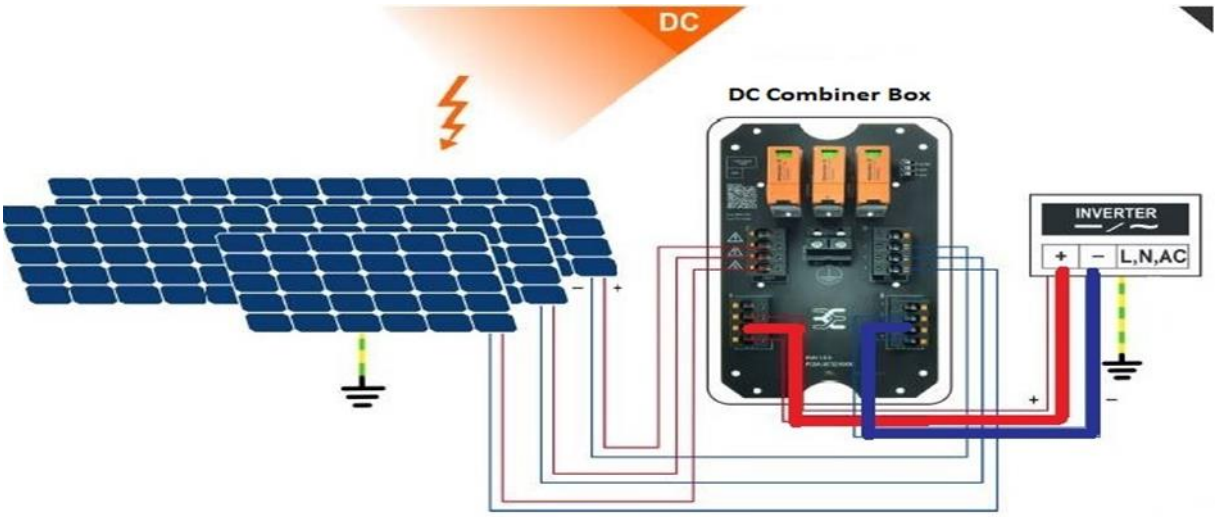


Figure 3-8 Visual Demonstration of the Collection of Strings in the DC Combiner Box

Inverter Station

Inverter station consists of inverter, transformer, and medium voltage disconnector-breaker unit.

The inverter is an electrical power conversion element. Another common name for the inverter is power converter or inverter. An inverter is simply a device that converts direct current (DC) into alternating current (AC) whose amplitude and direction change periodically.

The inverter provides AC current at the desired voltage, power or frequency values. Inverters are used to generate electricity from renewable energy sources. In particular, inverter types with more features are produced to make the energy obtained from wind and solar energy systems suitable for use, working with higher quality and stability.

The AC voltage obtained in the inverter is transferred to the transformer and increased from 690V to 33600V. In this way, both the power loss during the transmission of energy is minimized and it is possible to use a cable with a smaller cross-section.

The voltage raised at the transformer is transferred to the MV Disconnector -Breaker Unit (RMU). The energy in the RMU is transported via cables to the 154kV or 400kV Substation Building. Breakers in the RMU cut off power from the inverter station to protect the system in the event of failures. Separators, on the other hand, provide the opportunity to work safely by cutting the power in the line in cases where power failure is required.

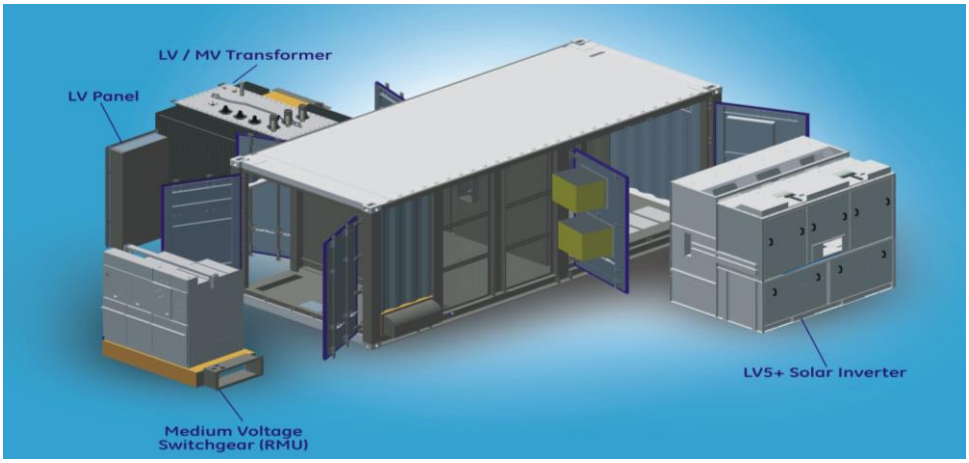


Figure 3-9 Visual Demonstration of an Inverter Station

Substation and Switchyard

It is a SCADA and Switchgear station that is the main link between the generation plant and the transmission system. The power generated in a power plant is transmitted through a switchyard. These are the facilities where electricity generation, transmission and distribution are carried out.

Substation and switchyard are composed of:

- Transformer: Electric transformers are used in switchyards. With these transformers, electricity is lowered or raised. Thus, the voltage is distributed by bringing it to the desired transmission level. Transformers connect two or more circuits by electromagnetic induction.
- Busbar: Busbars collect and distribute electrical energy at different frequencies and voltages, and provide communication between the control and control sections.
- Breakers: Breakers interfere with short circuits or overcurrent that may occur in large pure fields. When the breaker is closed, it provides energy flow from the circuit. In the open state, it prevents the flow of power.
- Control Equipment: It prevents malfunctions that may occur in the network and devices from causing permanent damage. These are the control circuits used for this purpose.
- Measuring Instruments: Switchyards have instruments that measure values such as current, voltage, power and frequency. Meters are used to measure the electrical energy consumed. Current and voltage transformers are used to measure medium and high voltage. Switchyards consist of switching, protection and control elements other than transformers. Protection elements differ according to the size of the site.
- SCADA: Automation of substations uses a SCADA system to optimize the management of capital assets and improve operation and maintenance efficiency with as little human intervention as possible. Problems that may occur in substations will lead to life or material problems. For this reason, quickly detecting a malfunction occurring in these centers, notifying the relevant people and making the correct intervention according to the type of malfunction will prevent vital and material losses. This system also includes the layout of substation and feeder operating functions and applications from alarm processing to integrated volt-var control. SCADA in the automation system has basic functions such as monitoring and control, report generation and historical data storage, as well as various functions for special applications in the substation automation scheme.

Layout of Project components is shown in Figure 3-10.

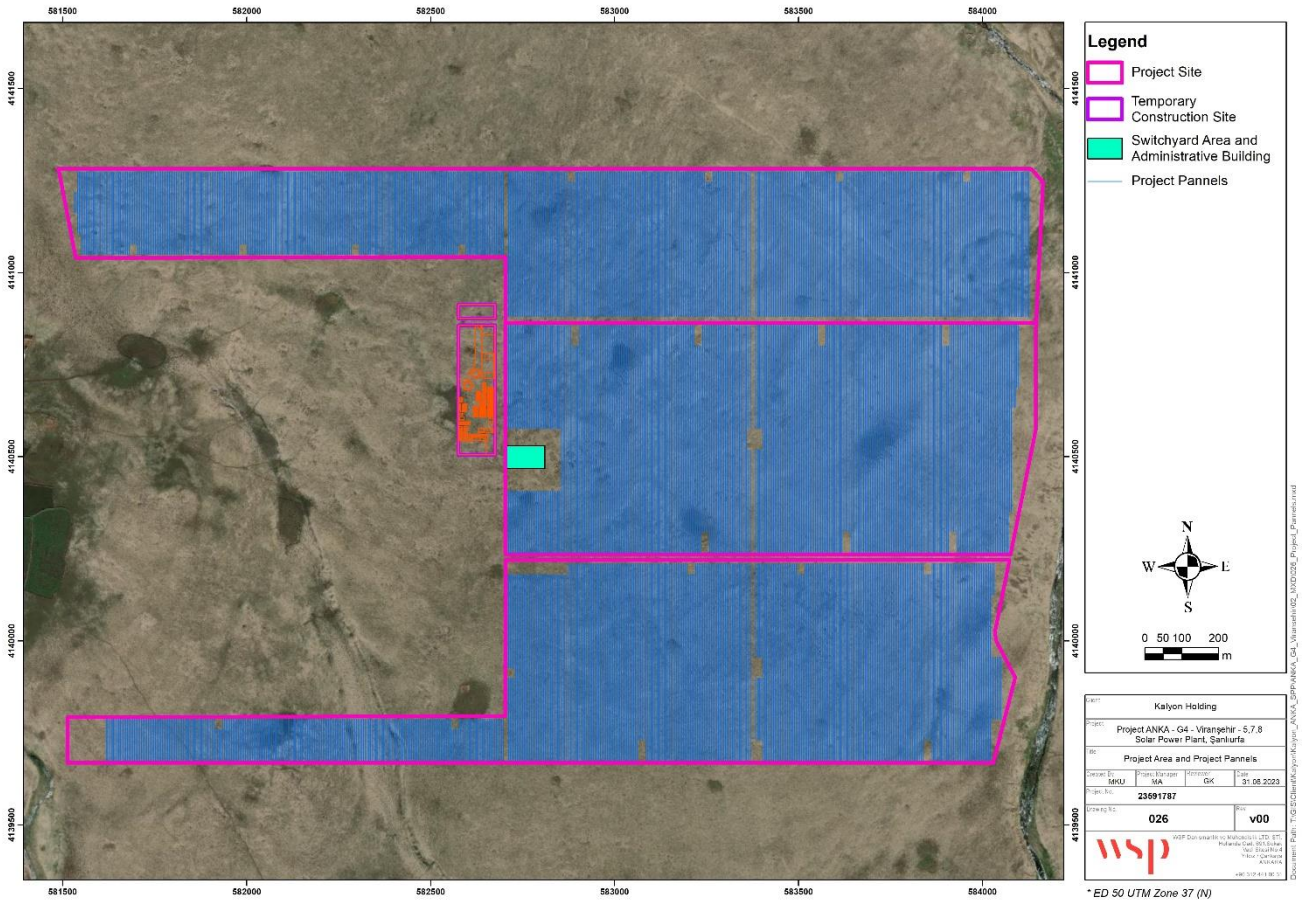


Figure 3-10: Layout of Project Components

3.3 Project Phases

3.3.1 Construction Phase

The construction phase activities include site clearance and earthworks (excavation, filling) to create the surface over which the project will be constructed and works after earthworks such as laying of concrete foundations, fencing, establishment of internal roads, erection of buildings and infrastructures, material storage, construction of temporary workers camps and offices, installation of electrical, telecommunication systems, assembly of panel systems and installation of solar panels, construction of the substation and control building, testing, commissioning and connection to the grid.

The Project pre-construction activities, namely, mobilization of temporary site facilities, site preparation, grading and levelling, material delivery and storage and certain early trenching activities for cable laying was planned to be started in August 2023. On the other hand, according to the latest information given by the Client, pre-construction activities have not started in the ESIA Report preparation phase.

Workflow charts for each Project component are presented below.

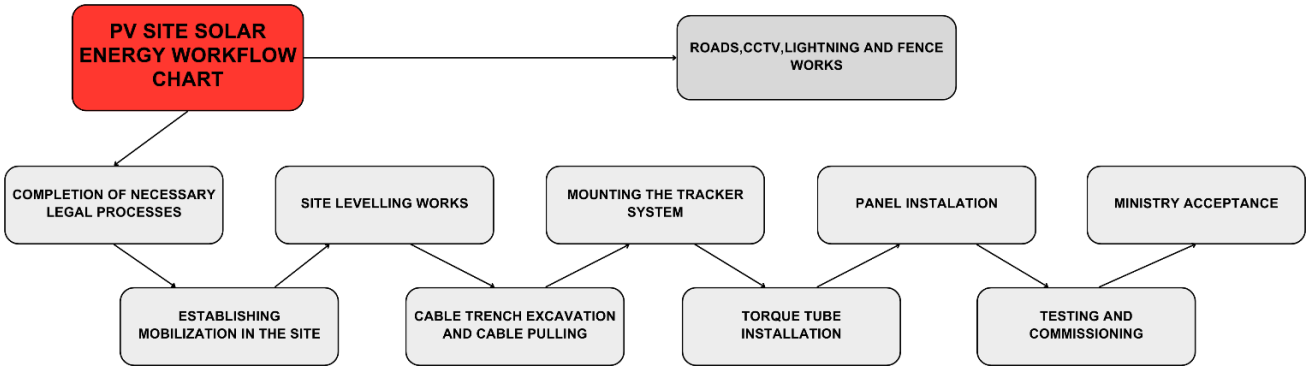


Figure 3-11: Workflow Chart of PV Site Solar Energy

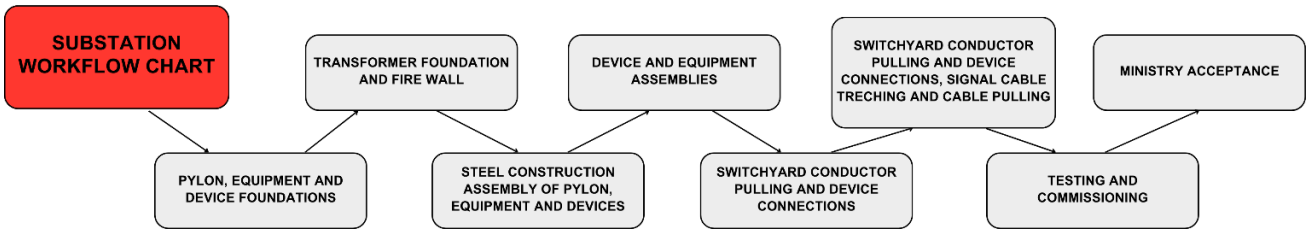


Figure 3-12: Workflow Chart of Substation

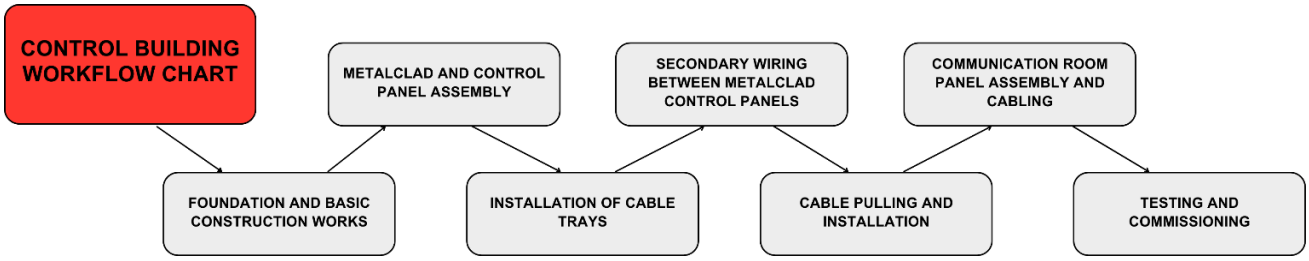


Figure 3-13: Workflow Chart of Control Building

3.3.2 Operation Phase

Maintenance will be necessary during the Project's operation phase to ensure an extended system lifetime, manufacturer warranty compliance, and energy production efficiency. Regular panel cleaning, maintenance of electrical equipment, control systems, and access roads are all examples of routine maintenance activities.

3.3.3 Decommissioning Phase

The Project would be decommissioned once it has reached to the end of its economic life after the Project's anticipated economic useful lifespan of about 30 years. Decommissioning activities will include disassemble, waste transports, management and restoration of the area. The ground surface will be covered according to appropriate vegetation selection (compatible with the soil, climate and flora of the region) after the rehabilitation operations are completed. The Project site will be handed over to the Ministry of Industry and Technology after the decommissioning works.

3.4 Associated Facilities

According to the OECD and IFC Performance Standards, Associated Facilities are defined as:

- OECD - “Associated facilities are those facilities that are not a component of the project but that would not be constructed or expanded if the project did not exist and on whose existence the viability of the project depends; such facilities may be funded, owned, managed, constructed and operated by the buyer and/or project sponsor or separately from the project.”
- IFC – PS1 par. 8 – “Associated facilities, which are facilities that are not funded as part of the project and that would not have been constructed or expanded if the project did not exist and without which the project would not be viable”.

3.4.1 OHTL

Transmission line is the system that provides electrical energy transmission between substations and end consumers. An overhead transmission line consists of a copper or aluminium conductor cable, a carrier pole and an insulating insulator that provides the connection between the pole and the conductor.

According to Electricity Market Law in Türkiye, OHTL investments can be constructed or financed jointly by the legal entity or entities requesting connection to facilities in the following cases:

- Where it is necessary to construct a new transmission facility for the connection of generation and consumption facilities to the transmission system and new transmission lines to connect this facility to the transmission system,
- Where TEİAŞ does not have sufficient financing for the construction of these facilities
- Investment cannot be planned on time by TEİAŞ,

The investment cost is repaid by deducting from the transmission system usage fee within the framework of a facility contract to be signed between the relevant legal entity or entities and TEİAŞ, and connection and system usage agreements.

According to the information obtained from the Client, once the Solar Power Plant is put into operation, it is planned to produce 150 MWe electricity annually, and the electricity produced will be transferred to the Viranşehir Substation via a new ~26.7 km-length 154 kV OHTL. This new OHTL will serve for the other solar power plants in the vicinity of the Project Area. Therefore, it is not clear whether OHTL will be counted as an associated facility for these reasons mentioned. Therefore, it is not considered as an associated facility within the scope of the ESIA report.

3.4.2 Water Pipeline

A patrolling office is planned to be built near the project area and a groundwater well will be drilled for the patrolling office. Kalyon will plan to use water from that well for potable water requirements of the personnel and utility during the construction and operation phase patrolling officeand installation and operation of the well will be under the responsibility of the patrolling office. Since patrolling office will be very close to the mobilization area of the Project, no pipeline construction is of concern at this stage of the ESIA. Therefore, the well and the water pipeline is not considered as an associated facility within the scope of the ESIA report.

3.5 Project Rationale

Solar power is a clean and renewable energy source that utilizes sunlight to generate electricity. By establishing a solar power plant, dependence on fossil fuels can be reduced and climate change can be mitigated by reducing greenhouse gas emissions.

Solar power provides an opportunity for countries to achieve energy independence. By generating electricity locally from the sun, reliance on imported fossil fuels can be reduced and energy costs can be stabilized. Once the initial investment is made to set up the solar power plant, the operational costs are relatively low. Solar

power has a long lifespan, and the fuel source (sunlight) is infinite and free, making it a financially viable and sustainable option.

Solar power plants offer scalability and modularity. Depending on the available space and energy demand, the plant's capacity can be expanded by adding more solar panels. This flexibility allows for the customization and optimization of the project to meet specific energy needs.

Solar power technology has been advancing rapidly, resulting in improved efficiency and reduced costs. Continued investments in solar power plants can help drive further technological innovations, making solar energy even more accessible and cost-effective.

Türkiye has favourable conditions for solar power generation due to its geographic location, receiving an average of 2,741 hours of sunlight per year. The government has also implemented supportive policies and incentives to promote the development of solar energy, including feed-in tariffs, long-term power purchase agreements, and various investment incentives.[2]

Türkiye has been actively investing in solar power capacity and has experienced significant growth in recent years. According to the installed capacity report of TEİAŞ for December 2022, Türkiye's total installed solar power capacity has reached around 9.4 gigawatts (GW). [3]

Türkiye's monthly geographical average global radiation distribution is presented below.

[2] https://enerji.gov.tr/bilgi-merkezi-enerji-gunes

[3] https://www.teias.gov.tr/kurulu-guc-raporlari

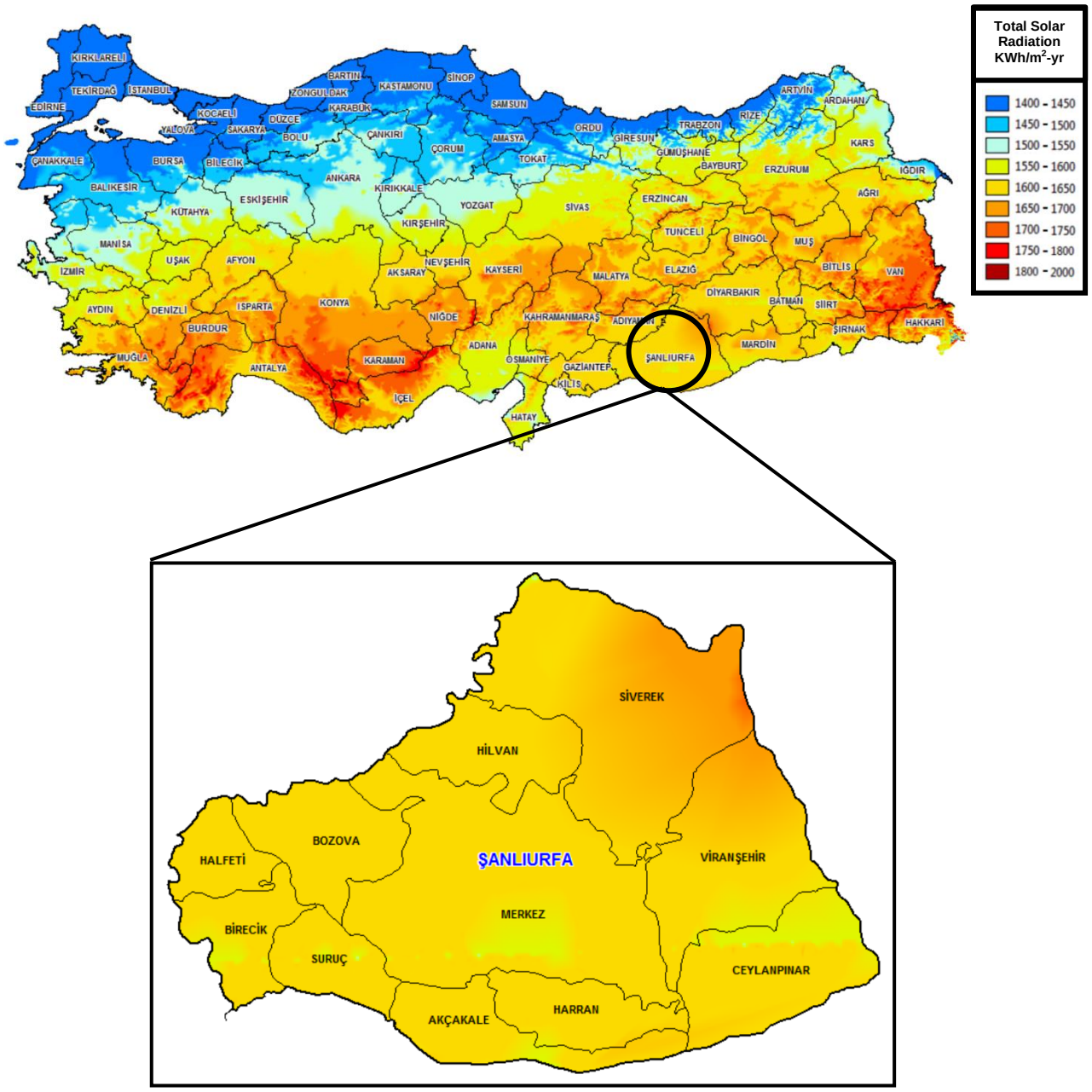


Figure 3-14: Türkiye's Monthly Average Global Radiation Distribution

Source: Republic of Türkiye Ministry of Energy and Natural Sources[4]

It is of great importance to create a balanced portfolio in electricity generation by increasing the share of renewable energy resources and resource diversity in total electricity generation. With the YEKA model realized in this context, on the one hand, the cost of electricity purchased from renewable energy generation facilities and greenhouse gas emissions from power generation will be reduced, while on the other hand, the development of domestic production in renewable energy technologies and the capacity of qualified human resources will be increased.

[4] https://enerji.gov.tr/eigm-yenilenebilir-enerji-kaynaklar-gunes#:~:text=Bakanl%C4%B1%C4%9F%C4%B1m%C4%B1zca%20haz%C4%B1rlanan%2C%20T%C3%BCrkiye%20G%C3%BCne%C5%9F%20Enerjisi,kWh%2Fm2%20olarak%20hesaplanm%C4%B1%C5%9Ft%C4%B1r.

The Regulation on Renewable Energy Resource Areas was published in the Official Gazette dated 09/10/2016 and numbered 29852. With this Regulation, a new investment model for the utilization of renewable energy resources was introduced. The advantages of the YEKA model are listed below.

- YEKA will be established on public and treasury immovables and immovables subject to private ownership, and renewable energy resources will be used more effectively and efficiently,
- By paving the way for indigenization in renewable energy technologies, it will become an important production capacity in Türkiye, together with its subsidiary sectors. Thus, it will trigger many of the sectors with direct and indirect employment and contribute positively to their development. Especially with the obligation to produce facility components with high local content (wind turbines, solar modules, etc.) with Türkiye's domestic facilities, contributions will be made to the development of our subsidiary industry (supply chain) that will be needed.
- Contributions will be made to ensure technology transfer and Research and Development (R&D) activities will be developed in Türkiye on renewable energy issues,
- The electricity to be generated in YEKAs will be purchased under more economical conditions compared to market prices,
- Factories and R&D centres to be established within the scope of the Allocation in Return for Domestic Production (APL) model will provide significant employment and technology transfer.

It is evaluated that there will be a significant acceleration in the utilization of Türkiye's renewable energy potential, renewable energy investments will increase further in our country, and thus Türkiye will have positive effects on becoming an important centre with its logistics advantage, economic power and qualified personnel competence.

Overall, establishing the Project aligns with sustainability goals, promotes environmental responsibility, reduces carbon emissions, and offers economic benefits while contributing to the transition towards a cleaner and more resilient energy future.

3.6 Project Parties

Project parties that will be involved in the SPP investment are illustrated below.

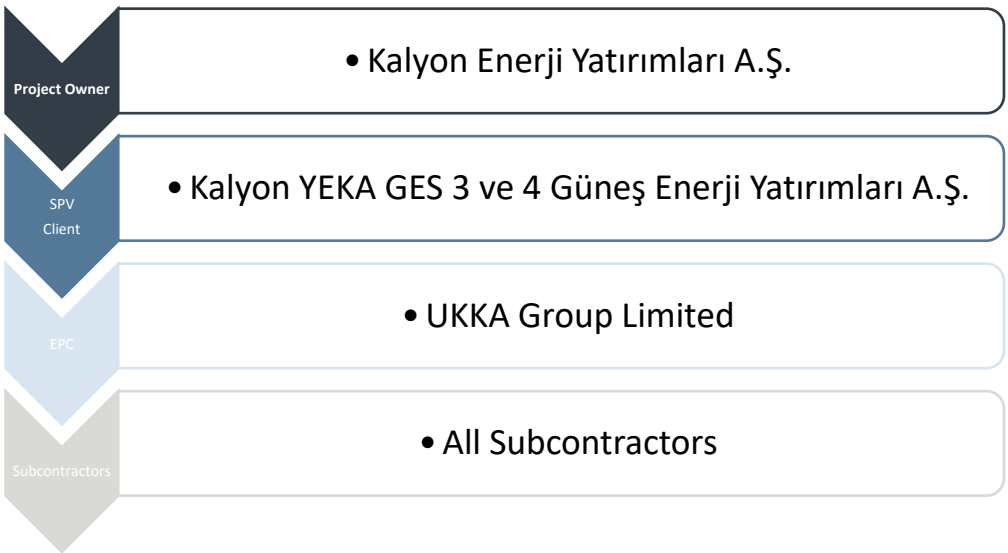


Figure 3-15: Illustration of Project Parties

Project Owner: Kalyon Enerji Yatırımları A.Ş.

SPV and the Client: Kalyon YEKA GES 3 ve 4 Güneş Enerji Yatırımları A.Ş., special purpose vehicle established for construction and operation of the facility, a subsidiary of Kalyon Enerji Yatırımları A.Ş.

EPC: UKKA Group Limited, responsible for engineering, procurement, and construction during the construction phase of the facility.

TEİAŞ: Turkish Electricity Transmission Corporation, a public government company, that operates and owns the transmission of electricity, is responsible for the planning of a transmission investment for the new transmission facilities to be established, to establish new transmission facilities. The right of ownership and operation boundary of TEİAŞ starts at the connection point to the transmission system. In case the connection of the generation or consumption facility to the transmission system is carried out through the switchyard of another generation or consumption facility, the right of use, operation, and maintenance of the connected feeder belongs to TEİAŞ. However, TEİAŞ may request the operation and maintenance of such equipment to be performed by the relevant generation or consumption facility at a specified cost.

Global Enco Energy: contractor responsible for the construction of energy transmission lines for all YEKA Projects under an ordinary partnership that will be established with the participation of YEKA Project Owners including Kalyon Enerji.

3.7 Project Schedule

A summary of the Project schedule is presented below. According to the schedule, the construction period of the Project is estimated to be 8 months and the overall operational period is estimated as 30 years. The detailed Project schedule is given in Appendix C.

Table 3-1: Project Schedule Summary

Activity	Start Date	End Date
Permitting		
Ministry Approval of Design	15-Mar-23	10-Aug-23
Construction Permit	15-Sep-22	10-Aug-23
Final Delivery Acceptance Certificate Application & Issuance	01-Mar-24	05-Mar-24
The signing of the YEKA Contract	08-Aug-22	
Master Plan Approval	20-Nov-22	14-Sep-23
EMRA (EPDK) Pre-License Approval	09-Nov-22	09-Mar-23
Base Plan Approval of the Site	04-Oct-22	30-Oct-22
Environmental Impact Assessment Approval	15-Sep-22	25-Jan-23
Signing TEİAŞ Connection Agreement	05-Oct-22	22-Jun-23
Transfer of Land Ownership	18-Nov-22	18-Aug-23
Land Allocation Approval	25-Nov-23	29-Nov-23
Electricity Generation License Approval	19-Oct-23	13-Nov-23
Baseline Studies (Physical Measurements & Biodiversity Monitoring)	04-Apr-23	05-Jun-23
Engineering	**06-Sep-22**	**30-Aug-23**

Activity	Start Date	End Date
SPP Engineering	28-Sep-22	24-Jun-23
Substation Contracting & Engineering	06-Sep-22	01-Jul-23
OHTL Contracting, Engineering	04-Oct-22	15-Jun-23
CCTV & Lighting Engineering	01-Aug-23	30-Aug-23
Procurement	**11-Apr-23**	**07-Sep-23**
Early Works	**01-Jun-23**	**29-Feb-24**
Rock Removal from Site Surface (Under Responsibility of Municipality)	15-Aug-23	29-Aug-23
Mobilization Works	15-Aug-23	13-Sep-23
Reptile & Mammal Nest Monitoring Prior to Earthworks	15-Aug-23	13-Sep-23
Construction	**15-Aug-23**	**21-Jun-24**
Solar System	15-Aug-23	21-Jun-24
Substation	15-Aug-23	11-Mar-24
OHTL	15-Aug-23	11-Mar-24
Test & Commissioning & Provisional Acceptance	**18-Dec-23**	**03-Jul-24**
Solar System	18-Dec-23	03-Jul-24
Substation	17-Mar-24	31-Mar-24
154 kV OHTL	12-Mar-24	16-Mar-24

3.8 Project Location and Ownership

The Project will be located in Şanlıurfa Province, Viranşehir District, Kadıköy neighbourhoods in Türkiye. Project location map is given below.

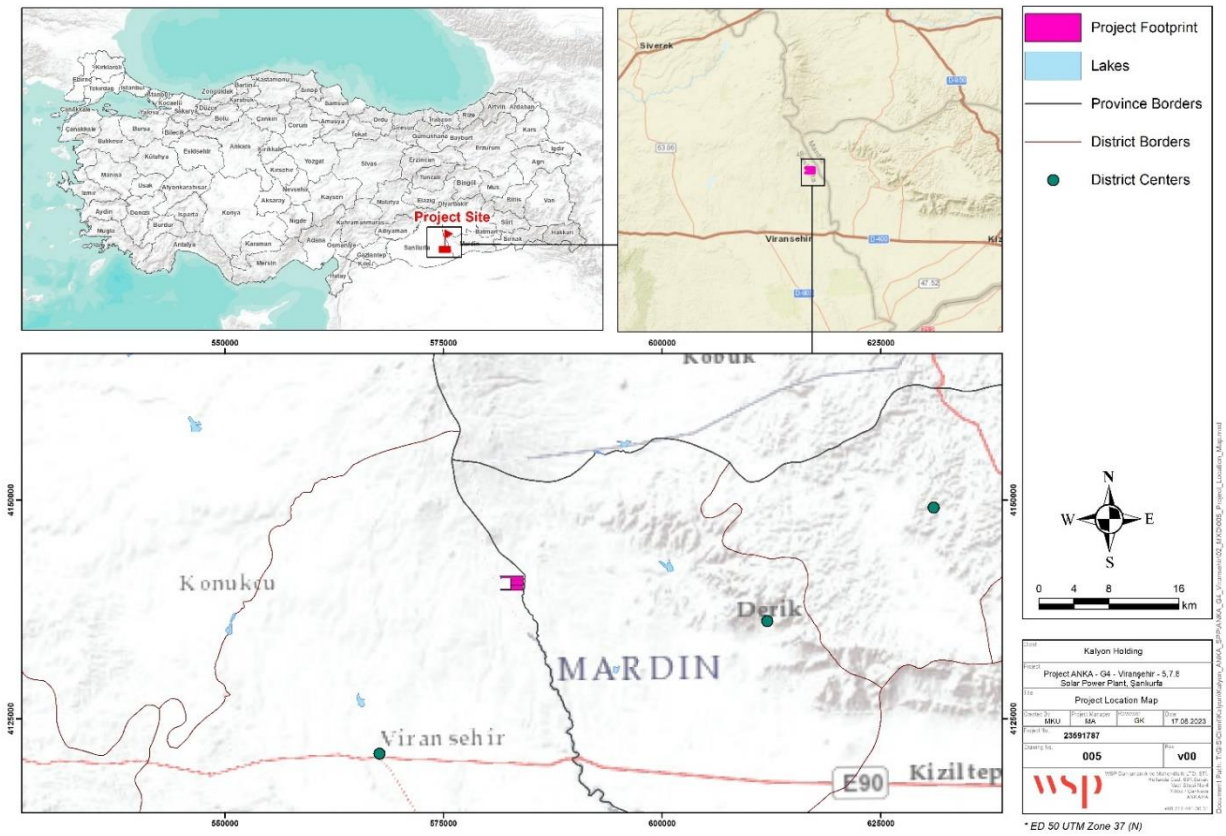


Figure 3-16: Project Location Map

The Project will be established on a pastureland with a size of 270 hectares. Adıyaman-Şanlıurfa-Diyarbakır Planning Region 1/100.000 Scaled Environmental Master Plan Amendment (M44, N42 and N43 Plan Plots, Plan Amendment Explanation Report) was approved on 07.07.2020 in accordance with Article 102 of the Presidential Decree No. 1. This Environmental Master Plan is located within the borders of "Grassland-Pastureland" as land uses in the 1/100.000 scale N43 Plan. The Project areas are also classified as "Pastureland" in terms of title deed.

Access to the Project area is provided through the existing cadastral roads and the road deviating from the Şanlıurfa-Mardin Road-D400/E90 highway, and there is no additional road construction works. There will not be any heavy-load transportation that goes beyond standard road transportation limitations; therefore, no road improvement is required for the transportation of the equipment. Internal access roads will be designed and constructed inside the Project area.

The closest settlements to the SPP site are Düzlük Hamlet with a distance of 0.57 km, Demirli Village with a distance of .1.89 km, Subaşı Hamlet with distance of 1.82 km, Göncük Village with a distance of 2.73 km and Kadıköy Village with a distance of 5.16 km. Nearest settlements to the Project site are shown in Figure 3-17.

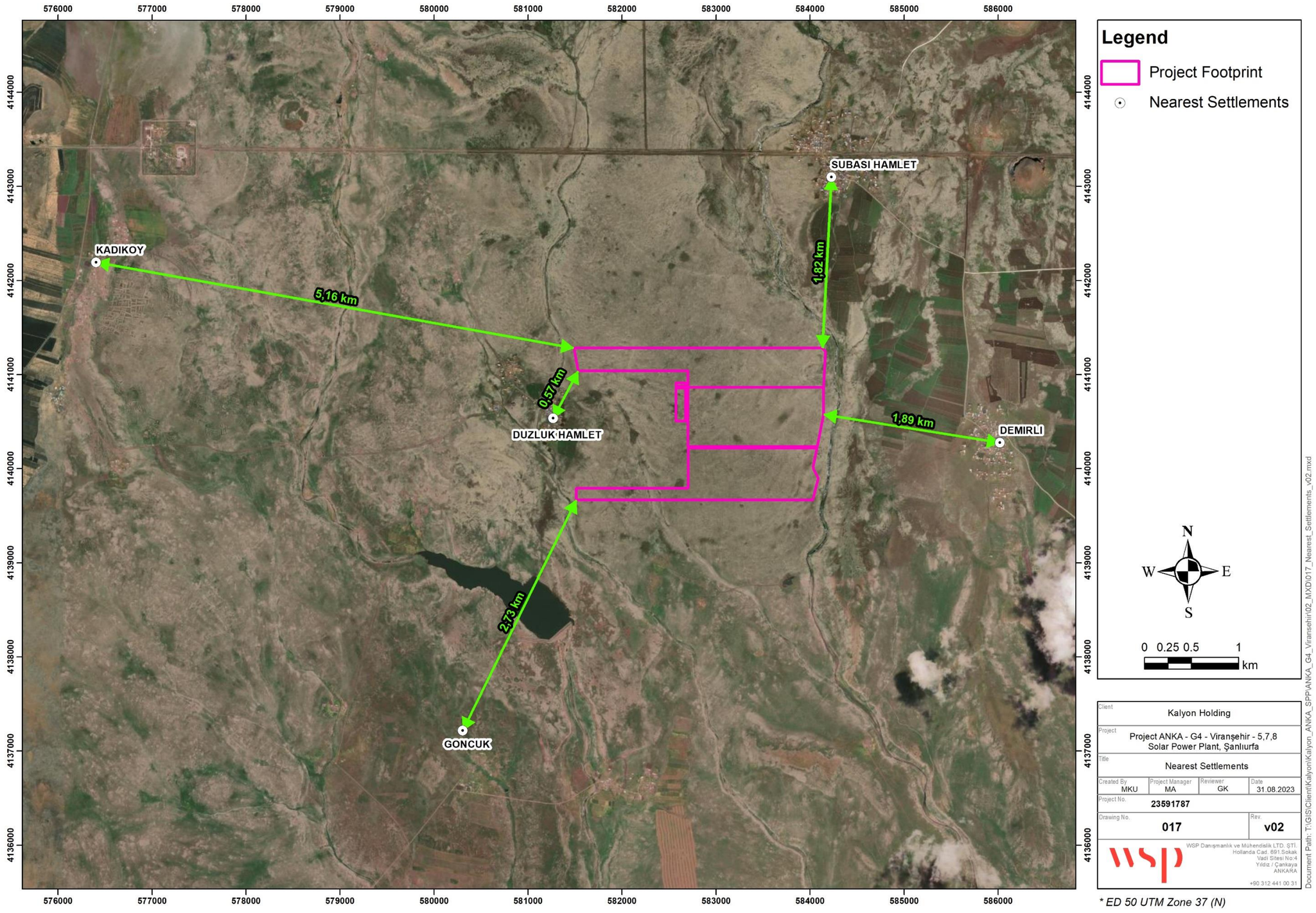


Figure 3-17: Map Showing Nearest Settlements to the Project Site

3.9 Project Labor and Working Conditions

Workforce

It is planned to employ 317 people during the construction phase of the Project and 25 people during the operation phase. It is projected that among 42 Kalyon Enerji employees to be worked during construction period, 32 of the employees will be skilled and 10 of the employees will be semiskilled. Where possible workforce is being sourced from local communities during the Project construction phase. The breakdown of the detailed number of employees is given in Table 3-2 below.

Table 3-2: The Number of Employees

Employee	Number of Employee
Kalyon workers	32- skilled 10- semiskilled
Mechanical workers (Subcontractor)	150
Electrical workers	70
Construction workers	45
HSE workers	10
Total:	**317**

Temporary Workers' Accommodation

A large proportion (approximately 200 workers, mostly unskilled and semiskilled) of the workforce will be accommodated in the construction camp. The camp is located inside the Project site borders (see Figure 3-4). The rest (approximately 117 workers, skilled) will be accommodated in rental houses and hotels in Viranşehir District and Şanlıurfa Province. The main construction camps will provide at least the following facilities:

- Accommodation with water and electricity supplies
- Office buildings
- Boundary fences/walls with gate, security office and traffic barrier
- Paved roads, hard standing for lorries and car parking and paved walkways serving all buildings
- Equipment storage and maintenance areas
- Toilets and washrooms
- Kitchens and cold storage for food
- Dining rooms
- Laundry
- Medical treatment room
- Recreation facilities
- Offices with telephones, data and postal services
- Diesel generators

- External lighting to roads and walkways
- Waste accumulation and storage area
- Wastewater treatment plant
- Emergency muster point

Camp will be fenced, lighted and guarded. The camp will be removed after the construction period. No lodging is planned during the operation phase. Employees will accommodate in houses in the vicinity of the Project area.

Working Hours

Working hours will be planned in compliance with the Labour Law. Construction working hours are planned to be 8 hours/day and operation working hours are planned to be in 3 shifts with 8 hours each.

3.10 Resource and Infrastructure Requirements

3.10.1 General

Waste Management Facilities

The existing licensed waste management infrastructure including landfills and other recycling/recovery facilities in Şanlıurfa Province is given below.

Table 3-3: Waste Management Facilities in Şanlıurfa

Facility Type	Number
Landfill (Municipality)	1
Licensed Packaging Waste Collection, Separation and Recycling Facilities	7
Hazardous Waste Recovery Facilities	0
Waste Oil Recovery Facility	1
Vegetable Waste Oil Recovery Facility	0
Waste Battery and Accumulator Recovery Facility	0
End-of-life Tire Recovery Facility	0
End-of-Life Vehicle Temporary Storage Areas	0
End-of-Life Vehicle Processing Facility	0
Medical Waste Sterilization Facility	1
Non-Hazardous Waste Recovery Facility	5
Waste Electrical and Electronic Equipment Processing Facility	0
Mine Waste Disposal Facility	0

Source: Şanlıurfa Provincial Environmental Status Report for 2021 (2022) (https://webdosya.csb.gov.tr/db/ced/icerikler/sanliurfa-ilcdr-2021-20221011144631.pdf).

Wastewater Infrastructure

Urban wastewater management facilities in Şanlıurfa are listed below.

Table 3-4: Urban wastewater Management Facilities in Şanlıurfa

Settlement	Treatment Facility	Capacity (ton/day)	Number of Populations Served
Viranşehir Municipality	**N/A**	**N/A**	**205,380**
Central District	N/A	N/A	2,143,020
Akçakale Municipality	Wastewater Treatment Plant (Biological)	8,232	120,834
Hilvan Municipality	Wastewater Treatment Plant (Biological)	5,760	42,766
Silverek Municipality	Wastewater Treatment Plant (Biological)	17,040	266,971
Bozova Municipality	Wastewater Treatment Plant (Biological)	2,535	53,878
Birecik Municipality	N/A	N/A	94,608
Ceylanpınar Municipality	N/A	N/A	89,871
Suruç Municipality	N/A	N/A	101,178
Halfeti Municipality	N/A	N/A	41,663
Harran Municipality	N/A	N/A	94,207

Source: Şanlıurfa Provincial Environmental Status Report for 2021 (2022) (https://webdosya.csb.gov.tr/db/ced/icerikler/sanliurfa-ilcdr-2021-20221011144631.pdf).

3.10.2 Construction Phase

3.10.2.1 Materials

The estimated quantities of the materials that may be needed for the establishment of the Project is given in Table 3-5.

Table 3-5: Construction Materials and Estimated Quantities

Material	Quantity
Concrete	15,000 m^3
Steel	10,728 tons (such as torque tube, I-H profile, and C profile)
Filling Material	60,000 m^3 Broken Stones 18,000 m^3 Fine Sand 720,000 pcs Pumice Block 6,500 m^3 stabilized filling material
Wire/Fence	17,500 m

The material needed for the construction activities, including bedding, padding, back filling and aggregate, concrete will be provided from companies in Viranşehir District/Şanlıurfa Province which have permits/licenses in accordance with national regulations.

Components of solar power plant, their origin and transportation methods are summarized below.

Table 3-6: Solar Power Plant Production Components and their Origin

Equipment	Quantity	Origin	Transportation Method
PV Panels*	487728 pcs	Türkiye (Kalyon PV)	By road
DC Combiner Box	756 pcs	India	By sea and road
Inverter Station	36 pcs	Inverter: United Kingdom Transformer: Türkiye RMU: Türkiye	Inverter: By road Transformer: By road RMU: By road
Substation and Switchyard	-	Türkiye	By road
Cable	1.854.150 m DC Cable 54.675 m MV Cable 80.000 m Fiber Cable	Türkiye	By road

** Polysilicon, raw material of PV panels, will be provided from Germany and United States of America. Transportation will be provided by road from Germany and by air from the United States of America.*

Vehicle and equipment list that is planned to be utilized during the construction phase of the Project is given below.

Table 3-7: Vehicle and Equipment List for the Construction Phase

Equipment / Vehicle	Number
Generator	10
Pile Driver	15
Excavator	10
Dozer	3
Earthmoving Trucks	35
Loader	2
JCB	10
Grader	1
Cylinder	2
SUVs	2
Septic Tanker	1
Mobile Crane	2
Telehandler	15
Lowbed	1

3.10.2.2 Infrastructure

Electricity and Fuel

During the construction phase of the Project, it is planned to meet the electricity demand for the activities to be carried out by means of diesel generators until connection to the local electricity grid is completed. The amount of diesel required for the construction phase is estimated to be 3,000 liters and electrical energy required for the rest of the construction phase when the connection to electricity grid is completed is estimated as 500,000 kWh.

The diesel fuel to be used in the construction phase will be brought to the Project site by road tankers having necessary permissions and licenses. Specific supply areas will be established for refilling fuels to the vehicles. These areas will be designed with prevention measures to protect soil, surface waters, ground waters and surface water drainage lines. The diesel fuel will be refueled directly to the vehicles without being stored. Total diesel fuel consumption due to vehicles is estimated to be 350,000 liters during construction phase.

Water Supply and Consumption

- Potable water needs of the personnel

The personnel who will work in the construction phase will need drinking and utility water. 317 people will be employed during the Project construction phase including offsite accommodation and construction camps. Water demand per capita is estimated as 228 L/person.day based on 2020 data of TUIK (Turkish Statistical Institute) Municipal Water Statistics. As such, the water consumption per day is calculated as follows:

Water demand of personnel = 317 individuals x 228 L/person day = 72,276 L/day ≈ 72.28 m^3/day.

The drinking water of the personnel will be supplied as bottled water.

A patrolling office is planned to be built near the project area and a groundwater well will be drilled for the patrolling office. Kalyon will plan to use water from that well for potable water requirements of the personnel and utility during the construction and operation phase and installation and operation of the well will be under the responsibility of the patrolling office.

The potable water needed for personnel usages at the construction camps will be supplied from Municipality by water tankers till the completion of well drilling works. Potable water needed for the personnel residing in off-site accommodation will be supplied through municipality water network.

- Water needs for dust suppression during dry periods

Water need for dust suppression during dry periods is estimated to be 50 m^3/day and it will be supplied through the effluent of the wastewater treatment plant having advanced treatment. It is planned that additional water needs will be supplied from drilled well. Until the well is drilled, water will be supplied from Viranşehir Municipality by water tankers.

Total potable and dust suppression water requirement for the construction phase is estimated to be 122,28 m^3/day.

3.10.3 Operation Phase

3.10.3.1 Materials

Utilization of any materials other than the materials to be used in the maintenance and repair operations is not expected during the operation phase.

Estimated amounts of annual chemical usage during the operation phase of the Project are given below.

Table 3-8: Annual Chemical Usage Amounts

Chemical	Amount
Slew Drive Grease	21 L
Silica Gel	10 L
Ethyl Alcohol	5 L
Transformer Protective Paint	0.5 L
Contact & Circuit Cleaner	1 L
Rust Remover	1 L
Oil Solubilizer	2 L
General Cleaner	50 L
Galvanized Spray Paint	3 L
Breaker Contact Grease	1 kg
Transformer Oil	50 L

Vehicle and equipment to be kept in the facility during the operation phase will be limited with pick-ups and cars and one diesel emergency generator.

3.10.3.2 Infrastructure

Electricity and Fuel

During the operation phase of the Project, electricity demand will be supplied through electricity grid. The estimated annual internal consumption during the operational period is 90,000 kWh during the day-time (i.e. during sun-light), 85,000 kWh at night-time (i.e. in the absence of sun-light) with a total of 175,000 kWh.

There will be no fuel station during the operation phase of the Project. Diesel fuel needs of the vehicles will be met from gas stations located in the district center. The fuel needed for the emergency generator will be met by purchasing in barrels.

Water Supply and Consumption

- Potable water needs of the personnel;

The personnel who will work in the operation phase will need drinking and utility water. 25 people will be employed during the Project operation phase. Water demand per capita is estimated as 228 L/person day based on 2020 data of TUIK (Turkish Statistical Institute) Municipal Water Statistics. As such, the water consumption per day is calculated as follows:

Water demand of personnel = 25 individuals x 228 L/person day = 5,700 L/day ≈ 5.70 m^3/day.

The drinking water of the personnel will be supplied by bottled water. For the potable water, a groundwater well will be drilled (by patrolling office) which has to meet the criteria required by national regulation and WHO Guidelines.

- Water needs for PV panel cleaning;

There are two alternative cleaning methods for cleaning PV panels: dry cleaning, where no water is required, and wet cleaning, where water is required for cyclical cleaning during certain months of the year.

According to the experience gained from other projects operated by Kalyon Enerji, there has been no need for panel cleaning in the region. However, if panel cleaning with wet cleaning method is required in the following years of operation, the amount of water required per wet cleaning is calculated as 390 m^3 according to the assumption that 2 tons per MWp will be required. The deionized water will be supplied by getting services from a related supplier for wet cleaning.

3.11 Emission, Wastewater and Waste

3.11.1 Construction Phase

Emission

Construction activities may generate emissions of fugitive dust caused by a combination of on-site excavation and movement of earth materials, contact of construction machinery with bare soil, and exposure of bare soil and soil piles to wind.

Exhaust gas emissions such as Nitrogen Oxides (NO_x), Carbon Monoxide (CO), Hydrocarbon (HC), Particulate Matter (PM) and Sulphur dioxide (SO_2) will occur due to the diesel engines that will be used in emergency situations and construction equipment that will be operated during land preparation / construction activities.

Heating and hot water needs will be provided by Liquefied Natural Gas (LNG) heating center composed of a boiler having 10,000 m^3 volume and 1,500 kW capacity in which similar exhaust gas emissions will occur.

During construction activities, noise and vibration may be caused by the operation of pile drivers, earth moving and excavation equipment, cranes and the transportation of equipment, materials and people.

Wastewater

Sources of wastewater to be produced during construction phase of the Project is listed below:

- Domestic wastewater due to water consumption by personnel;

Water demand per capita is estimated as 228 L/person day based on 2020 data of TUIK (Turkish Statistical Institute) Municipal Water Statistics. It is assumed that all the domestic water to be used by the Project personnel will be converted to domestic wastewater. As such, the wastewater generation per day during the construction period is calculated as 72.28 m^3/day including offsite accommodation and construction camp. Domestic wastewater generated by personnel at the camp site will be collected by sewage infrastructure and treated in package wastewater treatment plant. The effluent of the wastewater treatment plant will be used in dust suppression/irrigation in line with the permit to be secured from the Ministry (and/or Provincial Directorate).

No wastewater generation is expected as a result from dust suppression activities, since the water to be used for dust suppression activities is expected to evaporate.

Waste

General non-hazardous and hazardous wastes generated due to construction activities are mainly, municipal wastes, packaging wastes, waste oils, contaminated packaging wastes, hydraulic fluids, used batteries, empty paint and chemical containers, filters, fluorescent tubes, scrap metals and cables, welding waste, end-of-life tires, electrical and electronic wastes, treatment sludge and medical wastes and excavation wastes. The amount of excavation material caused by the Project is 34.000 m^3.20.000 m^3 excavated material will be used in the Project site for backfilling and 14.000 m^3 excavated material will be given to the license disposal sites.

Information on the management of wastes is provided in Chapter 7.

3.11.2 Operation Phase

Emission

No air or noise emission is expected during the operation phase considering the nature of the Project. Low-level noise emissions from inverters are generally reduced by a combination of shielding, noise cancellation, filtering, and noise suppression. Heating and hot water needs will be provided by electric heaters and air conditioners.

Wastewater

Sources of wastewater to be produced during operation phase of the Project is listed below:

- Domestic wastewater due to water consumption by personnel;

Water demand per capita is estimated as 228 L/person day based on 2020 data of TUIK (Turkish Statistical Institute) Municipal Water Statistics. It is assumed that all the domestic water to be used by the Project personnel will be converted to domestic wastewater. As such, the wastewater generation per day during the operation period is calculated as 5.24 m^3/day. Domestic wastewater generated by personnel will be collected by sewage infrastructure and stored in septic tanks and periodically transported to a licensed wastewater treatment plant.

- Wash water

There are two alternative cleaning methods for cleaning PV panels: dry cleaning, where no water is required, and wet cleaning, where water is required for cyclical cleaning during certain months of the year. According to the experience gained from other projects operated by Kalyon Enerji, there has been no need for panel cleaning. If panel cleaning with wet cleaning method is implemented no chemical or hazardous material will be used during cleaning. No wastewater generation is expected as a result from panel cleaning activities since the water to be used is expected to evaporate.

Waste

Typical non-hazardous and hazardous wastes routinely generated at facilities are general office and packaging wastes, municipal wastes, waste oils, oil contaminated rags, hydraulic fluids, used batteries, empty paint cans, waste chemicals and used chemical containers, used filters, fluorescent tubes, scrap metals and cables, electrical and electronic wastes, end-of-life or damaged PV panels, and medical wastes.

Polychlorinated Biphenyls (PCB) will not be used as dielectric fluid to provide electrical insulation. Therefore, hazardous waste containing PCB generation is not expected.

Information on the management of wastes is provided in Chapter 7.

4.0 ALTERNATIVES ANALYSIS

IFC PS1 requires full and detailed justification for any proposed alternatives through the environmental and social risks and impacts identification and assessment process. The purpose of this section is to summarize how the Project siting and components represent an optimized design that is technically and financially viable while minimizing overall environmental and social impacts.

4.1 Site Alternatives

The Project area was declared as an area suitable for the development of solar projects: a Renewable Energy Resource Area (“YEKA") by the Ministry of Energy and Natural Resources. Consequently, it was launched the "Competition Announcement on the Allocation of Renewable Energy Resource Areas and Connection Capacities Based on Solar Energy"; YEKA SPP-4 Erzin-Viranşehir (including G-4-Viranşehir-5,7,8) competitions were held on 28.06.2022. YEKA Right of Use Agreements were signed on 08.08.2022 with Kalyon Enerji Yatırımları A.Ş., which won the competition held by the Ministry of Energy and Natural Resources.

Since YEKA areas are assessed, defined and declared by the Ministry of Energy and Natural Resources and allocated for the investors who win the relevant competitions, there is no other site alternatives for the Project.

4.2 Technology Alternatives

There are two main types of solar energy technologies: photovoltaics (PV) and concentrating solar-thermal power (CSP).

Concentrating solar-thermal power (CSP) systems use mirrors to reflect and concentrate sunlight onto receivers that collect solar energy and convert it to heat, which can then be used to produce electricity or stored for later use. It is used primarily in very large power plants.

CSP technology often relies on water for cooling and steam generation whereas PV technology requires minimal to no water for electricity generation, PV systems typically require occasional cleaning to maintain optimal performance, while CSP systems involve more extensive maintenance and monitoring due to the use of mirrors, tracking mechanisms, and heat transfer fluids.[5]

CSP systems typically require large open areas with specific land requirements and solar resource availability whereas PV panels can be installed on various surfaces. It is worth noting that CSP technology has its own advantages, such as the ability to incorporate thermal energy storage, which allows for continuous electricity generation even when the sun is not shining.[6] The choice between PV and CSP depends on factors such as project scale, location, energy requirements, and other specific considerations.

The Ministry identified photovoltaic solar energy as the project technology during the tender stage. Therefore, no other technology alternative is available for the Project.

4.3 No Project Alternative

The ‘No Project’ alternative is the situation where the Project, does not proceed. Under this scenario, there would not be any negative impacts on the environment, the beneficial environmental (especially in terms of GHG emissions and climate change), socio-economic outcomes, economic benefit to local and national stakeholders and contribution to a sustainable environment would not happen. With the realization of the Project, annual amount of electricity to be generated by the Project is estimated as 300,000 MWh/year. Within this regard, based on the Turkish National Electricity Grid Emission Factor (0.6488 t CO2/MWh) defined by the Turkish Ministry of Energy and Natural Resources, 194,640 tonne CO2/year of GHG emissions will be

[5] https://www.sciencedirect.com/topics/earth-and-planetary-sciences/solar-energy-technology

[6] https://www.solarfeeds.com/mag/csp-and-pv-differences-comparison/

avoided in annual basis in the energy sector with the realization of the Project. However, considering that the Project area has been designated as YEKA and set aside for such projects, the Project area would still be used for other renewable energy projects of other companies if the "No Project" option was chosen.

5.0 ESIA METHODOLOGY

This chapter aims at describing the methodological approach of the process behind this ESIA, which is basically composed by three major steps:

1) **Definition of the baseline**, or the description of the environmental (i.e., physical, and biological components) and social context prior the realisation of the Project;

2) **Impact and risks assessment**, which is the evaluation of the possible interferences created by the Project on the environmental and social baseline conditions; and

3) **Identification of mitigation measures and definition of the Environmental and Social Management System Framework**, which identifies measures to avoid, reduce, mitigate, or offset the impacts and risks previously identified and assessed and organizes them in an ESMS framework for later implementation during Project construction and operations

The general methodology adopted by WSP Türkiye for the Environmental, and Social Impact Assessment has been designed to be analytical and transparent and allow for a semi-quantitative analysis of the impacts on the various environmental and social components. This methodology is based on the concept that projects can generate both negative and positive impacts and the significance of each impact can be evaluated considering both the characteristics of different Project activities and the environmental and social context.

This methodology is based on three main analytical phases, as described below:

- **Phase 1: Identification of Project Actions and Impact Factors**
  - **Project actions:** activities directly or indirectly related to the Project that can interfere with the context, generating environmental or social pressures;
  - **Impact factors**: direct or indirect interferences generated by the Project actions on the context and able to influence the state or quality of one or more environmental and social components;
- **Phase 2: Identification of Environmental and Social Components and Sensitivity Level Allocation**
  - **Identification of the components potentially subjected to interference:** using a specific cross-refence matrix between the impact factors and project actions, the components potentially subjected to an impact are identified for each phase of the Project (i.e., construction, operation and decommissioning).
  - **Sensitivity of the component**: conditions that characterise the current quality and state of the environment and/or its resources, and social component ;
- **Phase 3: Impact Assessment**
  - **Impacts**: changes to the environmental and social components caused by the impact factors ;
  - **Mitigation measures**: actions adapted to mitigate negative impacts or to maximize the effects of positive impacts on the environmental and social components.

The three building blocks are illustrated in the figure below and described in the following paragraphs.

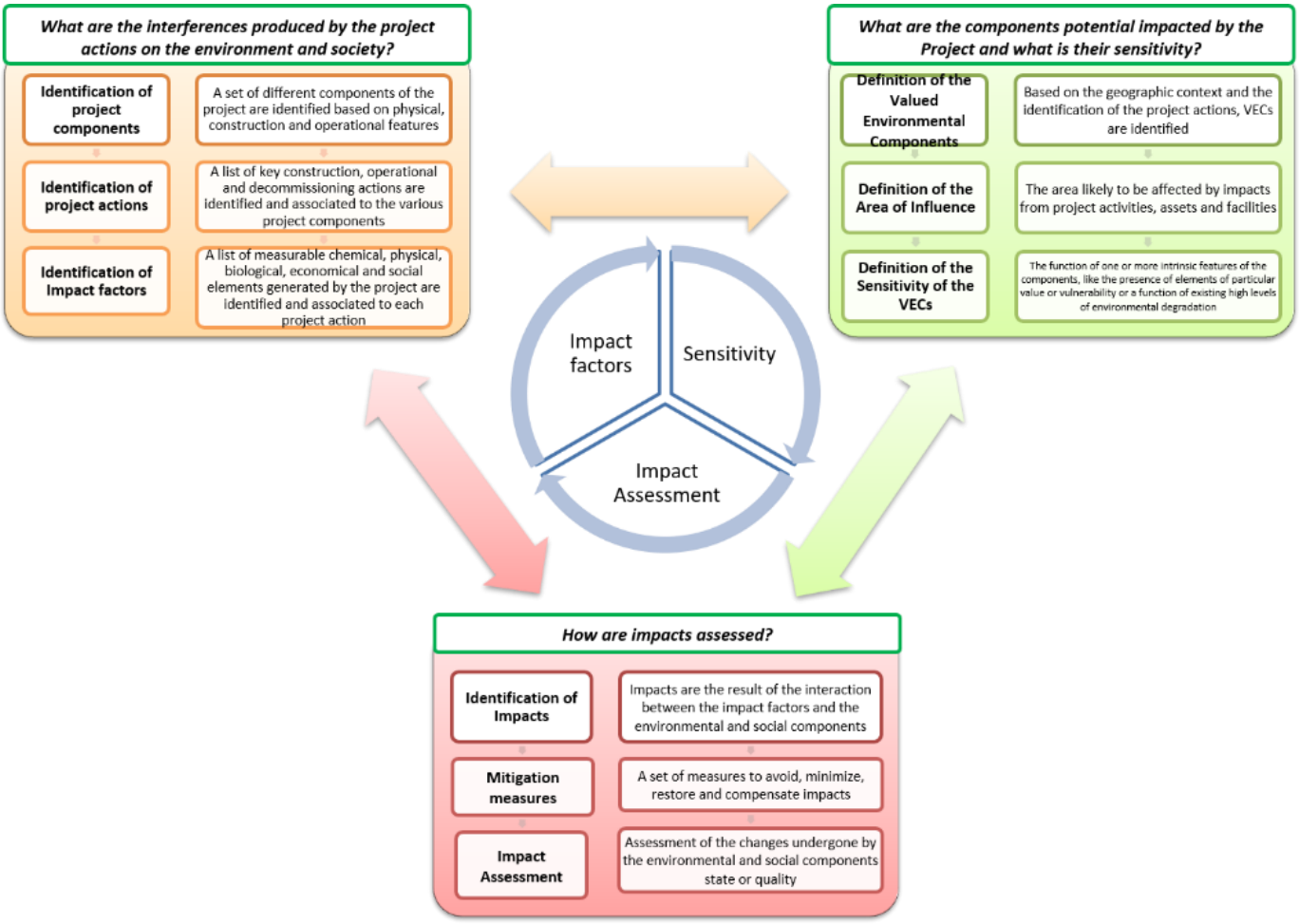


Figure 5-1: Three Phases of ESIA Process

5.1 Identification of Area of Influence

The Area of Influence ("AoI") of the Project is the area in which a direct or indirect impact on the biological, physical and social components might occur.

As defined by IFC PS1, the Area of Influence encompasses:

- The area likely to be affected by: (i) the project and the client's activities and facilities that are directly owned, operated or managed (including by contractors) and that are a component of the project (ii) impacts from unplanned but predictable developments caused by the project that may occur later or at a different location; or (iii) indirect project impacts on biodiversity or on ecosystem services upon which Affected Communities' livelihoods are dependent.
- Associated facilities, which are facilities that are not funded as part of the Project and that would not have been constructed or expanded if the Project did not exist and without which the Project would not be viable.
- Cumulative impacts that result from the incremental impact, on areas or resources used or directly impacted by the Project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted.

The baseline conditions represent the environmental (i.e., physical, and biological components) and social context prior the realization of the Project, thus, before any possible disturbance from Project activities may occur. The definition of the baseline conditions represents the starting point upon which the impact assessment

is built. The goal is to assign a sensitivity value to each environmental and social component expected to be affected by the Project.

The identification of the Project's Area of Influence varies according to the environmental and social component assessed and is hence clearly defined below and in Chapter 6 separately for physical, biological and social components. Regional Study Area (RSA) term is also used in the methodology as a source of high-level information in case of absence of site-specific data at the AoI level or regional level data is required to define the components and assess the impacts. As such, the RSA contains the Project AoI.

The Project AoI is presented in following tables and Figure 5-2.

Table 5-1: Area of Influence – Physical Components

ESIA Component	AoI
Soil and Subsoil	AoI includes the Project footprint
Hydrology and Surface Water Quality	AoI includes the Project footprint
Hydrogeology and Groundwater Quality	AoI includes the Project footprint. In case of groundwater use within the scope of the Project, AoI will include the cone of depression formed around the well.
Air Quality	AoI includes an area having boundaries 2 km away from the Project site
Noise and Vibration	AoI includes an area having boundaries 2 km away from the Project site

Table 5-2: Area of Influence – Biological Components

Biological RSA and LSA	Definition
Terrestrial and Freshwater	AoI includes an area having boundaries 1 km away from the Project site

Table 5-3: Area of Influence – Social Components

ESIA Component	AoI
Socioeconomical	AoI includes Viranşehir District, Kadıköy Neighbourhoods
Cultural Heritage	AoI includes the Project footprint

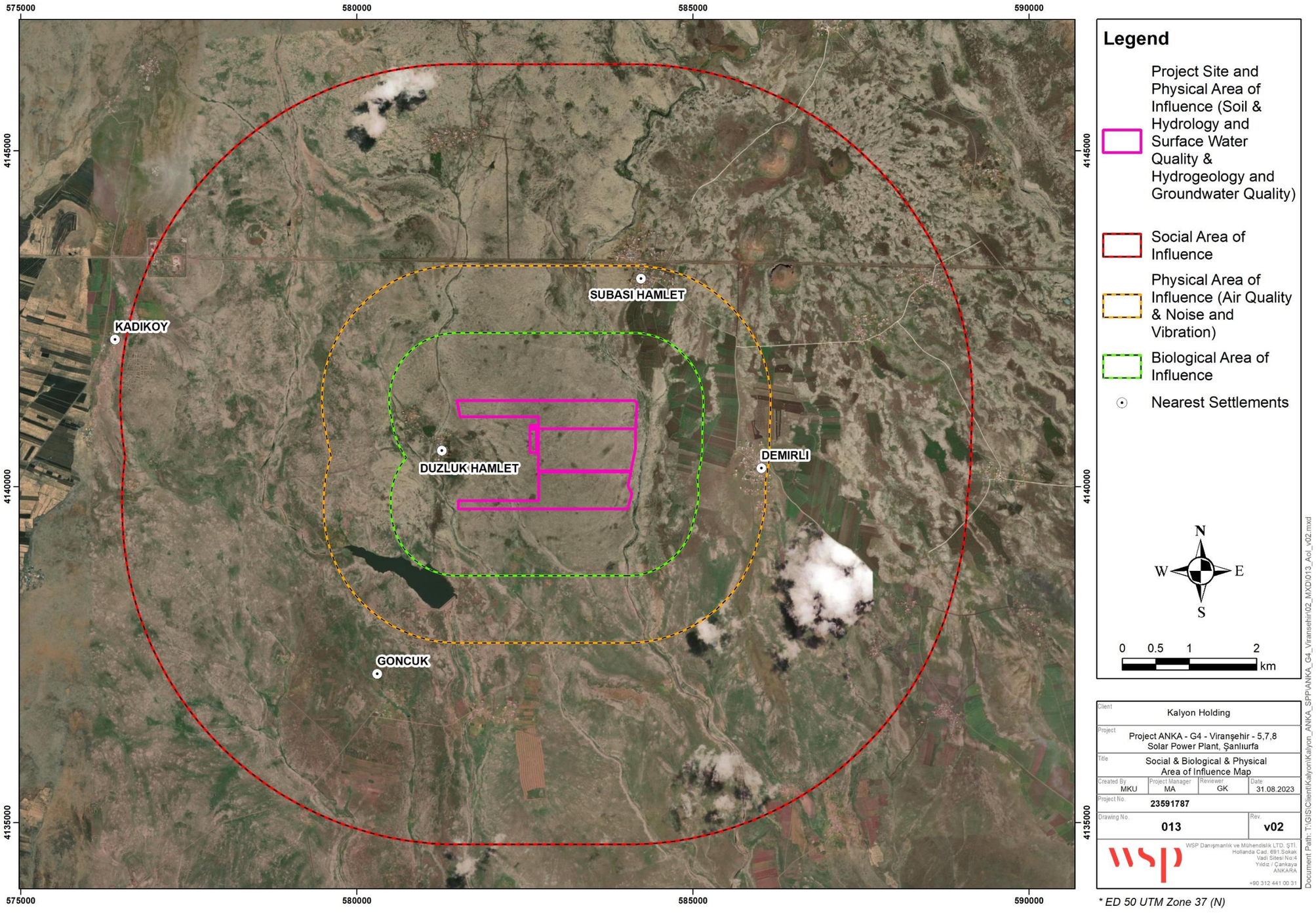


Figure 5-2: Area of Influence Map of the Project

5.2 Identification of the Project Components

Project components are identified coherently with the definition of the IFC PS1 as follows:

- The Project and the Client's activities and facilities that are directly owned, operated, or managed (including by contractors) and that are an essential component of the Project;
- Unplanned but predictable developments caused by the Project that may occur later or at a different location; and
- Associated facilities, which are facilities that are not funded as part of the Project and that would not have been constructed or expanded if the Project did not exist and without which the Project would not be viable (IFC Guidance Notes: Performance Standards on Environmental and Social Sustainability, 2012).

5.3 Identification of the Project Actions

Project actions are activities directly or indirectly related to the project which can interfere with the environment as primary generative elements of environmental or social pressures, defined in the context of this methodology as impact factors.

Project actions associated with the Project's development from the site preparation and construction phases, through operations to decommissioning are listed below.

5.3.1 Land Site Preparation and Construction Phase

- **General engineering/construction works**: earthworks (excavation, filling) to create the surface over which the project will be constructed and works after earthworks such as laying of concrete foundations, fencing, establishment of internal roads, erection of buildings and infrastructures, material storage, construction of temporary worker camps and offices, installation of electrical, telecommunication systems, assembly of panel systems and installation of solar panels, construction of the substation and control building, testing, commissioning and connection to the grid. This Project action also includes all activities and services relating to the accommodation of workers at camps including bedding, catering, management of free time, and all the administrative and management activities to ensure full respect of workers' rights and duties.
- **Material transportation**: includes transportation of the project elements and construction material from the ports-station etc. to the laydown area and camps and from the laydown area /camps to the working or construction areas.
- **Material storage**: includes temporary storage of the project elements or other construction materials in the laydown area.

5.3.2 Operation Phase

- **Plant/infrastructure operation**: includes technical and administrative activities (operation of the plant/infrastructure, surveillance, monitoring, maintenance) to maintenance the project parts in operation according to standard operating procedures.

5.3.3 Decommissioning Phase

- **General decommissioning works:** include disassemble, waste transports, management and restoration of the area etc.

5.4 Identification of the Impact Factors

Project Actions generate Impact Factors, intended as potential interferences that can influence, both positively or negatively, directly or indirectly, the environmental and/or social components.

By taken into consideration the national EIA process, international guidelines and previous experiences, Impact Factors as determined by the Project Actions are listed in the following table.

Table 5-4: Project Actions and Relevant Impact Factors

Project actions	Impact factors
Construction	
General engineering/construction works	Removal of soil Minor leakage of contaminants into soil Emissions of particulate matter Gaseous emissions from vehicles and construction equipment Demand for potable water Emission of noise Increase of population Introduction of alien species (potential risk) Land occupation (Loss of Income, soil) Demand for workforce Change in population influx Demand for goods, materials and services Access to ecosystem services Risk of Increasing Communicable Diseases and Waste Change in traffic load Minor leakage to groundwater Minor leakage to surface water Introduction of buildings/infrastructures Emission of light Discharge of wastewater
Material transportation	Emissions of particulate matter Gaseous emissions from vehicles and construction equipment Emission of noise Increase of traffic Emission of light
Material storage	Emissions of particulate matter Change in land use (temporary) Minor leakage of contaminants into soil Minor leakage to groundwater Minor leakage to surface water Change in traffic load Introduction of buildings/infrastructures
Operation	
Plant/infrastructure operation	Minor leakage of contaminants into soil

Project actions	Impact factors
	Gaseous emissions from vehicles and equipment Demand for potable water Discharge of wastewater Change in population Benefit to national economy Labour and working conditions related impacts Change in traffic load Minor leakage to surface water Minor leakage to groundwater Introduction of buildings/infrastructures Emission of light
Decommissioning	
General decommissioning works	Removal of soil Minor leakage of contaminants into soil Emissions of particulate matter Gaseous emissions from vehicles and construction equipment Demand for potable water Emission of noise Introduction of alien species (potential risk) Land occupation (Loss of Income, soil) Demand for workforce Population influx Demand for goods, materials and services Access to ecosystem services Increase of population influx Risk of increasing communicable diseases and waste Change in traffic load Minor leakage to groundwater Minor leakage to surface water Emission of light

5.5 Identification of the Environmental and Social Components

Impacts are identified as potential interferences of the impact factors with the environmental components identified in the study area. The analysis is conducted by means of matrices where environmental components are listed as rows and impact factors as columns.

When an impact factor has a potential to alter an environmental and social component, an impact is identified in the matrix. Impact factors can have a direct or indirect impact over a certain component.

All direct and indirect impacts identified are described in terms of their mechanism of action and likely consequences.

Matrixes have been created to link physical, biological and social components to the Project actions and presented in Table 5-5 and Table 6-6.

Table 5-5: Matrix for Physical and Biological Components and Impact Factors

Environmental Components / Project Actions		Physical Components								Biological Components					
		Meteorology and climatology	Air quality	Geology and geomorphology	Seismology	Soil	Hydrology and surface water quality	Hydrogeology and groundwater quality	Noise and vibration	Amphibians	Reptiles	Birds	Mammals	Habitats (Critical Habitat	Flora
Construction Phase	General engineering/construction works	√	√	√	√	√	√	√	√	√	√	√	√	√	√
	Material transportation	√	√						√	√	√	√	√		
	Material storage		√			√		√						√	
Operation Phase	Plant/infrastructure operation	√		√	√	√	√	√		√	√	√	√	√	
Decommissioning	General decommissioning works	√	√	√	√	√	√	√	√	√	√	√	√	√	√

Table 5-6: Matrix for Social Components and Impact Factors

Components / Project Actions		Social Components										
		Infrastructure facilities	Transportation and traffic	Land use and agriculture	Demographics	Employment and livelihoods	Education	Health issues and facilities	Cultural heritage and archaeology	Conflicts and social tensions	Ecosystem services	Visual
Construction Phase	General engineering/construction works	√	√	√	√	√	√	√	√	√	√	√
	Material transportation		√					√		√	√	
	Material storage		√	√								√
Operation Phase	Plant/infrastructure operation	√	√	√	√	√		√		√	√	√
Decommissioning	General decommissioning works	√	√	√	√	√	√	√	√	√	√	√

5.6 Impact Assessment

5.6.1 Assignment of the Sensitivity Level

As previously stated, the final goal in determining the Project's baseline is the evaluation of the sensitivity of each environmental and social component as a precondition to perform the impact assessment.

Each environmental and social component in the area of influence of the Project has a different sensitivity to the impact factors generated by the Project or can pose a different level of risk to the Project. The sensitivity of an environmental component is typically evaluated based on the presence/absence of some features which define both the current degree of the environmental quality and the susceptibility to environmental changes of the component. As examples, for physical components the sensitivity is typically related to the presence of elements that are at the highest or lowest scale of quality, for biodiversity it is related to the presence of threatened, endemic, or protected species or habitats and for social components to the presence of vulnerable elements of the community like poor, elderly, members of ethnic or religious minorities, indigenous people, etc. The **sensitivity ("S")** of the component is defined using component specific metrics during the baseline and can assume values between 1 and 5 associated to a definition from Low to High. The S value is assigned considering both the component's characteristics and the possible presence of sensitivity features.

The following list presents potential sensitivity features to be considered in defining the sensitivity of typical environmental and social components considered in ESIA studies. The specific metrics and levels of sensitivity for each of the features considered defined during the baseline studies and presented in this ESIA Report.

Geology and geomorphology & Natural Hazard Seismology:

- Presence of faults: areas with active faults are considered to pose highest risks to the Project and hence are considered of higher sensitivity;
- Presence of landslides: areas within the range of landslides are considered to pose highest risks to the Project and hence are considered of higher sensitivity;
- Other geohazards: (karst areas, slope erosion, liquefaction, stream channels, etc.). the presence of other geohazards in the Project area is considered of higher sensitivity; and
- Seismicity: the location of the Project in areas classified as at seismic risk is considered of higher sensitivity.

Soils:

- Soil agricultural potential: soils with highest agricultural potential according to local or global assessments are attributed a higher sensitivity;
- Soil erosion potential: soils with highest erosion potential according to local or global assessments are attributed a higher sensitivity; and
- Soil pollution potential: soils in areas identified and previously used for industrial, mining, or intensive agriculture are attributed a higher sensitivity.

Surface water:

- Presence of waterbodies in the Project area of influence and level of ecological integrity; the sensitivity increases with the level of ecological integrity;

- Presence of waterbodies in the Project area of influence and level of water/sediment pollution; the sensitivity increases in the presence of polluted watercourse; and
- Presence of waterbodies and level of tolerance to hydrological changes; the sensitivity is higher for waterbodies with a low level of tolerance for hydrological changes.

Groundwater:

- Presence of shallow aquifers; the sensitivity increases with the presence of shallow aquifers that could be more easily exposed to contamination source;
- Productivity of exploited aquifers; aquifers with low productivity might be depleted in case the Project entails groundwater abstraction. The sensitivity is higher for aquifer with low productivity;
- Presence and extent of existing groundwater exploitation; the sensitivity is higher for aquifers already exploited;
- Rock permeability; the sensitivity increases in case the subsoil is made of rocks with high permeability; and
- Aquifer vulnerability; the sensitivity increases with the vulnerability of the aquifer as determined by accepted methodologies.

Air quality:

- Presence of settlements and population potentially exposed to air emissions from the Project; the sensitivity increases with the number of people exposed;
- Presence of vulnerable targets (schools, hospitals, retirement houses, etc.) exposed to air emissions from the Project; the sensitivity increases with the number of vulnerable people exposed;
- Air quality levels in the areas affected by the Project; the sensitivity increases in areas already polluted and in areas designated for air quality protection; and
- Presence of sensitive ecological receptors like protected or classified areas, protected or endangered habitats and species.

Noise and vibration:

- Presence of settlements and population potentially exposed to noise and vibration from the Project; the sensitivity increases with the number of people exposed;
- Presence of vulnerable targets (schools, hospitals, retirement houses, etc.) exposed to noise and vibration from the Project; the sensitivity increases with the number of vulnerable people exposed;
- Noise and vibration levels and/or sources in the areas affected by the Project; the sensitivity increases in areas already experiencing high levels of noise and vibrations and in areas designated for protection from noise and vibrations; and
- Presence of sensitive ecological receptors like protected or classified areas, protected or endangered habitats and species.

Landscape and components with sensitivity to visual quality:

- Presence and number of settlements/people within the visual zone of visual influence.
- Presence of areas of touristic interest within the visual zone of visual influence.
- Presence of roads and volume of traffic within the visual zone of visual influence.
- Presence of archaeological, cultural, historic areas within the visual zone of visual influence.
- Presence of natural parks protected and classified areas within the visual zone of visual influence.

Habitats and biodiversity features:

- Number of species of flora or fauna present in the habitat. The sensitivity increases with the number of species present.
- Presence of threatened species of flora or fauna in the habitat as defined by global (IUCN) or national red lists. The sensitivity increases with the number of threatened species present and the threat level.
- Presence of endemic or restricted range species of flora or fauna in the habitat as defined by global (IUCN) or national red lists. The sensitivity increases with the number of species present and the level of endemicity.
- Presence of protected species or species listed in international conventions for the protection of biodiversity. The sensitivity increases with the number of protected/listed species.
- Presence of invasive alien species. The sensitivity is higher for habitats in areas with a higher number of invasive alien species present.
- Presence of natural habitats; the sensitivity increases with the surface of natural habitats present in the Project area of influence.
- Presence of threatened or protected habitats; the sensitivity increases with the surface of threatened or protected habitats present in the Project area of influence.
- Presence of critical habitats; the sensitivity increases with the surface of critical habitats present in the Project area of influence.
- Presence of relevant nursery, spawning or feeding grounds or migration routes.

Protected areas:

- Presence of protected areas; the sensitivity increases with the number, extent and level of protection of protected areas present in the Project area of influence.

Local communities:

- Presence of skilled personnel in the local community; the sensitivity (to positive impacts) is higher the more people with skills relevant to the Project.
- Presence of businesses and economic activities relevant to the Project; The sensitivity to positive impacts is higher for communities with a well-structured business community.

- Level of health care available; the Project could cause a population influx that can put a strain to existing health services if left unmanaged. The sensitivity of communities is higher in areas with an insufficient level of healthcare available.
- Presence of communicable diseases; the spreading of communicable diseases can be exacerbated by the influx of workers due to the Project. The sensitivity of communities is higher for those more prone to be affected due to local conditions.
- Overall health state of the population; the Project might cause increased levels of exposure to environmental health determinants like air pollutants, noise and vibrations, etc. The sensitivity of communities is higher in the presence of existing health issues in the communities potentially affected by the Project.
- The presence of environmental health determinants like air and water pollution, soil and groundwater contamination increase the community sensitivity.
- Areas with concentrated fisheries activities; areas with abundance of fishery resources.

Education

- Presence of education facilities;
- Level of education of the population;

Health

- Level of health care available; the Project could cause a population influx that can put a strain to existing health services if left unmanaged. The sensitivity is higher in areas with an insufficient level of healthcare available;
- Presence of communicable diseases; the spreading of communicable diseases can be exacerbated by the influx of workers due to the Project. The sensitivity is higher in areas affected by a high level of communicable diseases.
- Overall health state of the population; the Project might cause increased levels of exposure to environmental health determinants like air pollutants, noise and vibrations, etc. The sensitivity is higher in the presence of existing health issues in the communities potentially affected by the Project.
- Presence of existing environmental health determinants. The presence of environmental health determinants like air and water pollution, soil and groundwater contamination are increasing the sensitivity.

Ecosystem Services

- Presence of ecosystem services;
- Dependence of the local communities from ecosystem services

Cultural heritage:

- Presence of protected or recognized sites of archaeological or cultural value; the sensitivity increases with the number, cultural/scientific value and level of protection of sites potentially affected;

- Presence of sites with a high archaeological potential in the absence of specific site information or appropriate protection mechanisms; the sensitivity increases with the archaeological potential as indicated by relevant experts;
- Presence of intangible cultural values like sacred sites, initiation sites, sites used for cultural events, sites recognized in oral traditions, etc. the sensitivity increases with the number of sites and values as recognized by the local communities.

The component's Sensitivity can vary from low (1) to high (5) according to the following definitions:

- **Low (1):** the component does not present elements of sensitivity;
- **Medium-low (2)**: the component presents few elements of sensitivity that have limited significance;
- **Medium (3):** the component presents numerous elements of sensitivity that have limited significance;
- **Medium-high (4):** the component presents few elements of sensitivity that have high significance; and
- **High (5):** the component presents numerous elements of sensitivity that have high significance

The list of sensitivity features represents a tool/guideline used by the experts along with the "expert judgement" to rank the sensitivity of each component in the abovementioned five classes. For the biodiversity components the sensitivity assessment also considered the ecological and biological characteristics of each component in relation to the possible impacts generated by the Project.

5.6.2 Scoring of the Impact Factors

The **impact factors** identified during the analysis of the Project and through the definition of the Project phases and Project actions are assessed in their relevance, using a scoring system. The parameters considered to assess the impact factor score are the following:

Duration (D): is the duration of the impact factor and can vary from short to long according to the following definitions:

- very short, when the duration is shorter than a month;
- short when the duration is between a month and one year;
- medium when the duration is between one and two years;
- long when the duration is between two and five years;
- very long when the duration is over five year.

Frequency (F): is the frequency with which the impact factor manifests itself:

- single event;
- infrequent, if it consists of a few events evenly or randomly distributed over time;
- recurrent, if it consists of numerous events evenly or randomly distributed over time;
- frequent if it consists of a high number of events evenly or randomly distributed over time;
- continuous, if the event has no interruption over time.

Geographic extent (G): is the geographical area within which the impact factor can exert its effects:

- Project site; the impact factor is confined within the facilities owned or exclusively controlled by the Project;
- local; the impact factor extends to the areas or communities neighbouring the Project site
- regional; the impact factor extends to an area beyond the surroundings of the Project site and to regional physical (airshed – watershed, etc) or administrative boundaries
- national; the impact factor extends throughout several regions or to the entire country
- international: the impact factor has an international or global reach

Intensity (I): is a measure of the physical, economic or social severity of the impact factor:

- negligible: the impact factor is generated in quantities that cannot be easily detected or perceived and that are unlikely to be able to cause any detectable change in the target environmental or social components;
- low: the impact factor is generated in quantities that can be detected or perceived but whose effects are unlikely to cause tangible changes in the target environmental or social components;
- medium, the impact factor is generated in quantities that are well within legal standards or accepted practices and/or whose effects are likely to cause tangible changes in the target environmental or social components;
- high, the impact factor is generated in quantities that at the limit of legal standards or accepted practices and/or whose effects are likely to cause serious impairment in the target environmental or social components;
- very high, the impact factor is generated in quantities that are at risk of exceeding the limits of legal standards or accepted practices and/or whose effects are likely to cause very serious to catastrophic damage to the target environmental or social components;

Each of the parameters listed above can have a value between 1 and 5, and severity of the impact is determined through an **Impact Factor Score** which is the sum of the 4 parameters, hence it can assume a value between 5 and 20.

5.6.3 Calculation of the Impact Value

The calculation of the **Impact Value** is done by multiplying the Impact Factor Score for the value of the sensitivity of the target component, determined during the baseline. The result is then corrected by considering the reversibility of the impact.

The reversibility is the property of an impact to diminish its magnitude over time and to eventually recede entirely. Reversibility may vary from reversible to irreversible according to the following definitions:

- reversible in the short term if the initial condition of the component will be restored in a period between weeks and months after the end of the impact factor and/or the restoration activities;
- reversible in the short/midterm if the initial condition of the component will be restored in a period between a few months and one year after the end of the impact factor and/or the restoration activities;

- reversible in the midterm if the initial condition of the component will be restored in a period between one year and five years after the end of the impact factor and/or the restoration activities;
- reversible in the long term if the initial condition of the component will be restored in a period between five and 25 years after the end of the impact factor and/or the restoration activities;
- irreversible, if it is not possible to predict the restoration of the initial conditions.

The reversibility of the impact is measured on a scale 1 to 5, with 5 ranked as irreversible and 1 ranked as reversible within short-term.

The **Impact Value ("IV")** is calculated by multiplying the Impact Factor Score + the Sensitivity and by the value of the Reversibility IV= IFS x S x R

5.7 Calculation of the Residual Impact

The next step consists in defining mitigation measures and assessing their effectiveness to reduce or eliminate the negative impact (or to maximize the positive one). The mitigation measures are defined with reference to the mitigation hierarchy listed below in descending order of effectiveness:

- Avoid;
- Minimize;
- Restore;
- Offset;
- Compensate.

The effectiveness of the mitigation measures defined in the environmental and social management plans is assessed using expert judgement and the outcomes from previous applications of similar mitigation measures to similar Projects. The definitions of the mitigation effectiveness may vary from none to high, as described below:

- None: the measures can reduce the impacts by less than 20% of the expected outcome;
- Medium low: the measures can reduce the impacts by 20% - 40% of the expected outcome;
- Medium: the measures can reduce the impacts by 40% - 60% of the expected outcome;
- Medium high: the measures can reduce the impacts by 60% - 80% of the expected outcome;
- High: the measures can reduce the impacts by more than 80% of the expected outcome.

The Mitigation effectiveness is measured on a scale from 1 to 0.2 (1 = minimum effectiveness; 0.2 = maximum effectiveness) and the **Residual Impact Value (RIV)** is calculated multiplying the impact value with the impact mitigation effectiveness as per the following formula: RIV = IV x M

Positive impacts

Positive impacts are typically associated with economic and social opportunities and sometimes with environmental aspects a Project can solve (for example: a Project located in a brownfield where existing environmental issues can be addressed). Projects are typically promoting activities to enhance the economic, social, and environmental

opportunities through specific programs, plans and measures including, for example, professional skills generation, community investment, shared value programs, remediation programs, biodiversity conservation Projects, etc.

The assessment of positive impacts is based on the same parameters used to evaluate the negative ones. The only difference is that the mitigation measures are replaced by enhancement measures, or measures to maximize the potential positive impacts.

The enhancement measures effectiveness defined in the environmental and social management plan is assessed using expert judgement and the outcomes of previous application of similar enhancement measures to similar Projects. The definitions of the enhancement effectiveness may vary from none to high as shown below:

- None: the measures can enhance the positive impacts by less than 10% of the expected outcome;
- Medium low: the measures can enhance the positive impacts by 10% - 20% of the expected outcome;
- Medium: the measures can enhance the positive impacts by 20% - 30% of the expected outcome;
- Medium high: the measures can enhance the positive the impacts by 30% - 40% of the expected outcome;
- High: the measures can enhance the positive impacts by more than 40% of the expected outcome.

5.8 Scale of Residual Impacts

The scale of the residual impact resulting from the calculation described above ranges from 0,8 to 500. The impact value is then scaled in 5 levels by diving the entire distribution of values obtained in 5 classes with an equal number of values obtained.

The residual negative impacts are classified in 5 levels using the table below.

Residual impact score	Residual impact definition	Colour Code
0.8 – 33.0	Negligible	
33.1 – 76.0	Low	
76.1 – 136.0	Medium	
136.1 – 228.0	High	
228.1 – 500.0	Very High	

The residual positive impacts are classified in 5 levels using the table below.

Residual impact score	Residual impact definition	Colour Code
0.8 – 33.0	Negligible	
33.1 – 76.0	Low	
76.1 - 136.0	Medium	
136.1 - 228.0	High	
228.1 – 500.0	Very High	

5.9 Overall Assessment

The methodology described above allows for an analytical assessment of impacts caused by individual impact factors over individual environmental and social components. The process therefore results in a table presenting several impacts from different impact factors for each component.

The table defines the assessment of the overall impact on each component. It represents a synthesis of the impacts on a component from all the impact factors generated by the Project actions. The impact assessment provides a comprehensive view of the impact value that affects the environmental or biological component.

The impact assessment is expressed based on the assessor's experience, assigning higher weight to the values less favourable to the component's protection, in order to guide the assessment toward a more conservative approach.

Impacts are presented in separate tables for negative and positive impacts to avoid automatic trade-offs and/or mediating between positive and negative aspects, as they are often targeting different sections of the community.

5.10 Cumulative Impact Assessment

Cumulative impacts are caused by the accumulation and interaction of multiple stresses affecting the parts and the functions of ecosystems. Of particular concern is the knowledge that ecological systems sometimes change abruptly and unexpectedly in response to apparently small incremental stresses.

IFC Performance Standard 1 (2012) and another recent publication by IFC (Good Practice Handbook on Cumulative Impact Assessment and Management, August 2013) require that the ESIA includes a cumulative impact assessment ("CIA"), i.e., "*cumulative impacts that* result *from the incremental impact, on areas or resources used or directly impacted by the project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted*".

IFC guidelines denote that the scope of the CIA should be commensurate with the extent of cumulative impacts anticipated. This gives good direction to produce a focused assessment, considering only relevant disciplines. Cumulative impacts are limited to those impacts generally recognized as important on the basis of scientific concerns and/or concerns from Affected Communities[7]. In addition, although the quoted requirements indicate that *past, present and reasonably foreseeable/reasonably defined developments* including *unplanned but predictable activities* should be considered in the assessment, it is clear that most if not all of past and existing developments have generated or generate impacts that contribute in defining the existing baseline on which the Project will cumulate its impacts. This implies that impacts of past and existing projects will be captured in the baseline investigations, and the cumulative impact assessments therefore comes down to assessing how the Project impacts may cumulate with future impacts of existing projects or with impacts from future or reasonable planned and foreseeable developments, whose impacts have to be estimated and predicted as they are not yet occurring.

Cumulative impacts can result from various types of interaction among different impact factors:

[7] Examples of cumulative impacts include: incremental contribution of gaseous emissions to an airshed; reduction of water flows in a watershed due to multiple withdrawals; increases in sediment loads to a watershed; interference with migratory routes or wildlife movement; or more traffic congestion and accidents due to increases in vehicular traffic on community roadways.

- Impacts arising from the accumulation of different impact factors at a specific location or over a specific receptor; as an example, the concurrent presence of the emission of noise and emission of dust during construction at the same location;
- Impacts arising from the same impact factor over the same receptor in a different geographic location; as an example, the degradation of the same habitats in different locations may harm the population of associated species across their entire distribution area.
- Impacts arising from the concurrent presence of impact factors caused by the Project and other development projects; as an example, we can consider the emission of dust from the construction and the concurrent construction of a new infrastructure Project at the same location.

The process followed for the assessment is consistent with the framework provided by IFC and illustrated in the figure below, as described in the following paragraphs. Good Practice Handbook proposes as a useful preliminary approach for developers in emerging markets the conduct of a rapid cumulative impact assessment ("RCIA") which is illustrated below (Figure 5-3).

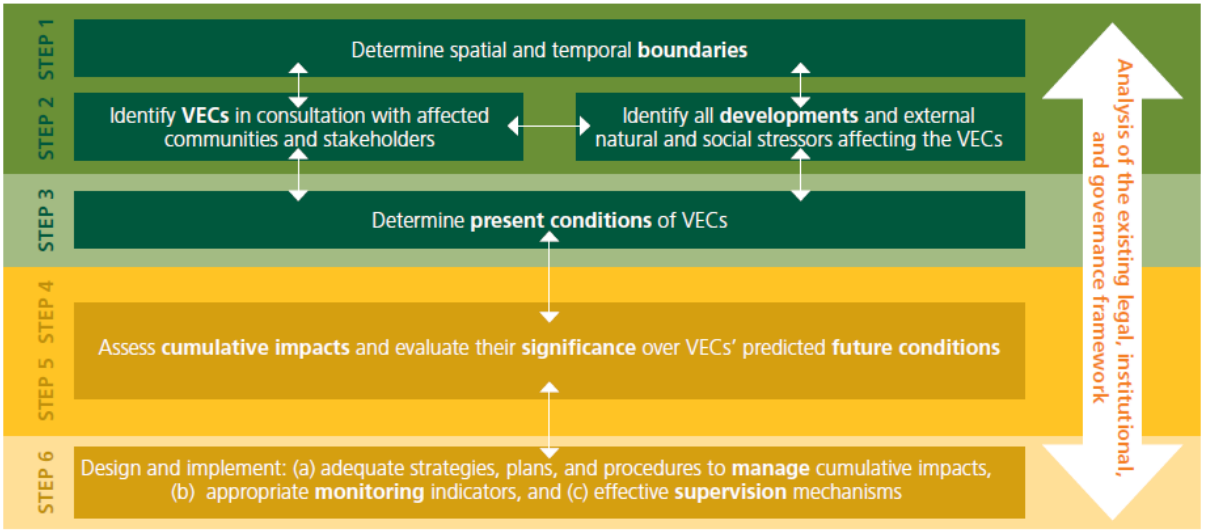


Figure 5-3: RCIA: Six-Step Approach

For the purposes of the present study, the cumulative impact assessment ("CIA") is limited to those residual impacts (post mitigation) resulting from past projects (captured through the baseline investigations) and from future residual effects of present or reasonably foreseeable projects and activities.

The foreseeable projects that will supplement the Project with a third-party service or other independent projects proposed in the area were identified and described to be considered in the CIA. There must be a reasonable potential that the other projects' impacts will overlap with those of the Project in time and/or space. If this overlap is not apparent, then a CIA is not warranted.

For cumulative effects to occur, residual impacts from the Project need to cumulate with residual impacts from other projects.

Table of Contents

TABLES

FIGURES

APPENDICES

APPENDIX D
List of species

6.0 ENVIRONMENTAL AND SOCIAL BASELINE

This chapter is aimed at providing a description of the environmental (physical and biological) and social context in the Regional Study Area (RSA) and Area of Influence (AoI) of the project prior to its realization.

Following the directions outlined in the Methodology (Chapter 5), the work presented here will include information on all relevant components to provide an understanding of the environmental and social state of the area (e.g., air quality, terrestrial fauna and flora, land use, etc.), and to assess their sensitivity.

All information reported in this chapter represent the starting point to the following Impact Assessment (Chapter 7).

The baseline description process has been aligned to the identified project components (Chapter 3).

The identification of the Project's Area of Influence varies according to the environmental and social component assessed and is hence summarized in the Methodology (Chapter 5) and detailed separately for physical, biological, and social components in this chapter. RSA term is also used in the methodology as a source of high-level information in case of absence of site-specific data at the AoI level or regional level data is required to define the components and assess the impacts. As such, the RSA contains the Project AoI. RSA provides information containing a geographically distinct assemblage of environmental conditions, defined as a starting point for the understanding of the environmental context at regional scale using secondary sources such as scientific papers, grey literature, and databases, and are described under each component. For each of the component investigated, the AoI was defined taking into consideration the Project footprint plus a buffer of variable width depending on the components' characteristics and the Project activities. The AoI for each physical component are represented and described in the respective chapters.

6.1 Physical Components

6.1.1 General Methodology

6.1.1.1 Desktop Studies

Literature review focused on the regional study area to document available data on air quality, soil quality, water quality, pollution sources, hydrology and hydrogeology, geology, and geomorphology. Both scientific and grey literature were considered to provide an accurate description of the physical characteristics of the onshore environment in the Project Area.

6.1.1.2 Field Studies

Within the scope of the Gap Analysis, a site visit to habitats near the Project area was conducted by WSP Türkiye on 11 April 2023 with the company of Client representatives. In addition to the this, an in-depth interview was held with the Mukhtar of Kadıköy on April 27, 2023.

6.1.2 Meteorology and Climatology

Definition	Meteorological characteristics of the AoI is critical in evaluating the air quality and dispersion of pollutants in the air and structural safety of Project components and the Project environment.
Area of Influence	**AoI:** 2,000 m buffer zone
Rationale for AoI	**Rationale:** The nearby receptors (i.e., communities), around the Project site, potentially exposed to pollutant emissions.
Data sources	**Primary sources**: Data from Şanlıurfa Meteorology Station
	Secondary sources: Secondary data from scientific papers, grey literature, and databases.

This section presents the baseline conditions for local and regional meteorology and climatology providing the basis for air quality evaluation. Parameters within this section will provide critical information on assessing air quality baselines and to identify dispersion pathways and ranges of pollutants in the air and provide input for the structural design.

Meteorological data were obtained from Meteorology Stations located around the Project site. The data were recorded in Şanlıurfa Meteorology Station and obtained from the Turkish State Meteorology General Directorate to establish the basic conditions for meteorology and climatology. The location of the meteorology station is shown in Figure 6-1.

Şanlıurfa has a continental climate. Summers are very dry and hot; winters are rainy and relatively mild. Şanlıurfa is closer to the equator in terms of mathematical location. It is located in an area far from the influence of the sea. For this reason, the continental climate feature predominates. This feature shows itself in terms of temperature and precipitation.

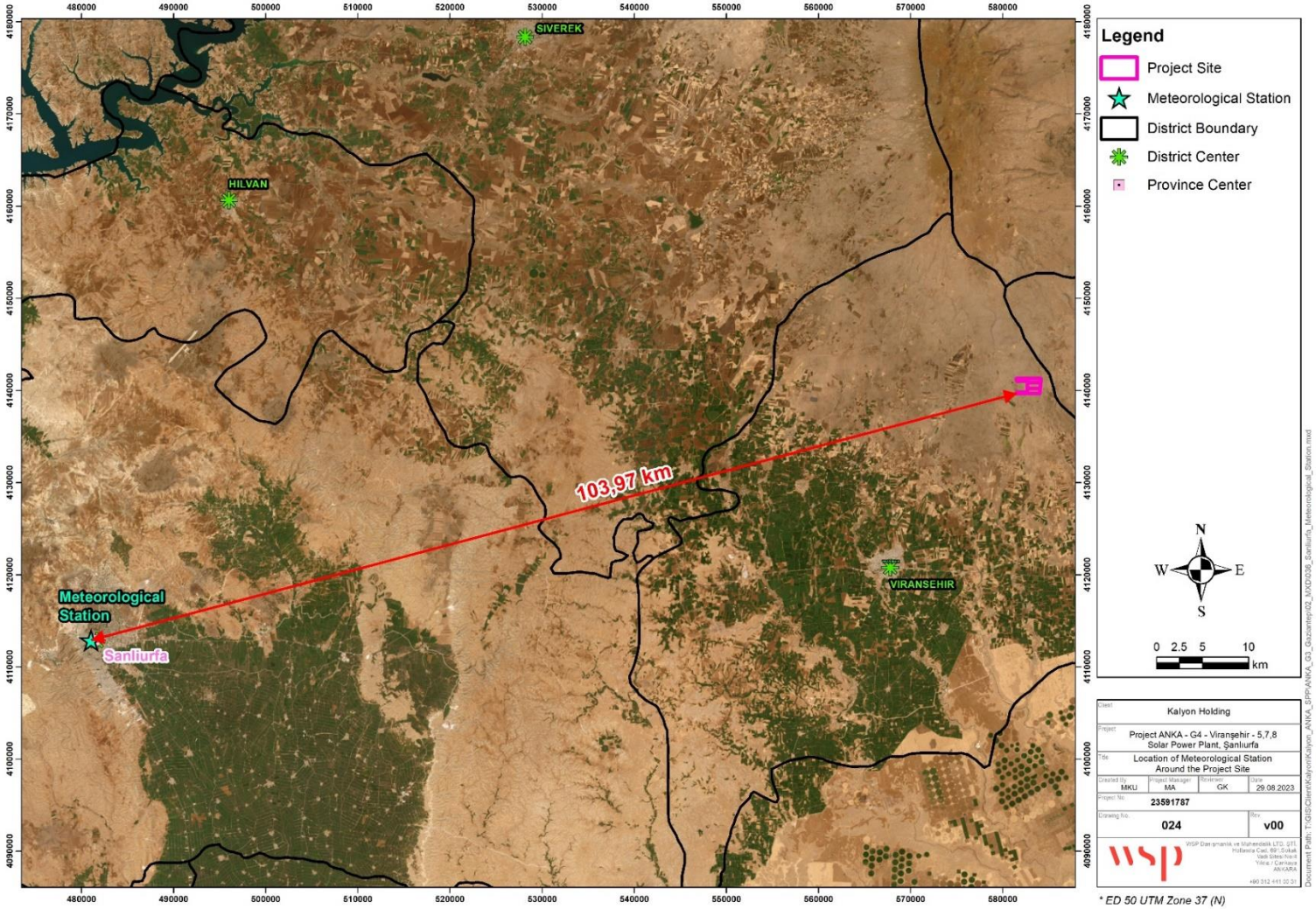


Figure 6-1: Location of Şanlıurfa Meteorological Station with respect to project Area

Pressure

According to the long term (1960-2021) observation records of Şanlıurfa Meteorology Station, the average pressure is 948.9 hPa per year, the maximum pressure is observed as 968.1 hPa, and the minimum pressure is 928 hPa (see Table 6-1 and Figure 6-2).

Table 6-1: Şanlıurfa Meteorological Station - Pressure Measurements (hPa) (1960 - 2021)

Months	Average Pressure (hPa)	Maximum Pressure (hPa)	Minimum Pressure (hPa)
January	954.1	967.4	931.7
February	952.5	968.1	928.7
March	950.4	966.2	928.0
April	948.6	961.5	931.2
May	947.4	958.2	931.0
June	943.9	954.0	933.2
July	940.4	949.5	932.5
August	941.8	949.8	933.3
September	946.7	956.5	937.6
October	951.6	963.5	935.3
November	954.3	966.0	934.7
December	954.9	967.3	934.6
Annual	**948.9**	**968.1**	**928.0**

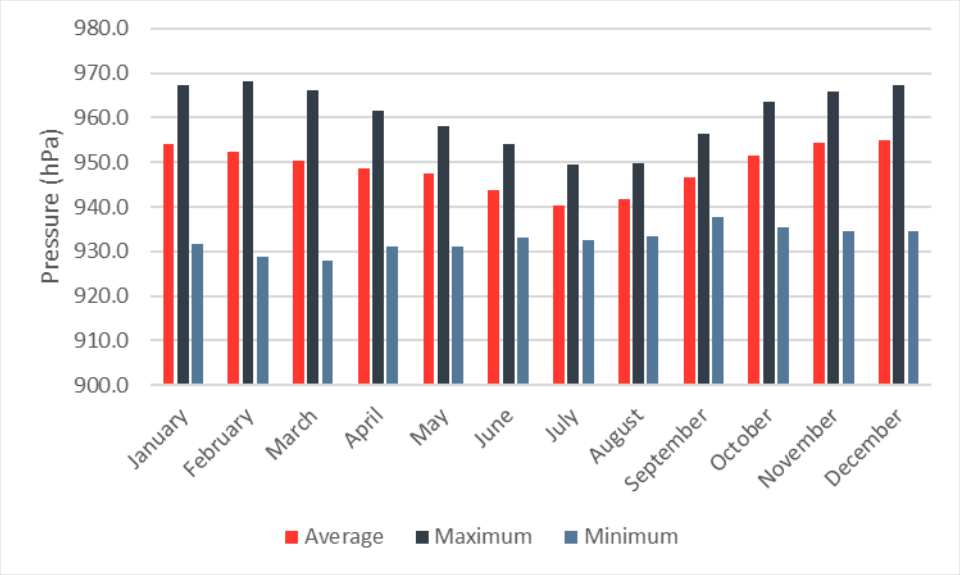


Figure 6-2: Şanlıurfa Meteorological Station - Pressure Measurements (1960 - 2021)

Temperature

According to the observation records of Şanlıurfa Meteorology Station between 1960 and 2021, the annual average temperature is 18.6°C. The highest temperature was recorded in July with 46.8°C, and the lowest temperature was measured in February with -9.6°C. Temperature values for 1960-2021 are presented in Table 6-2 and Figure 6-3.

Table 6-2: Şanlıurfa Meteorological Station - Temperature Measurements (°C) (1960 - 2021)

Months	Average Temperature (°C)	Maximum Temperature (°C)	Minimum Temperature (°C)
January	5.8	21.6	-8.0
February	7.2	25.5	-9.6
March	11.2	29.5	-7.3
April	16.3	36.4	-3.2
May	22.4	40.4	6.0
June	28.1	44.1	10.0
July	32.0	46.8	16.0
August	31.5	45.8	16.0
September	27.2	43.9	11.2
October	20.7	37.0	2.5
November	13.0	29.4	-2.7
December	7.6	26.0	-6.4
Annual	**18.6**	**46.8**	**-9.6**

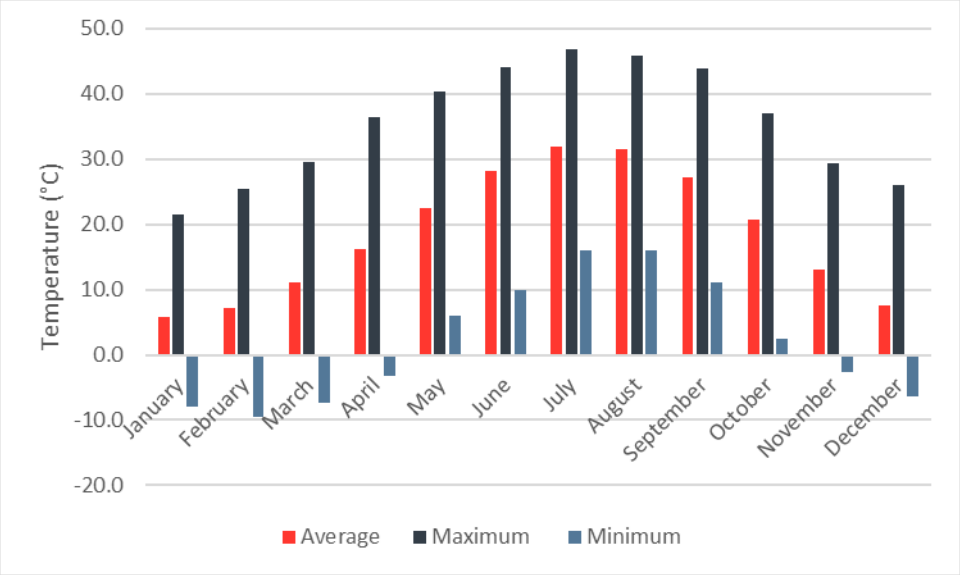


Figure 6-3: Şanlıurfa Meteorological Station - Temperature Measurements (°C) (1960 - 2021)

Precipitation

According to the observation records of Şanlıurfa Meteorology Station between 1960 and 2021, the annual average total precipitation is 462.5 mm. The maximum amount of precipitation was measured in January with 119.5 mm. Precipitation values for 1960-2021 are presented in Table 6-3 and Figure 6-4.

Table 6-3: Şanlıurfa Meteorological Station - Precipitation Measurements (mm) (1960 - 2021)

Months	Average Total Precipitation (mm)	Maximum Monthly Precipitation (mm)
January	85.3	119.5
February	68.2	64.7
March	63.8	59.5
April	47.2	99.7
May	27.5	55.9
June	4.4	23.4
July	2.1	9.7
August	3.9	26
September	5.1	42.3
October	27.7	117.1
November	46.4	49.3
December	80.9	90.5
Annual	**462.5**	**119.5**

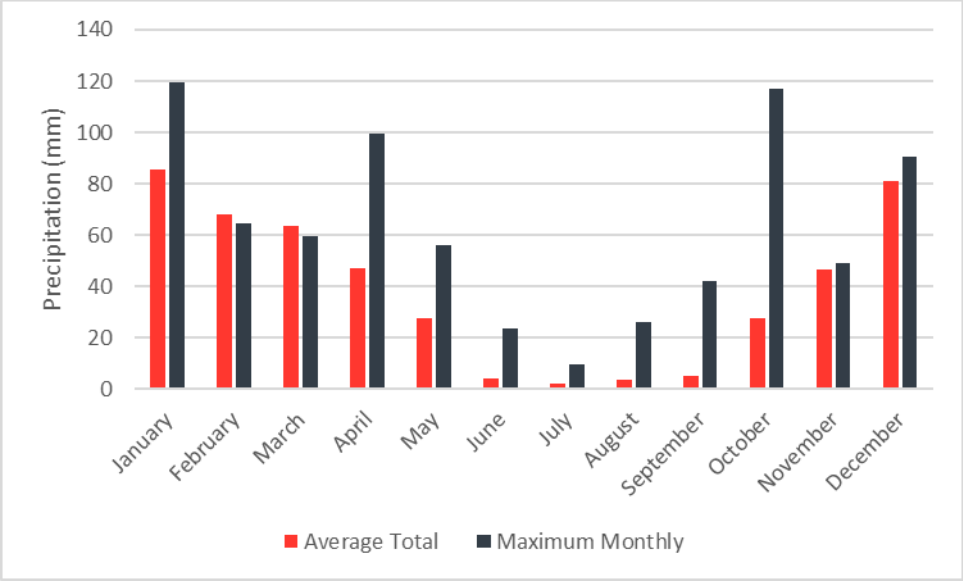


Figure 6-4: Şanlıurfa Meteorological Station - Precipitation Measurements (mm) (1960 - 2021)

Relative Humidity

According to the observation records of Şanlıurfa Meteorology Station between 1960 and 2021, the annual average relative humidity is 50.4%. Relative humidity values for 1960-2021 are presented in Table 6-4 and Figure 6-5.

Table 6-4: Şanlıurfa Meteorological Station - Relative Humidity Measurements (%) (1960 - 2021)

Months	Average Relative Humidity (%)
January	70.5
February	66.7
March	60.3
April	55.7
May	44.8
June	33.1
July	30.2
August	33.1
September	35.7
October	45.3
November	59.4
December	70.2
Annual	50.4

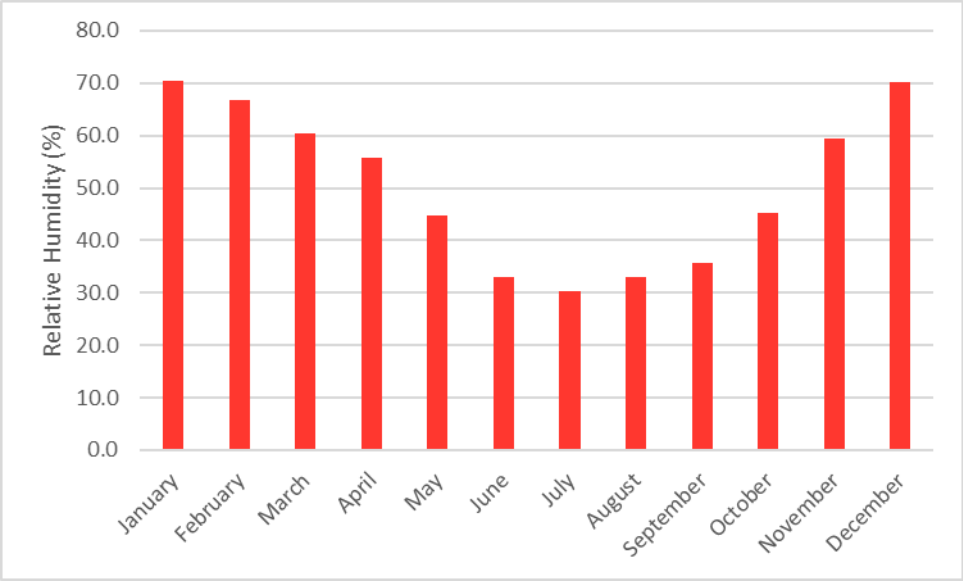


Figure 6-5: Şanlıurfa Meteorological Station - Relative Humidity Measurements (%) (1960 - 2021)

Evaporation

According to the observation records of Şanlıurfa Meteorology Station between 1960 and 2021, the average total evaporation was 1644.5 mm, and the daily maximum evaporation was 19 mm in July. Evaporation Values for 1960-2021 are presented in Table 6-5 and Figure 6-6.

Table 6-5: Şanlıurfa Meteorological Station - Evaporation Measurements (mm) (1960 - 2021)

Months	Average Evaporation (mm)	Daily Maximum Evaporation (mm)
January	-	-
February	-	-
March	32.6	5.0
April	114.3	18.1
May	189.1	15.1
June	282.0	18.0
July	336.2	19.0
August	300.4	17.0
September	213.7	13.5
October	125.8	9.3
November	42.3	4.6
December	8.1	1.8
Annual	1644.5	19.0

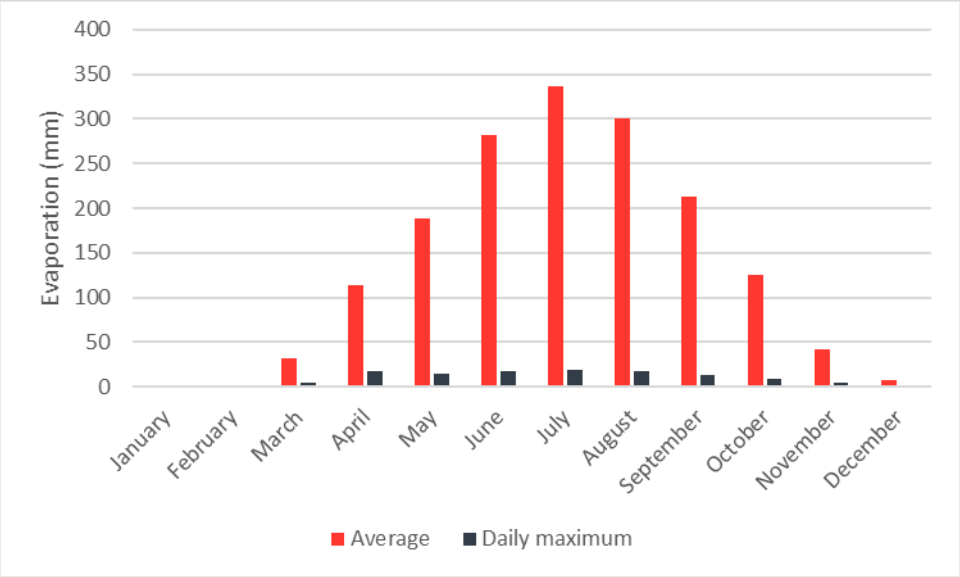


Figure 6-6: Şanlıurfa Meteorological Station - Evaporation Measurements (mm) (1960 - 2021)

Wind Distribution

Number of Winds

The total number of the wind blowing measured at Şanlıurfa Meteorological Station between 1960 and 2021 is given in Table 6-6 and Figure 6-7. As can be seen from the Table 6-6 and Figure 6-7, dominant wind direction is blowing from west-northwest (WNW) direction, second degree dominant wind direction is blowing from northwest (NW) direction.

Table 6-6: Şanlıurfa Meteorological Station - Wind Direction Measurements (mm) (1960 - 2021) (blowing from)

Direction	Annual Total Wind
N	32202
NNE	25163
NE	11230
ENE	22514
E	21087
ESE	35773
SE	17216
SSE	19004
S	11638
SSW	11846
SW	11335
WSW	31775
W	45498
WNW	101238
NW	68353
NNW	59489

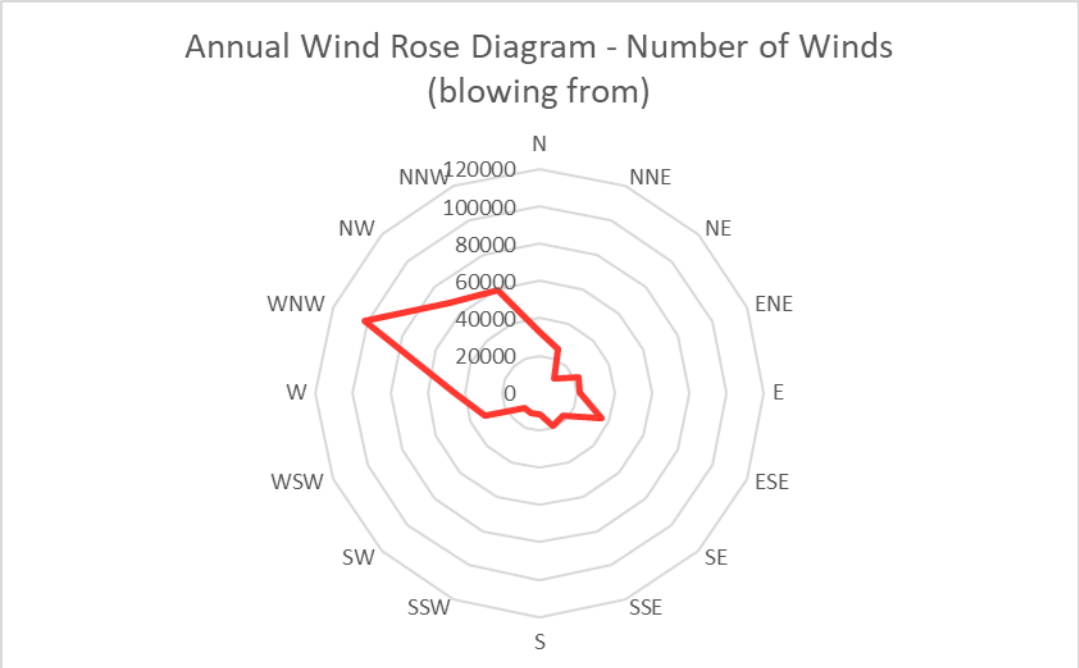


Figure 6-7: Şanlıurfa Meteorological Station - Wind Direction Measurements (mm) (1960 - 2021) (blowing from)

Wind Speed

According to data from Şanlıurfa Meteorology Station between 1960 and 2021, the annual average wind speed is 1.8 m/s. Maximum monthly wind speed is measured as 31.5 m/sec blowing from northwest (NW) direction (see Table 6-7)

Table 6-7: Şanlıurfa Meteorological Station - Wind Speed (m/ sec) (1960 - 2021)

	Average Monthly Wind Speed (m/sec)	Maximum Monthly Wind speed (m/sec) and Direction
January	1.4	25.2 / S
February	1.5	24.1 / WSW
March	1.7	24.0 / W
April	1.9	20.1 / WNW
May	2.0	22.4 / WNW
June	2.5	24.3 / WNW
July	2.5	22.5 / NNW
August	2.3	31.5 / NW
September	1.9	26.2 / SSE
October	1.5	26.5 /WNW
November	1.3	20.4 / WNW

	Average Monthly Wind Speed (m/sec)	Maximum Monthly Wind speed (m/sec) and Direction
December	1.2	29.0 / E
Annual	1.8	31.5 / NW

Other parameters

According to the observation records of Şanlıurfa Meteorology Station between 1960 and 2021:

- the average annual number of snow days is 4, the number of snow-covered days is 8.54, the number of foggy days is 1.86, the number of hail days is 2.58, the number of frosty days was 6.02, and the number of thunderstorm days was 5.41.
- The maximum snow thickness was measured as 29 cm in January.
- The number of strong windy days is 116.5 days per year, and the number of stormy days is 16.99 days per year.

6.1.3 Air Quality

Definition	Ambient air quality is a broader term used to describe the level of air pollution in outdoor environments. WHO defines ambient air pollution as potentially harmful pollutants emitted by industries, households, vehicles, etc. Construction and decommissioning activities may generate emission of fugitive dust caused by a combination of on-site excavation and movement of earth materials, contact of construction machinery with bare soil, and exposure of bare soil and soil piles to wind. Exhaust gas emissions such as nitrogen oxides, carbon monoxide, hydrocarbon, particulate matter, and sulfur dioxide, will occur due to the diesel engines that will be used for electricity generation, construction equipment will be operated during the land preparation / construction activities.
Area of Influence	2,000 m buffer zone including Project footprint (See Figure 6-8)
Rationale for the AoI	**Rationale:** The nearby receptors (i.e., communities), around the Project site, potentially exposed to pollutant emissions.
Data sources	**Primary sources**: ■ Baseline air quality measurements conducted in 2023 in the scope of ESIA studies.
	Secondary sources: ■ Data from Air Quality Monitoring Stations in Şanlıurfa Province ■ Secondary data from scientific papers, grey literature, and databases.

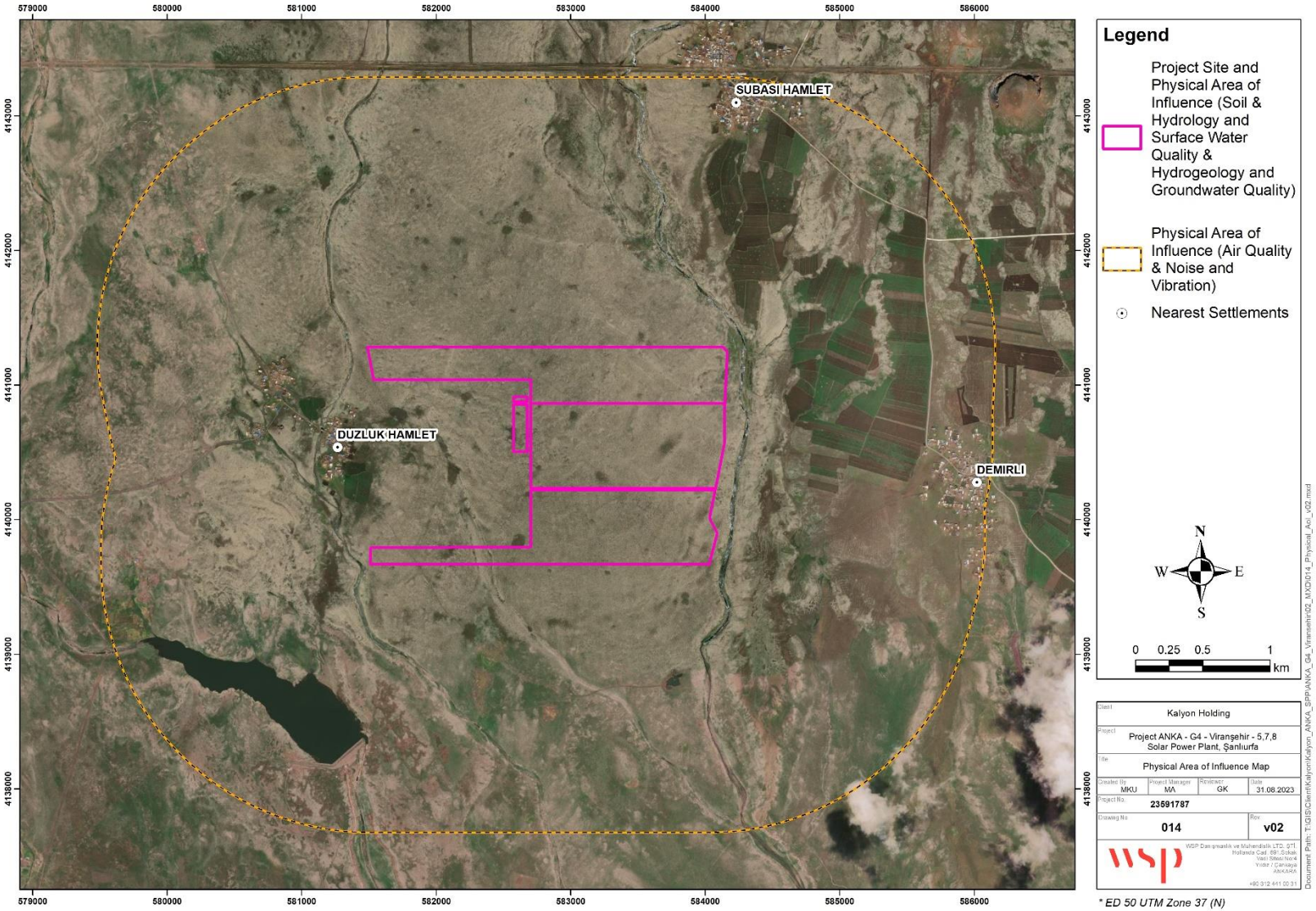


Figure 6-8: Map Showing Physical Area of Influence of Air Quality and Noise Components

Methodological Approach

Air Quality Monitoring Stations

Information about the air quality in the RSA is provided from the National Air Quality Monitoring Stations in Şanlıurfa. The air quality data at this station are published on the website of the Continuous Monitoring Center (CMC) of MoEUCC. There is one CMC in Şanlıurfa. The Şanlıurfa CMC is approximately 100 km to the project area. The air quality monitoring station is given in Figure 6-9.

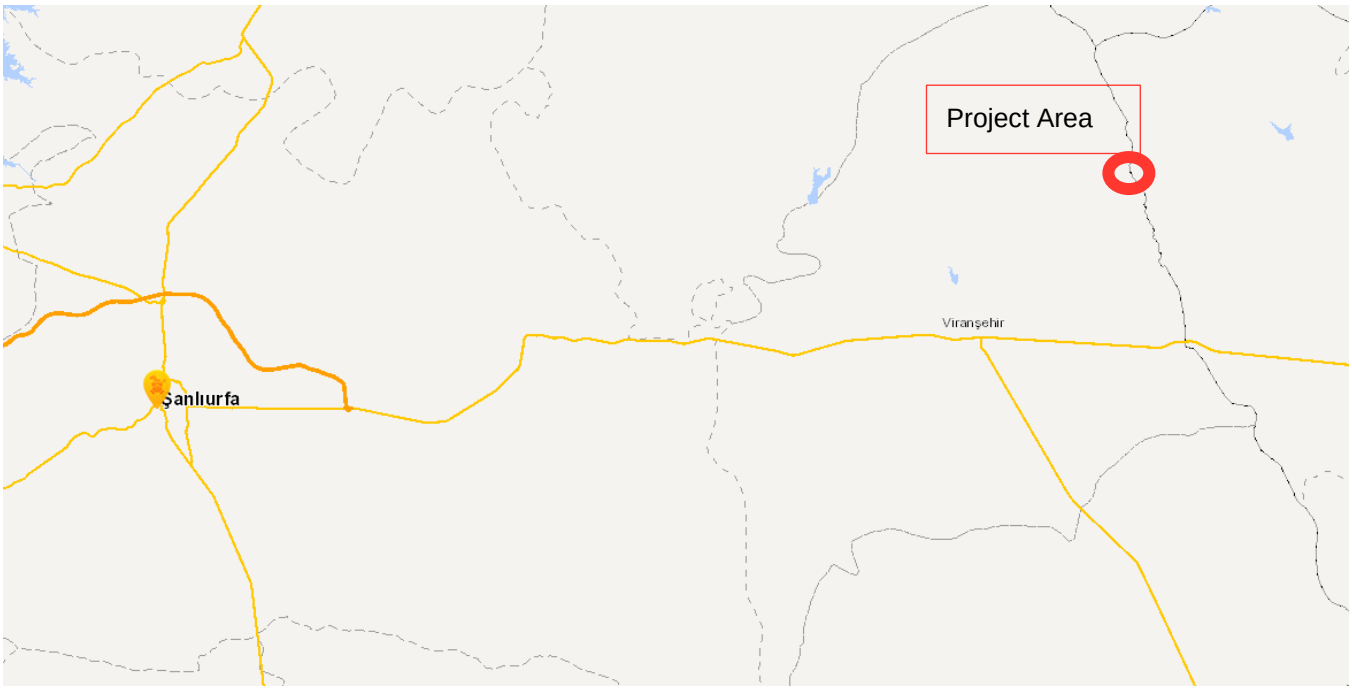


Figure 6-9: Continuous Measurement Center of MoEUCC and Project Area

Within the scope of ESIA studies, PM10, PM2.5 and settled dust measurements were conducted. PM10 and PM2.5 measurements were conducted at the same measurement points. The details of measurement points and periods are given in Table 6-8, Table 6-9, Table 6-10 and Figure 6-10. PM10 and PM2.5 measurements were conducted for 72 hours in 11 measurement points. Settled dust measurements were conducted for 2-months at 11 points.

Table 6-8: PM10 Measurement Coordinates and Periods

Points	Coordinate s		Measurement Period and Date
PM10-1	585615.232154	4140130.10903	72 hours – 04.04.2023-07.04.2023
PM10-2	585303.295513	4142670.83341	72 hours – 04.04.2023-07.04.2023
PM10-3	584178.03751	4142922.10895	72 hours – 04.04.2023-07.04.2023

Points	Coordinate s		Measurement Period and Date
PM10-4	580274.601119	4141990.40802	72 hours – 04.04.2023-07.04.2023
PM10-5	579922.307102	4139595.33474	72 hours – 04.04.2023-07.04.2023
PM10-6	581437.446954	4140814.39361	72 hours – 04.04.2023-07.04.2023
PM10-7	581276.968025	4140302.57777	72 hours – 07.04.2023-10.04.2023
PM10-8	582249.246576	4136873.21998	72 hours – 07.04.2023-10.04.2023
PM10-9	580578.987685	4136856.27572	72 hours – 07.04.2023-10.04.2023
PM10-10	580939.593319	4141260.45412	72 hours – 07.04.2023-10.04.2023
PM10-11	584407.280105	4141341.86367	72 hours – 07.04.2023-10.04.2023

Table 6-9: PM2.5 Measurement Coordinates and Periods

Points	Coordinates		Measurement Period and Date
PM2.5-1	585615.232154	4140130.10903	72 hours – 04.04.2023-07.04.2023
PM2.5-2	585303.295513	4142670.83341	72 hours – 04.04.2023-07.04.2023
PM2.5-3	584178.03751	4142922.10895	72 hours – 04.04.2023-07.04.2023
PM2.5-4	580274.601119	4141990.40802	72 hours – 04.04.2023-07.04.2023
PM2.5-5	579922.307102	4139595.33474	72 hours – 07.04.2023-10.04.2023
PM2.5-6	581437.446954	4140814.39361	72 hours – 07.04.2023-10.04.2023
PM2.5-7	581276.968025	4140302.57777	72 hours – 07.04.2023-10.04.2023
PM2.5-8	582249.246576	4136873.21998	72 hours – 07.04.2023-10.04.2023
PM2.5-9	580578.987685	4136856.27572	72 hours – 07.04.2023-10.04.2023
PM2.5-10	580939.593319	4141260.45412	72 hours – 10.04.2023-13.04.2023
PM2.5-11	584407.280105	4141341.86367	72 hours – 10.04.2023-13.04.2023

Table 6-10: Settled Dust Measurement Coordinates and Period

Points	Coordinates		Measurement Period and Date
SD-1	585629.073817	4140119.16467	2 months – between 04.04.2023 and 03.06.2023
SD-2	585322.18211	4142700.31168	2 months – between 04.04.2023 and 03.06.2023
SD-3	584184.56148	4142916.802	2 months – between 04.04.2023 and 03.06.2023

Points	Coordinates		Measurement Period and Date
SD-4	580257.688023	4142013.36064	2 months – between 04.04.2023 and 03.06.2023
SD-5	579915.5489	4139587.71391	2 months – between 04.04.2023 and 03.06.2023
SD-6	581400.562498	4140786.85193	2 months – between 04.04.2023 and 03.06.2023
SD-7	581274.54987	4140289.85812	2 months – between 04.04.2023 and 03.06.2023
SD-8	582253.991834	4136881.69119	2 months – between 04.04.2023 and 03.06.2023
SD-9	580569.736265	4136857.33937	2 months – between 04.04.2023 and 03.06.2023
SD-10	580932.084219	4141260.42158	2 months – between 04.04.2023 and 03.06.2023
SD-11	584396.798257	4141343.60123	2 months – between 04.04.2023 and 03.06.2023

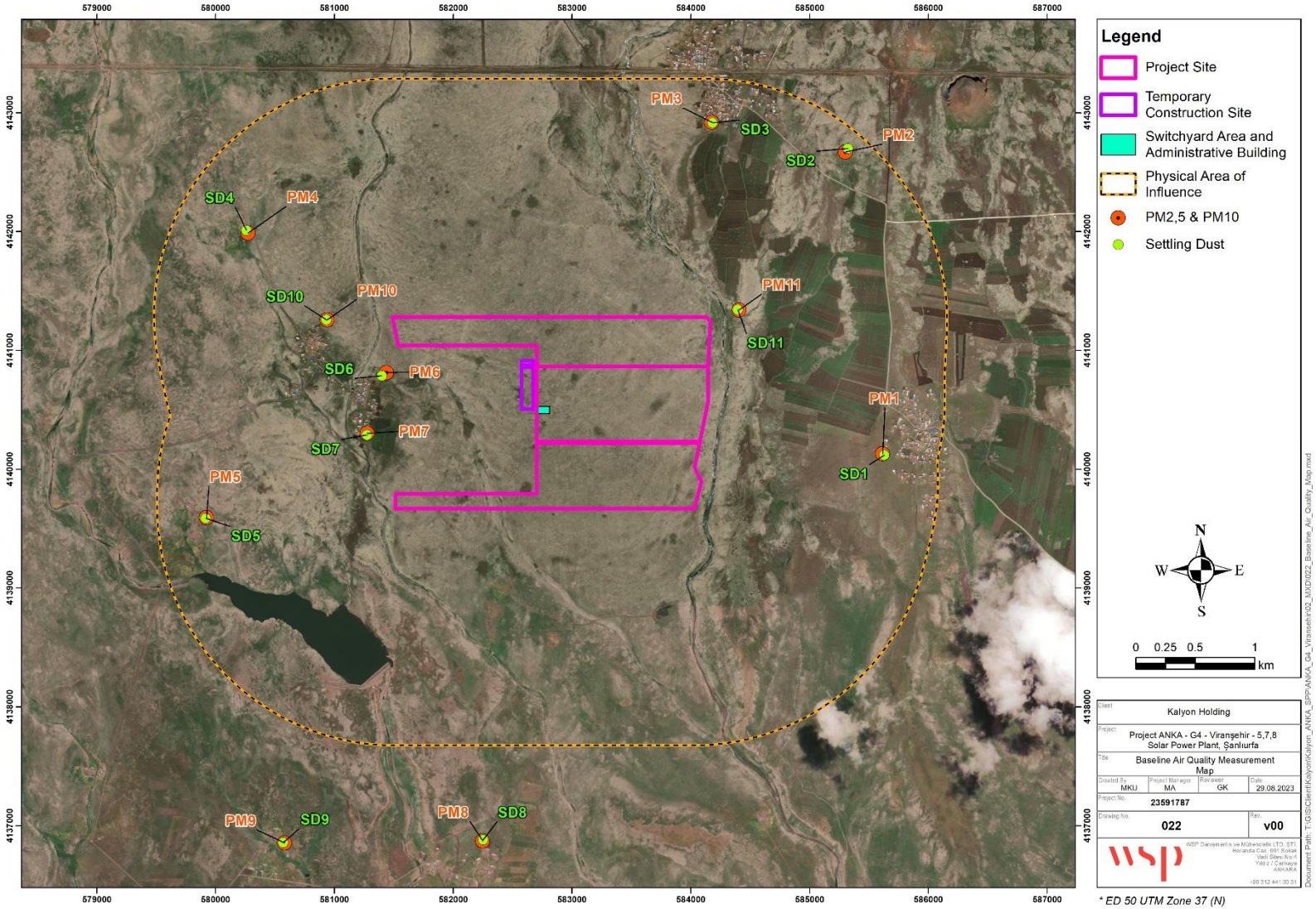


Figure 6-10: Baseline Air Quality Measurement Points

Air sampling methodologies are provided from the laboratories and summarized below.

- PM10 and PM2.5 measurement studies are conducted according to the TS 12341 standard: “Standard gravimetric measurement method for the determination of the PM10 or PM2.5 mass concentration of suspended particulate matter”. In this method, air vacuumed from the ambient air by a pump passes a filter and collected on the filter for 24 hours. After the sampling period, the filter is transported to the laboratory and gravimetric analysis is conducted. By calculating the amount of dust on the filter, PM10 and PM2.5 concentrations in the ambient air are achieved.
- Settled dust measurement study is conducted according to TS 2342 standard: “Methods for the measurement of air pollution methods for the installation and the use of the directional dust gauge”. This method is based on collection of particles settled due to the factors such as gravity, precipitation in a directional dust gauge, collection of the gauge after the sampling period (720 hours) and calculation of the dust concentration.

Regional Study Area

The data of the Şanlıurfa CMC of the Ministry of Environment, Urbanization and Climate Change is presented in Table 6-11.

Table 6-11: Air Quality of Şanlıurfa District*

Parameter	Unit	Minimum Value	Minimum Date	Maximum Value	Maximum Date	Average Value	Turkish Air Quality Standards (µg/Nm3)
PM10	µg/m3	10.21	06.05.2022	328.12	25.04.2022	61.73	20
SO2	µg/m3	3.76	04.04.2022	183.09	18.02.2022	37.51	20

Source: (MoEUCC, 2022)

Area of Influnce

Within the scope of the ESIA, PM2.5, PM10 and settled dust, measurements were conducted. The results and evaluations are given in the following sub-sections.

PM10 Measurement Results

The results of PM10 measurements are given in Table 6-12. As can be seen from the results, the PM10 concentration around the Project area is below the Turkish and IFC Air Quality Standards. The highest PM10 concentration was measured as 13.54 µg/Nm3 at PM10-6 sampling point.

Table 6-12: PM10 Measurement Results

Sampling Point	PM10 Measurement Results			Turkish Air Quality Standards[1] (µg/Nm3)	IFC Air Quality Standards (µg/Nm3)[2]
	Day 1	Day 2	Day 3		
PM10-1	12.82	12.00	11.63	50	50
PM10-2	10.33	10.98	11.83		
PM10-3	11.65	12.59	11.81		
PM10-4	10.79	12.91	11.01		
PM10-5	11.93	11.40	13.49		
PM10-6	11.47	13.54	11.85		
PM10-7	11.83	10.21	10.58		
PM10-8	11.38	12.45	11.05		
PM10-9	10.95	12.79	10.80		
PM10-10	11.36	12.64	11.59		
PM10-11	12.26	11.21	12.05		

[1] Regulation on Control of Industrial Air Pollution (Dated 03.07.2009 and Numbered 27277) and Regulation on Assessment and Management of Air Quality (Dated 06.06.2008 and Numbered 26898)

[2] IFC General Environmental, Health, and Safety (EHS) Guidelines (WHO stands for World Health Organization) (Dated 30 April 2007)

PM2.5 Measurement Results

The results of PM2.5 measurements are given in Table 6-13. The PM2.5 measurement results around the Project area are below the IFC Air Quality Standards. The highest PM2.5 concentration was measured as 6.89 µg/Nm3 at PM2.5-1 sampling point.

Table 6-13: PM2.5 Measurement Results

Sampling Point	PM10 Measurement Results			Turkish Air Quality Standards (µg/Nm3)	IFC Air Quality Standards (µg/Nm3)[1]
	Day 1	Day 2	Day 3		
PM2.5-1	6.89	6.69	6.16	-	25
PM2.5-2	5.25	4.89	5.52		
PM2.5-3	5.62	5.80	6.16		
PM2.5-4	6.34	5.80	6.16		
PM2.5-5	4.17	4.17	3.62		
PM2.5-6	5.97	5.61	6.35		
PM2.5-7	6.16	6.16	5.80		
PM2.5-8	4.88	4.70	5.26		
PM2.5-9	4.97	5.99	5.40		
PM2.5-10	6.00	5.18	6.42		
PM2.5-11	5.81	5.60	6.02		

[1] IFC General Environmental, Health, and Safety (EHS) Guidelines (WHO stands for World Health Organization) (Dated 30 April 2007)

Settled Dust Measurement Results

The settled dust measurement results around the Project area are below the regulatory limits. The highest settling dust concentration was measured as 36 mg/m²-day, at SD-2 air quality measurement point.

Table 6-14: Settled Dust Measurement Results

Points	Settled dust Measurement Results (mg/m²-day)				Turkish Air Quality Standards (mg/m²-day)		IFC Air Quality Standards
	1st Period	2nd Period	Long Term Value	Short Term Value	Long Term Limit	Short Term Limit	
SD-1	23	27	25	27	210	390	-
SD-2	30	36	33	36			
SD-3	26	29	28	29			
SD-4	27	29	29	29			
SD-5	28	30	29	30			

Points	Settled dust Measurement Results (mg/m²-day)				Turkish Air Quality Standards (mg/m²-day)		IFC Air Quality Standards
	1st Period	2nd Period	Long Term Value	Short Term Value	Long Term Limit	Short Term Limit	
SD-6	20	23	22	23			
SD-7	28	30	29	30			
SD-8	29	31	30	31			
SD-9	28	29	29	29			
SD-10	23	24	24	24			
SD-11	18	20	19	20			

Sensitivity Assessment

After analysing the baseline data, the sensitivity of the air quality component is given below.

Sensitivity features	Supported by	Sensitivity value
Baseline PM10, PM2.5, and settled dust in the AoI (albeit below Project Standards) Close presence of communities, vulnerable targets and sensitive ecological receptors potentially exposed to air emissions. Other ongoing projects (under construction and planning stage) around the Project area.	Primary and secondary data	Medium-high

6.1.4 Noise and Vibration

Definition	Background noise/vibration or ambient noise/vibration is the sound level of environmental noise/vibration such as water waves, traffic noise, trains and airplanes, acoustic noise from animals, and electrical noise from equipment. During construction and decommissioning activities, noise and vibration may be caused by the operation of pile drivers, earth moving and excavation equipment, concrete mixers, cranes, and the transportation of equipment, materials, and people.
Area of Influence	2,000 m buffer zone including Project footprint (See Figure 6-8)
Rationale for the AoI	The nearby receptors (i.e., communities) around the Project site may be affected from potential noise and vibration impacts.
Data sources	**Primary sources:** Field work and background noise and vibration measurements conducted in 2023 during ESIA Studies
	Secondary sources: ■ Secondary data from scientific papers, grey literature, and databases

Methodological approach

Baseline data collected during ESIA studies is the only available data for this component since there is not any provincial level noise and vibration information. Details about the methodology used for the noise baseline data collection study are provided below.

Within the scope of the ESIA studies, background noise measurement was conducted at 11 points for 48 hours. The 24h measurement is conducted in weekday and other 24h measurement is conducted in weekend in compliance with the Turkish legislation and IFC General EHS Guideline for Noise. On the other hand, vibration measurements were also conducted in AoI at three locations.

Measurement locations are presented in Table 6-15, Table 6-16 and Figure 6-11.

Table 6-15: Noise Level Measurement Coordinates and Periods

Points	Coordinates		Measurement Period and Date
N-1	585606.524551	4140149.77614	24 hours in weekday- 05.04.2023 24 hours in weekend – 08.04.2023
N-2	585284.007971	4142673.29433	24 hours in weekday- 05.04.2023 24 hours in weekend – 08.04.2023
N-3	584177.768912	4142914.63194	24 hours in weekday- 05.04.2023 24 hours in weekend – 08.04.2023
N-4	580280.083017	4141999.13904	24 hours in weekday- 05.04.2023 24 hours in weekend – 08.04.2023
N-5	579933.12501	4139591.52022	24 hours in weekday- 06.04.2023 24 hours in weekend – 08.04.2023

Points	Coordinates		Measurement Period and Date
N-6	581409.831912	4140773.20198	24 hours in weekday- 06.04.2023 24 hours in weekend – 15.04.2023
N-7	581288.646084	4140296.74356	24 hours in weekday- 06.04.2023 24 hours in weekend – 15.04.2023
N-8	582247.439983	4136880.70468	24 hours in weekday- 06.04.2023 24 hours in weekend – 15.04.2023
N-9	580572.982267	4136866.69231	24 hours in weekday- 11.04.2023 24 hours in weekend – 15.04.2023
N-10	580932.708727	4141271.364	24 hours in weekday- 11.04.2023 24 hours in weekend – 08.04.2023
N-11	584402.51671	4141351.91814	24 hours in weekday- 11.04.2023 24 hours in weekend – 15.04.2023

Table 6-16: Vibration Level Measurement Coordinates and Periods

Points	Coordinates		Measurement Period and Date
V-1	581405.861123	4140756.56138	Instantaneous measurement – 04.05.2023
V-2	584169.116369	4142911.38713	Instantaneous measurement – 04.05.2023
V-3	585616.410183	4140108.05681	Instantaneous measurement – 04.05.2023

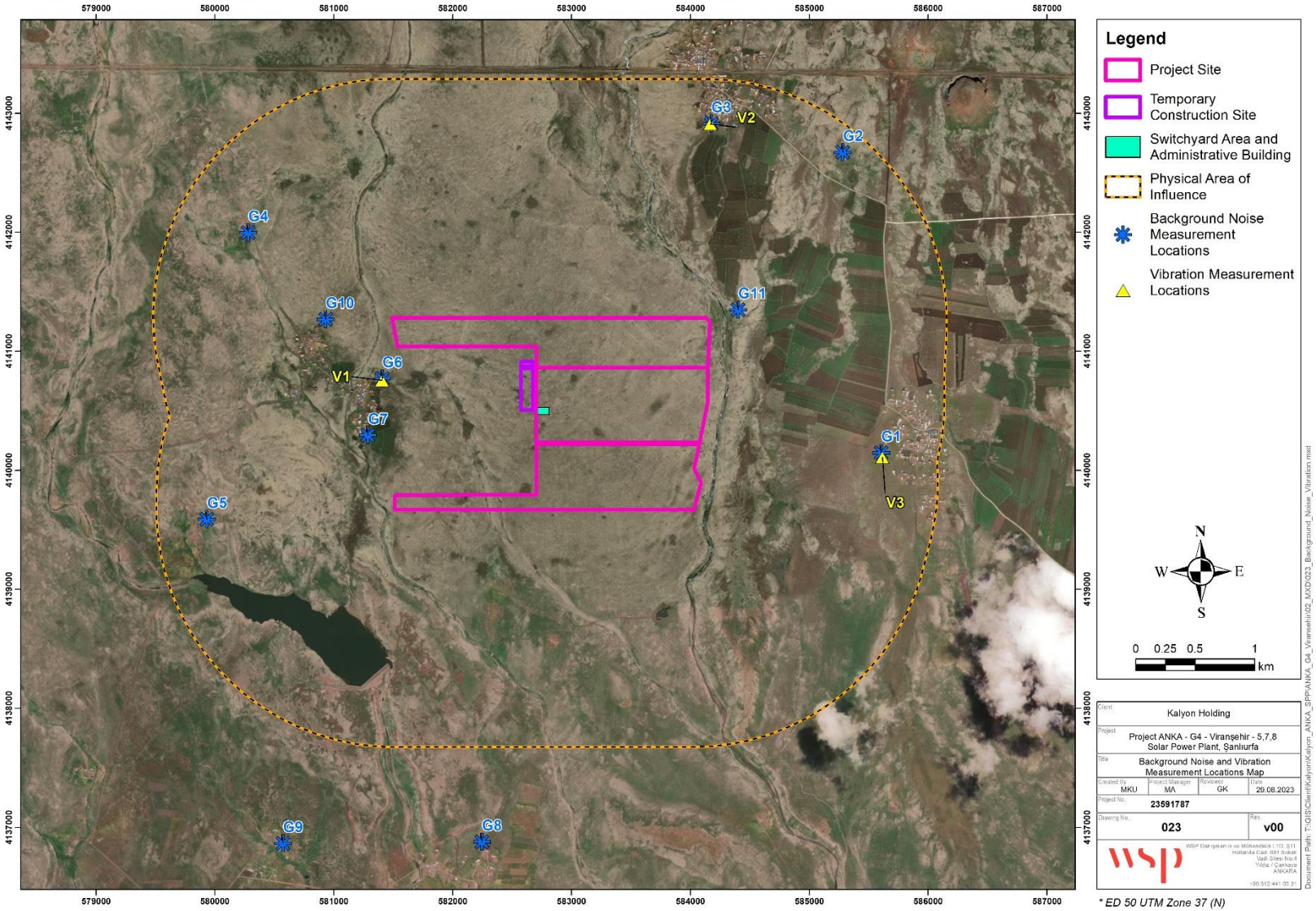


Figure 6-11: Map Showing Background Noise and Baseline Vibration Measurement Points

Area of Influence

The noise level limit values and time periods are defined different in Turkish Regulation on Control of Environmental Noise and in IFC Guidelines. Therefore, 48 hours noise measurement results are presented as per both Turkish Legislation and IFC Guidelines in Table 6-17. The results do not exceed Turkish Legislation and IFC Guideline Limits. As can be seen from the Table 6-19, baseline vibration measurements are well below the regulatory limits.

Table 6-17: Noise Level Measurement Results - Weekday

Sampling Name	Date	Measurement Results as per Turkish Legislation[1] (dBA)			Measurement Results as per IFC[2] (dBA)	
		Day (07:00-19:00)	Evening (19:00-23:00)	Night (23:00-07:00)	Day (07:00-22:00)	Night (22:00-07:00)
N-1	05.04.2023	44.6	42.6	38.6	44.3	38.7
N-2	05.04.2023	44.3	43.2	40.3	44.2	40.5
N-3	05.04.2023	45.2	43.2	38.0	44.8	39.0
N-4	05.04.2023	43.5	44.2	38.8	43.5	40.3
N-5	06.04.2023	44.8	44.3	36.5	44.8	37.7
N-6	06.04.2023	43.1	42.1	34.3	43.2	36.4
N-7	06.04.2023	44.6	42.7	37.6	44.4	37.9
N-8	06.04.2023	43.7	40.4	38.2	44.2	38.9
N-9	11.04.2023	41.5	42.5	39.2	42.4	39.8
N-10	11.04.2023	44.1	42.9	39.9	44.1	39.7
N-11	11.04.2023	42.4	40.2	37.7	42.1	37.9
Limit Values	**-**	**65**	**60**	**55**	**55**	**45**

[1] Regulation on Control of Environmental Noise
[2] IFC Environmental, Health, and Safety (EHS) Guidelines General EHS Guidelines: Environmental - Noise Management;

Table 6-18: Noise Level Measurement Results - Weekend

Sampling Name	Date	Measurement Results as per Turkish Legislation[1] (dBA)			Measurement Results as per IFC[2] (dBA)	
		Day (07:00-19:00)	Evening (19:00-23:00)	Night (23:00-07:00)	Day (07:00-22:00)	Night (22:00-07:00)
N-1	08.04.2023	40.8	38.7	34.1	40.4	35.1
N-2	08.04.2023	42.6	43.0	37.9	42.7	38.2
N-3	08.04.2023	44.1	41.8	37.7	43.7	38.3
N-4	08.04.2023	44.2	43.2	37.6	44.0	40.9
N-5	08.04.2023	44.0	41.9	37.4	43.7	37.9

Sampling Name	Date	Measurement Results as per Turkish Legislation[1] (dBA)			Measurement Results as per IFC[2] (dBA)	
		Day (07:00-19:00)	Evening (19:00-23:00)	Night (23:00-07:00)	Day (07:00-22:00)	Night (22:00-07:00)
N-6	15.04.2023	43.7	43.0	37.7	43.8	38.1
N-7	15.04.2023	42.2	41.9	38.6	42.2	38.9
N-8	15.04.2023	43.1	42.3	37.5	43.1	38.4
N-9	15.04.2023	42.1	41.3	39.0	41.9	39.6
N-10	08.04.2023	43.9	37.5	34.7	43.1	35.4
N-11	15.04.2023	46.4	39.4	35.9	45.6	36.3
Limit Values	**-**	**65**	**60**	**55**	**55**	**45**

[1] Regulation on Control of Environmental Noise
[2] IFC Environmental, Health, and Safety (EHS) Guidelines General EHS Guidelines: Environmental - Noise Management;

Table 6-19: Baseline Vibration Measurement Results

Frequancy (Hz)	Vibration Point 1 (mm/s)			Limit Value (mm/s)[1]	Measurement Date
	X direction	Y direction	Z direction		
1.0 Hz	0.0264	0.0053	0.0321	**1.5**	05.04.2023
1.25 Hz	0.0417	0.0417	0.0364	**0.3**	
1.60 Hz	0.0085	0.0034	0.0089		
2.0 Hz	0.0153	0.0046	0.0161		
2.5 Hz	0.0225	0.0191	0.029		
3.15 Hz	0.0069	0.0097	0.0044		
4.0 Hz	0.0066	0.0099	0.0024		
5.0 Hz	0.0113	0.0104	0.0109		
6.3 Hz	0.0017	0.0055	0.0046		
8.0 Hz	0.0059	0.0042	0.0046		
10.0 Hz	0.009	0.0065	0.0127		
12.5 Hz	0.0083	0.0042	0.0045		
16.0 Hz	0.0107	0.0073	0.0045		
20.0 Hz	0.0038	0.0166	0.0033		
25.0 Hz	0.0029	0.0113	0.0025		
31.5 Hz	0.0014	0.0042	0.0021		
40.0 Hz	0.0129	0.0119	0.0069		

Frequancy (Hz)	Vibration Point 1 (mm/s)			Limit Value (mm/s)[1]	Measurement Date
	X direction	Y direction	Z direction		
50.0 Hz	0.0025	0.0049	0.0034		
63.0 Hz	0.0012	0.0012	0.002		
80.0 Hz	0.0017	0.0018	0.0013		
Vibration Point 2 (mm/s)					
1.0 Hz	0.035	0.0307	0.0367	**1.5**	05.04.2023
1.25 Hz	0.0624	0.0417	0.0509	**0.3**	
1.60 Hz	0.0193	0.0193	0.0231		
2.0 Hz	0.024	0.0132	0.0229		
2.5 Hz	0.0243	0.0208	0.0236		
3.15 Hz	0.0069	0.0042	0.0101		
4.0 Hz	0.0099	0.0077	0.0115		
5.0 Hz	0.0113	0.0147	0.0127		
6.3 Hz	0.0037	0.0051	0.0053		
8.0 Hz	0.0055	0.0044	0.0051		
10.0 Hz	0.0087	0.0059	0.0061		
12.5 Hz	0.0026	0.0031	0.0024		
16.0 Hz	0.0032	0.0022	0.0021		
20.0 Hz	0.0028	0.0054	0.0029		
25.0 Hz	0.005	0.0087	0.0024		
31.5 Hz	0.0023	0.0105	0.0019		
40.0 Hz	0.0112	0.0125	0.0036		
50.0 Hz	0.0111	0.0283	0.0083		
63.0 Hz	0.0015	0.0041	0.0023		
80.0 Hz	0.0011	0.0012	0.0008		
Vibration Point 3 (mm/s)					
1.0 Hz	0.0264	0.0264	0.0413	**1.5**	05.04.2023
1.25 Hz	0.0417	0.0382	0.0473	**0.3**	
1.60 Hz	0.0166	0.0058	0.026		
2.0 Hz	0.0175	0.0153	0.0275		
2.5 Hz	0.0208	0.0225	0.02		
3.15 Hz	0.0179	0.0083	0.013		

Frequancy (Hz)	Vibration Point 1 (mm/s)			Limit Value (mm/s)[1]	Measurement Date
	X direction	Y direction	Z direction		
4.0 Hz	0.0066	0.0077	0.0115		
5.0 Hz	0.0104	0.0147	0.0145		
6.3 Hz	0.0039	0.0074	0.0046		
8.0 Hz	0.0042	0.0075	0.0046		
10.0 Hz	0.0106	0.0072	0.007		
12.5 Hz	0.0084	0.0149	0.0047		
16.0 Hz	0.0104	0.0131	0.0076		
20.0 Hz	0.0078	0.0136	0.0065		
25.0 Hz	0.0065	0.0154	0.0034		
31.5 Hz	0.0078	0.0173	0.0057		
40.0 Hz	0.0414	0.0428	0.0156		
50.0 Hz	0.0122	0.0135	0.0064		
63.0 Hz	0.0057	0.006	0.0065		
80.0 Hz	0.005	0.0021	0.0025		

[1] Regulation on Control of Environmental Noise

Sensitivity Assessment

After analysing the baseline data, the sensitivity assessment of noise and vibration component is given below.

Sensitivity features	Supported by	Sensitivity value
Baseline noise levels in the AoI (albeit below Project Standards) Close presence of communities, vulnerable targets and sensitive ecological receptors potentially exposed to noise and vibration emissions Other ongoing projects (under construction and planning stage) around the Project site.	Primary and secondary data	Medium

6.1.5 Geology, Geomorphology and Seismicity

Definition	Geology is a field of study that focuses on the interactions between humans and ’he Earth's geologic systems, particularly as they relate to environmental issues. It involves understanding the geological processes and features that influence the environment, such as water resources, natural hazards, soil quality, and land use. Geology also includes address and mitigate human impacts on the environment, such as pollution, climate change, and ecosystem degradation. Geomorphology is the study of the nature and history of landforms and the processes which create them. Seismicity is a measure encompassing earthquake occurrences, mechanisms, and magnitude at a given geographical location.
Area of Influence	Project Footprint
Rationale for the AoI	**Rationale:** Within the scope of the Project, since the areas where the Project units are located are likely to be affected by the geological structure, the areas where the Project Site are located were selected as AoI.
Data Sources	**Primary Sources** ■ Data and Geotechnical Report for Viranşehir SPP (September 2022)
	Secondary Sources: Academic Journals, Grey Literature and Government Agency Reports & Databases. National EIA Report dated January 2023

6.1.5.1 Geomorphology and Geology

The geomorphologic characteristics around the Project Area are dominated by the effects of the Karacadağ volcanics. The elevation difference between the summit of Karacadağ and Viranşehir district centre is around 1300 meters. There is an almost imperceptible slope from Karacadağ, which was formed as a result of volcanism, towards Viranşehir[1].

Although the topography is undulated in some places, it can be said that the elevation generally increases from south to north. Towards the south of Viranşehir district centre, the basalt-dominant topography is replaced by a calcareous topography where karstic structures can be observed. This area covers an area from Siverek-Viranşehir Plateau to Ceylanpınar Plain in the south and consists of fertile soil[2].

Viranşehir morphologically consists of three units: The Karacadağ volcano forming the mountainous area in the north, the Siverek-Viranşehir Plateau between the Şanlıurfa-Viranşehir highway to the south of Karacadağ, and the slightly undulating plain area between the Ceylanpınar Plain in the south and the Siverek-Viranşehir Plateau (Benek, 2009, p. 35). Viranşehir is located on an undulating plain covered with basalt deposits. The area where the city is located has almost no slope. The maximum slope of 10-15% is seen on the slopes of the Cırcıp (Duali) stream to the west of the city[2].

[1] Filiz, A. (2019). Viranşehir in terms of its Urban Functions (MSc Thesis). Şanlıurfa: Harran University.

[2] Filiz, A. (2019). Viranşehir in terms of its Urban Functions (MSc Thesis). Şanlıurfa: Harran University.

6.1.5.1.1 Stratigraphy

The units surfaced in and around Şanlıurfa can be classified into five (5) groups. Their ages are between the Eocene and Quaternary.

Gaziantep Formation

The unit consists of clayey limestone and chalk. The Formation's typical outcrops are observed and described in Gaziantep Province. This formation, which consists of clayey limestone, chalky limestone and limestone, is observed as clayey limestone and chalky limestone showing soft topography. In some places, thick-bedded limestones are seen instead of these clayey and chalky limestones. The clayey limestones are whitish, grey, cream, dirty yellow; loose; thin- to medium-bedded and sometimes marl interbedded with very little chert and chalky levels.

Gaziantep Formation shows lateral and vertical facies changes. As it moves from south to north, the depositional environment changes from a deep-water environment to a turbulent shallow water environment.

The unit is Upper Eocene - Lower Oligocene aged.

Fırat (Euphrates) Formation

The Euphrates Formation is frequently observed especially along the highway routes from Gaziantep to Kahramanmaraş, Yavuzeli, Şanlıurfa and Kilis.

The unit consists of reef limestones in places. The formation starts at the bottom with cream, whitish, dirty yellow, medium-thickly stratified and sometimes unstratified limestone, which is overlain by dirty yellow, medium-thickly stratified limestone with abundant chert punch and abundant fossil inclusions. The uppermost part consists of whitish, cream and dirty yellow coloured, thick-very thick-bedded bioclastic limestones with few chert nodules, abundant echinites, ostrea, gastropods and lamellae. The limestones are generally fractured, and the fractures are filled with calcite. The limestones forming the formation are observed with the same characteristics everywhere without showing lateral and vertical facies change.

Fırat Formation was deposited in the Lower Oligocene - Lower Miocene ages.

Şelmo Formation

Upper-Miocene aged terrestrial Şelom formation, which presents a thick stack within the Akçakale Graben, consists of pink-red sandstones, gravelstones and lacustrine limestones.

Karacadağ Volcanics

The volcanites, consisting of basaltic lavas and pyroclastic rocks, spread over a wide area between Diyarbakır and Şanlıurfa provinces in Southeastern Anatolia, are anonymously defined as Karacadağ volcanites due to the region where the largest volcano cone of the region is located[3]. Karacadağ volcanites are divided into three groups from bottom to top according to their main activity periods: Siverek Group, Karacadağ Group and Ovabağ Group[4].

Siverek Group is composed of first-stage volcanites; Kördis basalt, Çiftağaç basalt, Çavuşlu basalt, Alitaşıtepe basalt, Çelebi basalt, Barzadağı basalt and Gökçetaş pyroclastic.

Karacadağ Group formed by second stage volcanites; Kuşdoğan basalt, Seyran basalt, Hırkapınar basalt, İnanözü basalt, Karabahçe basalt, Çelkanyayla basalt and Mergimir pyroclastic.

[3] Moses, H. F. (1934). Geological Deport of the Mardin-Cizre Region in the Eastern Part of Türkiye. Ankara: MTA.

[4] Ercan, T., Şaroğlu, F., Turhan, N., Matsuda, J., Fujitani, T., Notsu, K., . . . Güler, H. (1991). Geology and Petrology of the Karacadağ Volcanites. Geological Congress Bulletin (s. 118-133). Ankara: MTA.

The Ovabağ Group, formed by the third-stage volcanites, is defined as Hama basalt, Leblebitaşı basalt, Görgü basalt and Kırmızıtepe pyroclastic.

Karacadağ volcanites have a thickness of approximately 2000 meters. The unit was formed as a result of volcanic activity starting in the Upper Miocene and continuing until the Quaternary period.

Siverek Group basalts can be seen in the Project Area. These basalts, which are the product of an impactogenic rifting, are mainly alkaline, rarely tholeiitic and completely olivine basalt. This formation has around 500 m of thickness.

Alluvium (Qal)

The Quaternary Alluvium are generally found in old riverbeds and on plains surrounded by high hills. These surface deposits consisting of unconsolidated gravel, sand and mud are used for agriculture or as sand and gravel deposits.

According to the 1/500,000 scale geological map, the study area consists of Pliocene-aged Siverek Basalts. The 1/500,000 scale geological map showing the project area and its vicinity is given in Figure 6-13.

A Geotechnical Report for the Project was prepared in September 2022. To determine the properties of the subsurface soils, 18 boreholes were drilled to a depth of 7 m. RQD values indicate that most of the rock units are Very Weak to Weak in strength. Medium to good-quality rocks were encountered in places. Uniaxial strength tests show that rocks are mostly very low strength. The local soil class is ZB (poorly weathered, moderately consolidated rocks).

Structural Geology and Tectonism

The African Plate has been constantly moving northwards due to the mobility of the divergent plate boundaries on the surrounding mid-ocean ridges. Due to the Red Sea Rift, the Arabian Plate moved even faster and shifted northwards. As a result of the north-south convergence of the African-Arabian and Eurasian plates, the Tethys Sea, which is considered to be the ancient ancestor of the Mediterranean Sea, was closed in the Lower-Middle Maastrichtian, followed by the collision of the Arabian and Eurasian plates along the Bitlis-Zagros Fold and Thrust Belt (BZKK) or the South-eastern Anatolian Thrust in the Tortonian (about 10 million years ago)[5]. From this period until the Pliocene (2-5 million years ago), north-south compressions were met by naps and folds with axis orientations approximately east-west and parallel to the BZKK.

In the Late Pliocene, these stresses could not be met by thrust faults and folds and lateral thrust faults became dominant[6]. Meanwhile, the North Anatolian Fault Zone (NAFZ) and the East Anatolian Fault Zone (EAFZ) formed, and the Anatolian Block started moving westwards along these fault zones. During this movement, a right-lateral strike along the NAFZ and a left-lateral strike along the EAFZ occurred in accordance with strike-slip fault modelling.

The tectonic features of Şanlıurfa and its vicinity reflect the tectonic features of the South-eastern Anatolia Region in general. The folds observed in the region developed in two phases: The first folding event in the region occurred in the Paleocene, whereas the second most important folding event in the region was in the Middle-Late Miocene as a result of the collision of the Arabian and Anatolian plates. As a result of this folding, the older units and the overlying younger units were folded together, and the present folded topography of the region was formed.

[5] Şengör, A. M. C., 1980. Fundamentals of the Turkish Neotectonism, TJK.

[6] Herece, E., Akay, E., 1992. East Anatolian Fault between Karlıova and Çelikhan, Türkiye 9th Petroleum Congress, 361-372.

While overthrust and thrust faults formed a thrust belt in the north of the region with the effect of the Miocene and later compressional tectonics, grabens developed in the south with the effect of tensional tectonics[7]. In the region, the Bozova fault system formed by Bozova, Samsat and Kalecik faults in the north of Şanlıurfa developed as a right-directional strike-slip fault system, while N-S oriented grabens and N-S oriented Karacadağ volcanism opening cracks were formed in the south. In the north of the study area, the Akçakale graben system was formed by numerous NW-SE oriented right-lateral strike-slip faults parallel to the Bozova fault system in the Late Miocene and later ages. As a result of the NE-SW tectonism active during the Oligocene, the Bozova fault with a thrust character developed. Later, during the Late Miocene-Early Pliocene, the Bozova fault moved as a right-lateral strike-slip fault. It is a shear zone between the compressional and extensional systems in the South-eastern Anatolia region between the Öludeniz Rift, the northward movement of the Arabian plate, the Eastern Anatolian Fault (EAF), and the Bitlis-Zagros Fold and Thrust Belt in the neotectonics period.

Although the Bozova fault is the closest fault, approximately 3 km away, according to the 1/500.000 scale geological map (Diyarbakır sheet) prepared by the General Directorate of Mineral Research and Exploration (MTA), it is uncertain whether this fault is active or not. According to the 2012 dated Active Faults Map prepared by the same organization, the nearest fault is the Karacadağ Fault, which is approximately 34 km away.

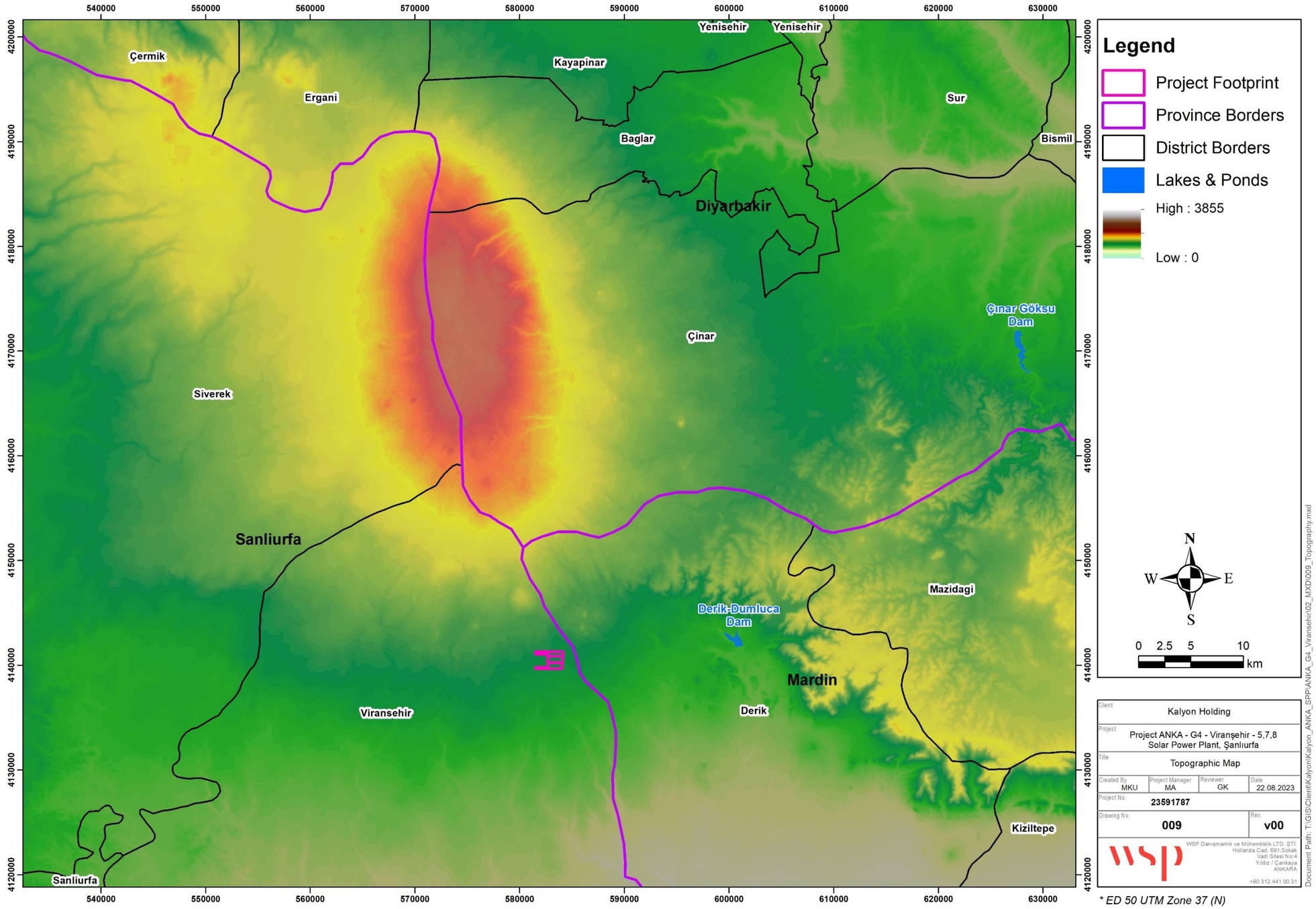
Topographic Map, Geological Map and Fault Map showing the Project Site and its surroundings are given in Figure 6-12, Figure 6-13, Figure 6-14 respectively.

6.1.5.2 Seismicity

The Earthquake Zone Map of Türkiye which came into force in 1996 has been updated as Türkiye Earthquake Hazard Map by the Disaster & Emergency Management Authority, Presidential of Earthquake Department and published in the Official Gazette numbered 30364 and dated March 18, 2018.

Figure 6-15 shows the Project Site on Türkiye Earthquake Hazard Map developed by the Disaster and Emergency Management Authority (AFAD, 2018). According to this map considering the latest earthquake source parameters, earthquake catalogues and new generation mathematical models, the 475-year return period Peak Ground Acceleration (PGA) was calculated as 0.094 g.

[7] Tardu, T., Başkurt, T., Güven, A., Us, E., Dinçer, A., Tuna, M. E., & Tezcan, O. Ş. (1987). Structural-Stratigraphic Features of Akçakale Graben and its Petrolueum Potential. 7th Petroleum Congress Proceedings, (s. 36-49).



* *ED 50 UTM Zone 37 (N)*

Figure 6-12: Topographic Map Showing the Project Area and its Vicinity

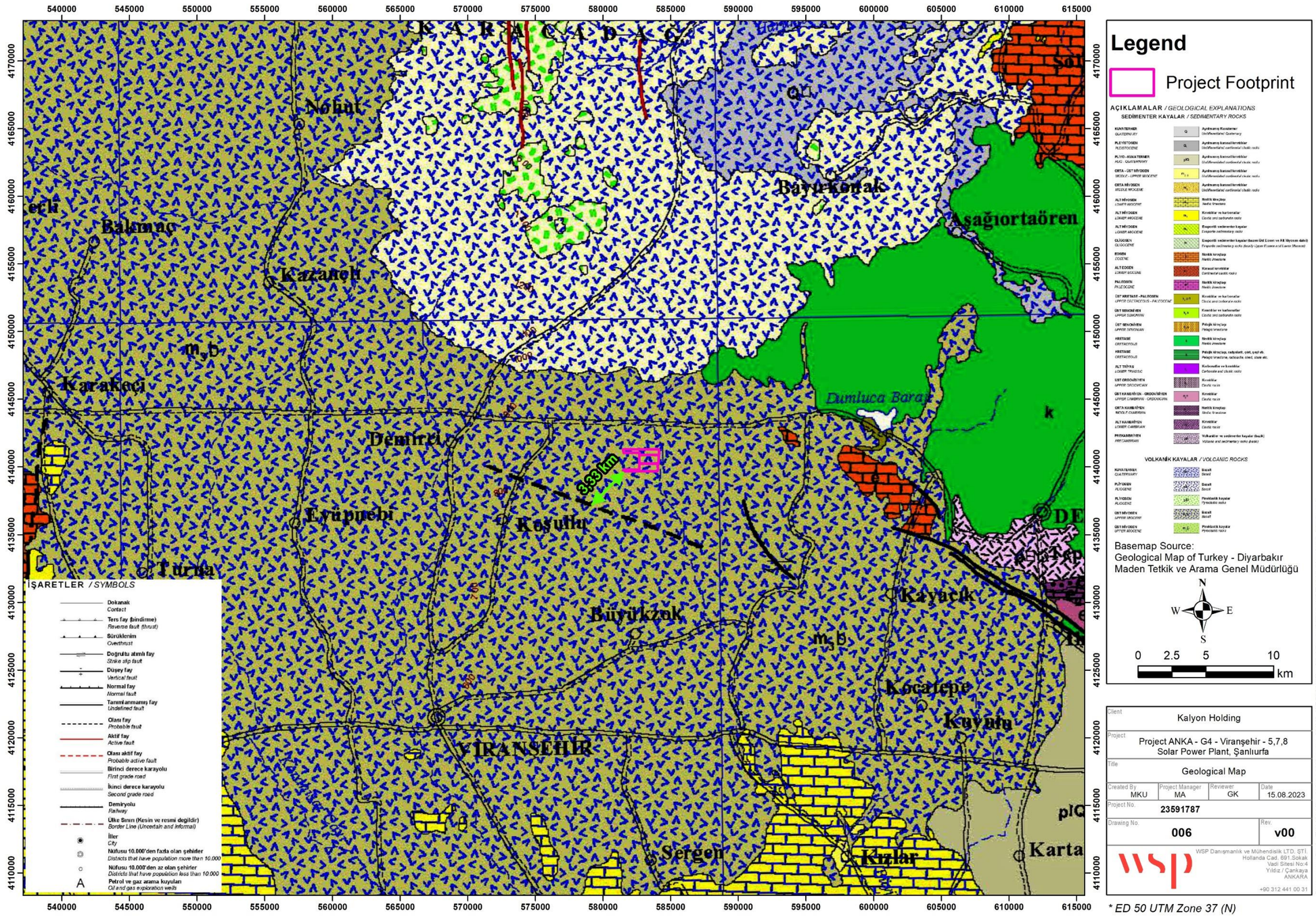


Figure 6-13: 1/25,000 Scale Geological Map of the Regional Study Area (Source: Diyarbakır Sheet, MTA)

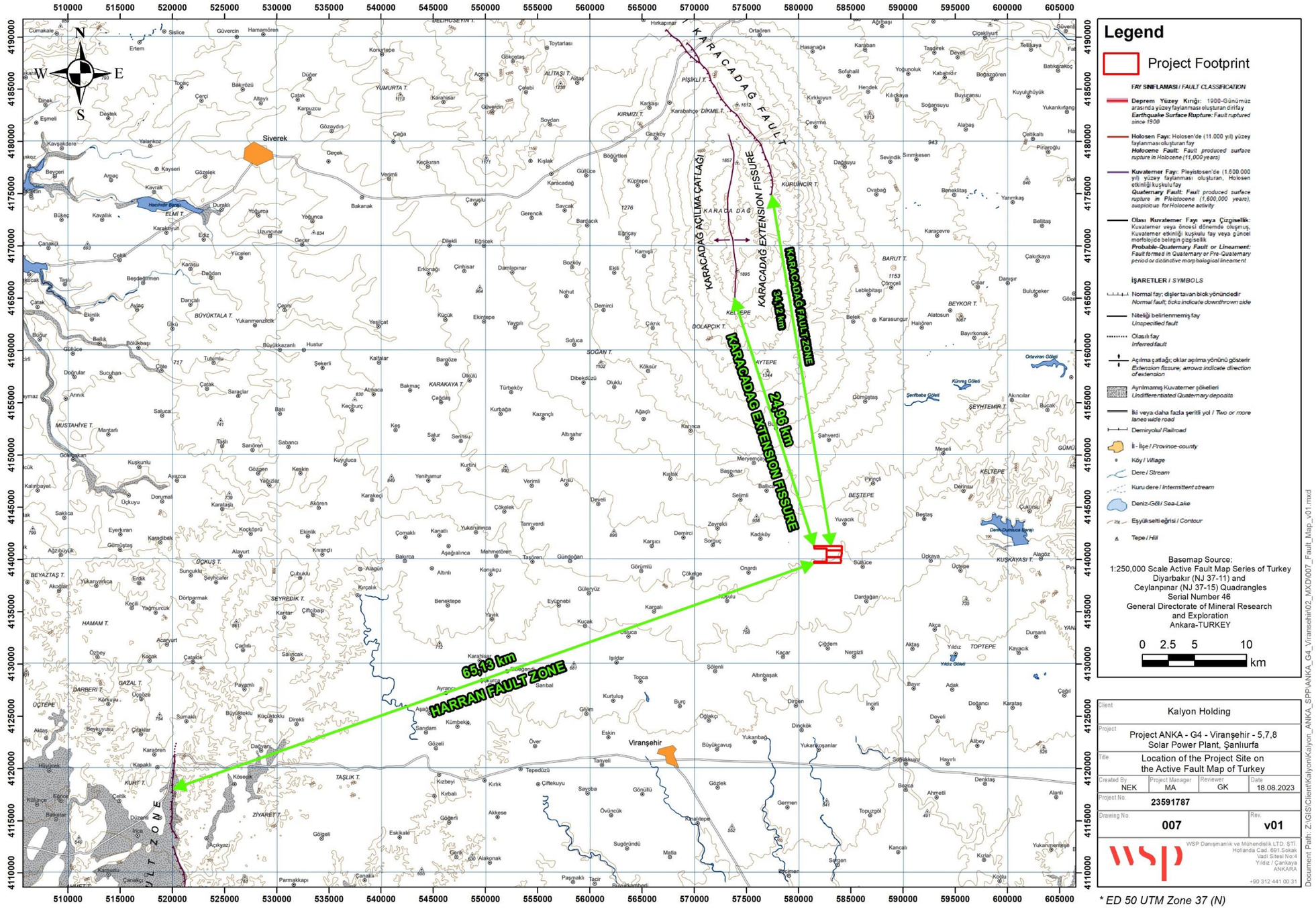
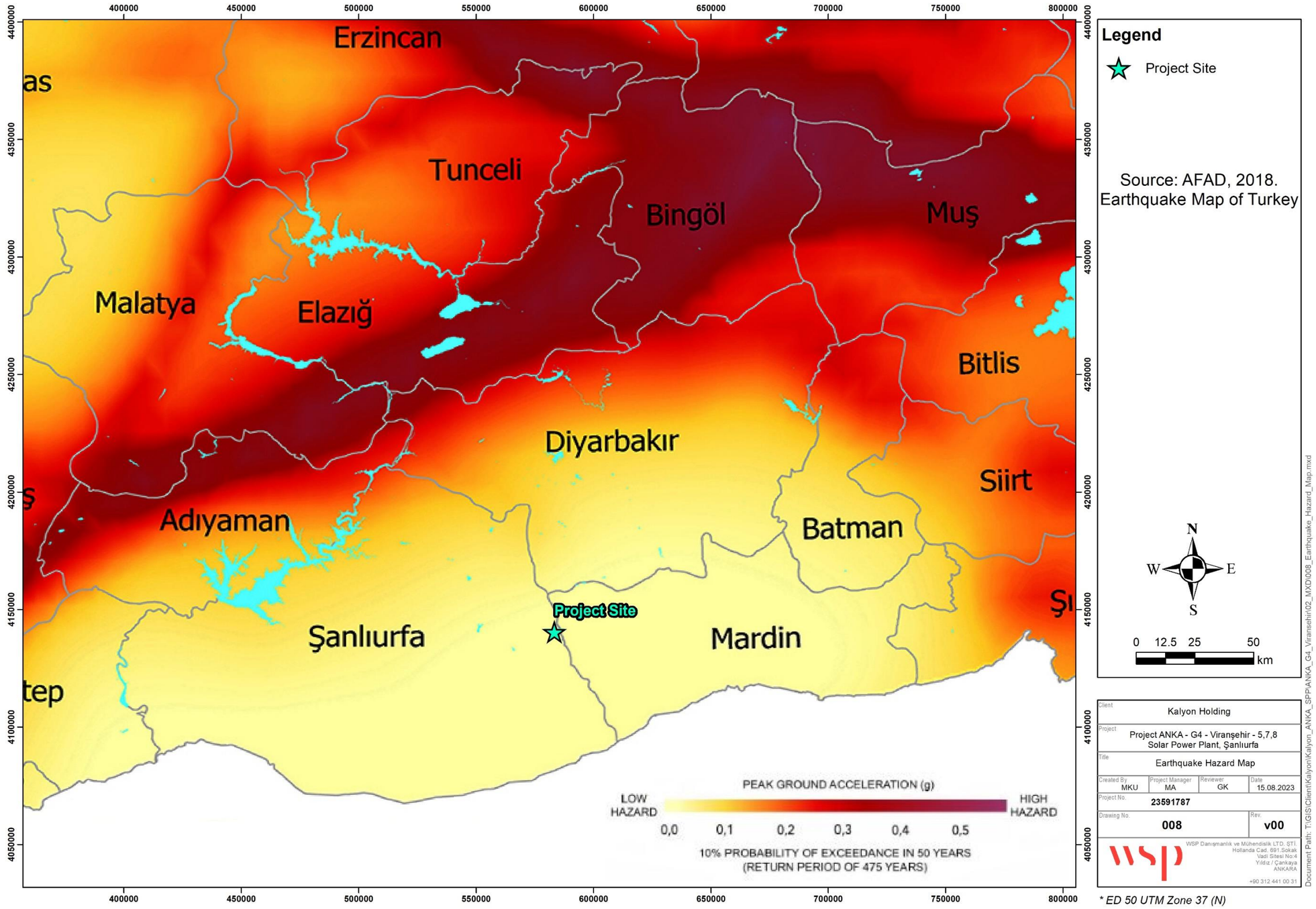


Figure 6-14: 1/250,000 Scale Active Fault Map of the Regional Study Area (Source: Diyarbakır-Viranşehir Sheets, MTA)



** ED 50 UTM Zone 37 (N)*

Figure 6-15: Location of the Project Site on the Earthquake Hazard Map

Sensitivity Assessment

Sensitivity Features	Supported by	Sensitivity Value
Geology, Geomorphology and Seismicity	Primary Data and Secondary Data	Low

6.1.6 Soil and Subsoil

Definition	Soil is a mixture of organic and inorganic materials on the surface of the Earth that provides a medium for plant growth and is composed of minerals, organic matter, water, air, and living organisms. In this section, the characteristics of the existing soil layer at the project location, such as its properties, purposes of use, and contamination status are examined.
Area of Influence	Project Footprint (Figure 5-1)
Rationale for the AoI	**Rationale:** Since the impact of the project on the soil layer during the Project will be limited to the units mentioned in the project, the Project site have been determined as AoI.
Data sources	**Primary Sources**: Baseline soil sampling study data conducted in April 2023
	Secondary Sources: Secondary data from various surveys for the Project, scientific papers, literature review and databases.

Regional Study Area

The large soil group in the region in which the Project Area is located is classified as Bazaltic Soils (see Figure 6-16). Basaltic Soils are heavy clay, dark colored soils and their profiles are not well developed. Lime is mostly not found in these soils. The soil reaction ranges from neutral to moderately alkaline. Soils are relatively poor in organic matter. Because of their poor physical properties, their productivity is often low.

Within the scope of the CORINE project, prepared and put into use by the Ministry of Agriculture and Forestry, according to CORINE 2018, the Project area is located on Sparse Plant Areas. The CORINE 2018 data around the Project area is given in Table 6-20 and The AoI in terms of CORINE 2018 land cover data includes the following;

Table 6-20: CORINE 2018 Land Cover

CODE	NAMES	Area (ha)	% Area Related to Viransehir
321	Natural grasslands	75,21	27,59
333	Sparsely vegetated areas	197,43	72,41

The Project area and its immediate surroundings are in C class hydrological soil group in terms of hydrological soil groups. The minimum infiltration degree of the C class hydrological soil group is 0.8-3 mm/h, and when they are completely wet, they have soil properties with less than moderate infiltration rate and permeability and a very significant clay content.

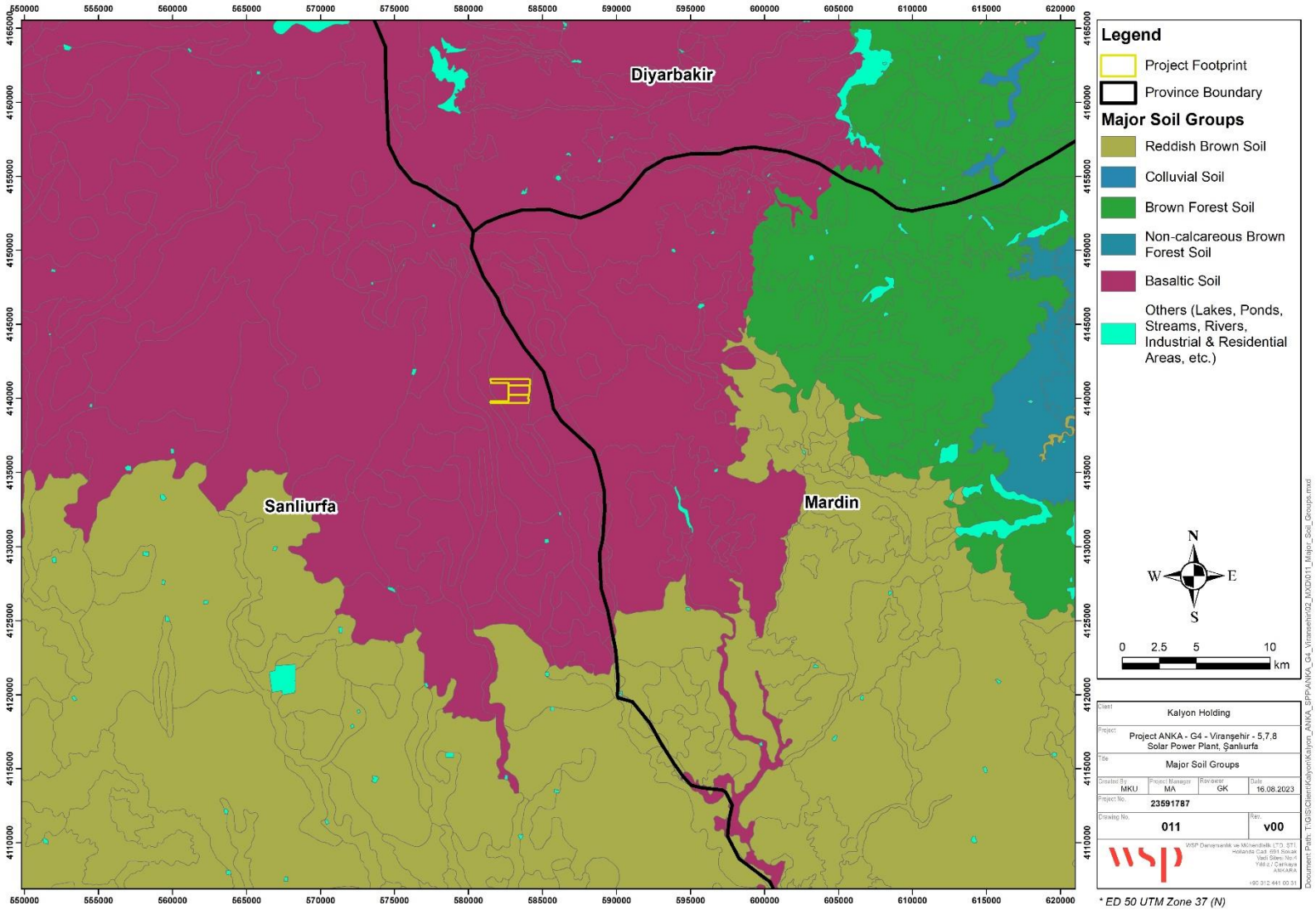


Figure 6-16: Map showing Major Soil Groups around the Project Area

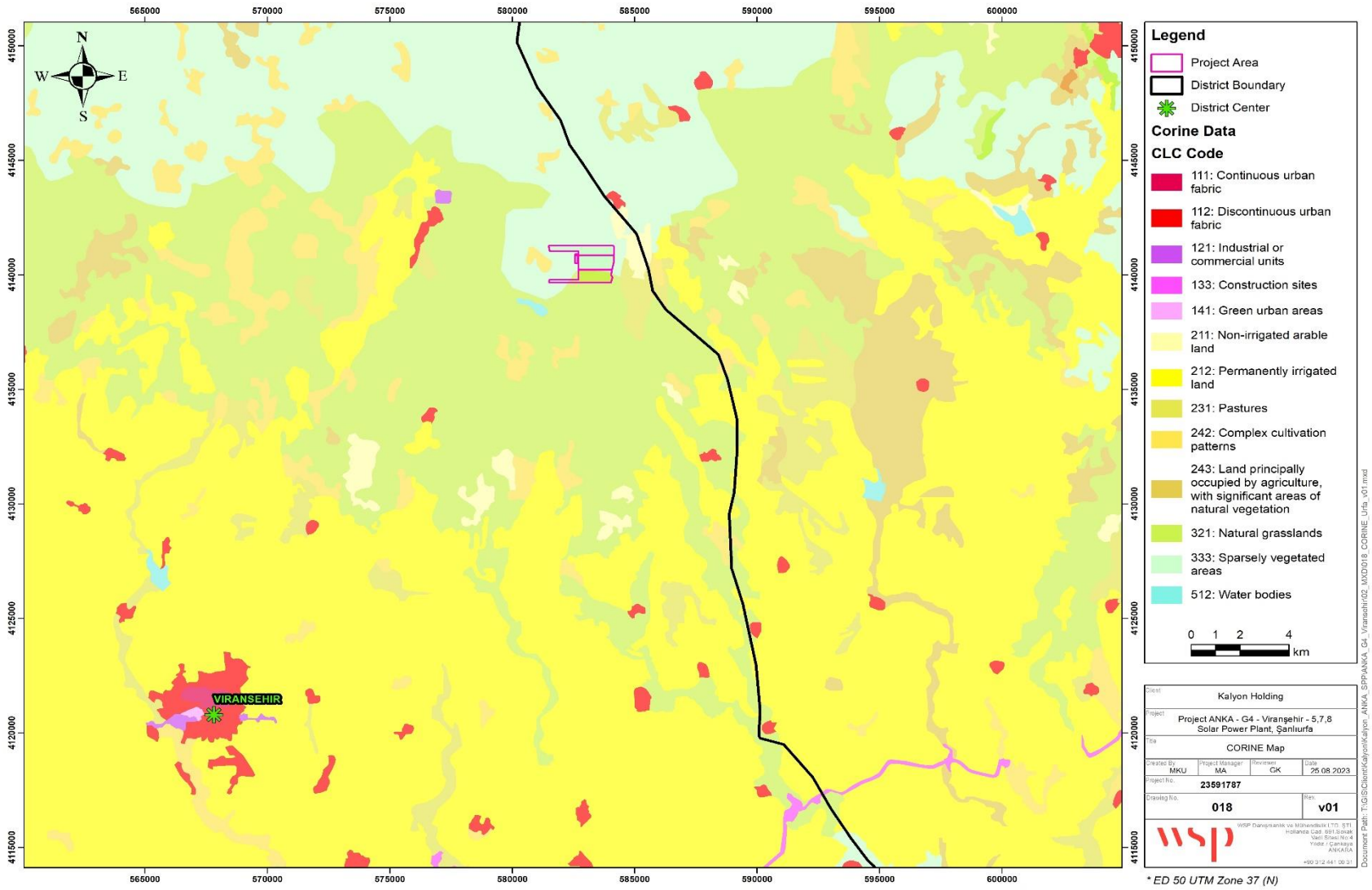


Figure 6-17: CORINE 2018 Land Cover

Area of Influence

The “Soil Pollution Control and Sites Polluted by Point Source Contamination Regulation” was published on June 8. 2010 (Official Gazette: 27605) and was fully implemented on June 8. 2015. In accordance with the new regulation, it is obligatory to prevent pollution, stop pollution release in the polluted areas and determine the extent of pollution.

The soil concentrations measured for the purposes of this study were compared to the generic limit values mentioned in the Annex I of the Regulation.

Annex I of the updated regulation contains different generic limit values dependent on the exposure routes (pathways):

- Generic Limit Value-1: Soil ingestion and absorption through skin contact,
- Generic Limit Value-2: Inhalation of volatile matter in external environment,
- Generic Limit Value-3: Inhalation of fugitive dust in the external environment, and
- Generic Limit Value-4: Transport of pollutants into groundwater and drinking of groundwater (Safety Factor (SF) = 1 or 10).

The Generic Limit Value-1 and Generic Limit Value-3 are used for the surface/shallow soil samples and Generic Limit Value-2 and Generic Limit Value-4 are used for sub-soil samples.

In order to determine the existing soil contamination and quality of the Project Site, 10 soil samples were taken in April 2023 (see Table 6-21). Based on the current and future activities of the site, the parameters presented in Table 6-22 should be analysed in soil and samples as required by the Turkish Soil Pollution Control and Sites Polluted by Point Source Contamination Regulation.

Table 6-21: Baseline Soil Sampling Coordinates and Periods

Points	Coordinates		Measurement Period and Date
	East	North	
Soil -1	37.403865	39.920697	07.04.2023
Soil -2	37.406674	39.921380	
Soil -3	32.414591	39.952641	
Soil -4	37.405538	39.957917	
Soil -5	37.411279	39.942148	
Soil -6	37.400741	39.942587	
Soil -7	37.396728	39.941371	
Soil -8	37.396943	39.924732	
Soil -9	37.399260	39.925250	
Soil -10	37.412104	39.924653	

Table 6-22: Parameters to be Analysed According to the Turkish Soil Pollution Control and Sites Polluted by Point Source Contamination Regulation

NACE Code	Industrial Activity	Activity Based Contaminant Indicator Parameters
40.1	Electricity generation, transmission, and distribution	TOX, TPH, As, B, Ba, Cd, Cr, Cu, Hg, Mo, Pb, Sb, Se, Zn

Source: Soil Pollution Control and Sites Polluted by Point Source Contamination Regulation

Baseline data on Project site are complete for the purpose of a preliminary and general assessment on the soil quality. The analytical results were compared to the generic limit values mentioned in the Annex I of the Turkish Soil Pollution Control and Sites Polluted by Point Source Contamination Regulation.

Soil sampling locations are shown in Figure 6-18 and the measurement results of the parameters are presented in following tables.

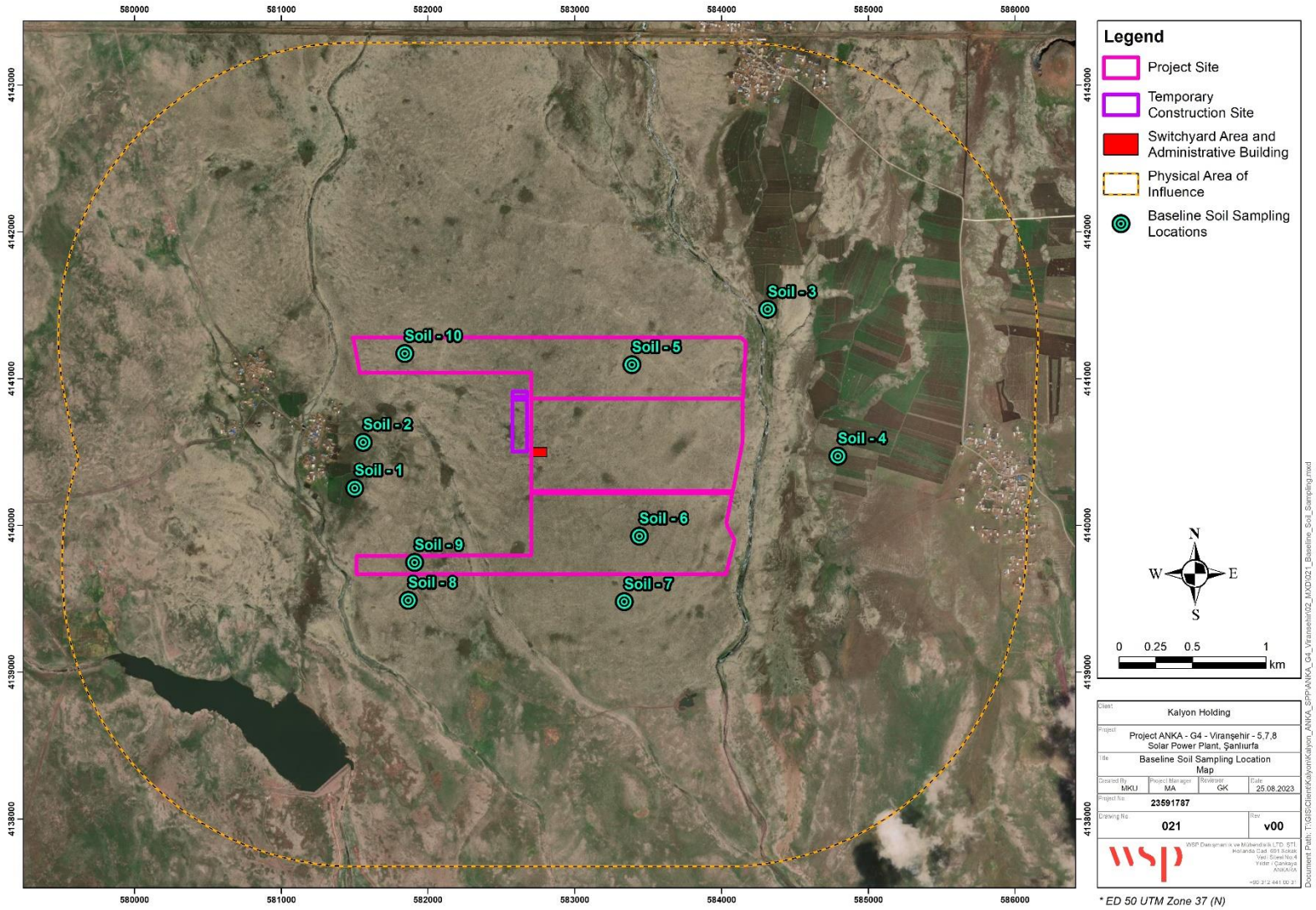


Figure 6-18: Map Showing Baseline Soil Sampling Points

Table 6-23: Baseline Soil Analyses Results

Parameters	Unit	Limit Value (National Legislation)		Soil-1	Soil-2	Soil-3	Soil-4	Soil-5	Soil-6	Soil-7	Soil-8	Soil-9	Soil-10
		Control of Soil Pollution and Point Source Regulation on Contaminated Areas											
		Ingestion of soil or dermal contact (mg/kg oven dry soil)	Outdoor inhalation of fugitive dust (mg/kg dry soil)										
TOx	mg/kg	**-**	**-**	22.64	<20	<20	<20	<20	<20	<20	38.1	29.71	<20
TPH (Aliphatic) (C6-C8)	mg/kg	**4,693**	**-**	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
TPH (Aliphatic) (C8>-C16)	mg/kg	**7,821**	**-**	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6
TPH (Aliphatic) (C16>-C35)	mg/kg	**156,429**	**-**	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2	<2.2
TPH (Aromatic) (C6-C9)	mg/kg	**15,643**	**-**	<1.4	<1.4	<1.4	<1.4	<1.4	<1.4	<1.4	<1.4	<1.4	<1.4
TPH (Aromatic) (C9>-C16)	mg/kg	**1,564**	**-**	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
TPH (Aromatic) (C16>-C35)	mg/kg	**2,346**	**-**	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6
TPH (Aliphatic-Aromatic)	mg/kg	**-**	**-**	<9.2	<9.2	<9.2	<9.2	<9.2	<9.2	<9.2	<9.2	<9.2	<9.2

Parameters	Unit	Limit Value (National Legislation)		Soil-1	Soil-2	Soil-3	Soil-4	Soil-5	Soil-6	Soil-7	Soil-8	Soil-9	Soil-10
		Control of Soil Pollution and Point Source Regulation on Contaminated Areas											
		Ingestion of soil or dermal contact (mg/kg oven dry soil)	Outdoor inhalation of fugitive dust (mg/kg dry soil)										
Arsenic	mg/kg	**0.4**	**471**	3.38	2.63	<1.25	1.77	<1.25	<1.25	<1.25	<1.25	1.33	1.92
Boron	mg/kg	**-**	**-**	44.2	45.6	52	50.8	44.3	54.8	54	55.5	51.3	71.7
Barium	mg/kg	**15,643**	**433,702**	199	209	188	226	114	106	188	196	192	291
Cadmium	mg/kg	**70**	**1,124**	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Chromium	mg/kg	**235**	**24**	116	106	86.4	99.8	79.5	121	112	151	146	251
Copper	mg/kg	**3,129**	**-**	23.2	20.8	16.7	23.5	29.3	38.4	27.8	27.2	29.4	46.4
Mercury	mg/kg	**23**	**-**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0,5
Molybdenum	mg/kg	**391**	**-**	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Lead	mg/kg	**400**	**-**	12.8	11.7	7.17	13.4	8.03	6.21	8.79	11.8	12.3	21.1

Parameters	Unit	Limit Value (National Legislation)		Soil-1	Soil-2	Soil-3	Soil-4	Soil-5	Soil-6	Soil-7	Soil-8	Soil-9	Soil-10
		Control of Soil Pollution and Point Source Regulation on Contaminated Areas											
		Ingestion of soil or dermal contact (mg/kg oven dry soil)	Outdoor inhalation of fugitive dust (mg/kg dry soil)										
Antimony	mg/kg	**31**	**-**	2.3	2.08	2.15	2	2.39	2.88	2.51	2.22	2.97	3.98
Selenium	mg/kg	**391**	**-**	<1.25	<1.25	<1.25	<1.25	<1.25	<1.25	<1.25	<1.25	<1.25	<1.25
Zinc	mg/kg	**23,464**	**-**	72.5	65.4	56.7	65.5	62.7	73.6	63.8	70.1	76.5	121

According to the regulation; when calculating the limit values given above, it is assumed that the site is used for residential purposes or will be used for residential purposes in the future and people will be exposed to the pollutant at “maximum level for a reasonable period of time”. The reason for assuming that the site will be used for residential purposes now or in the future is that the generic values given above will be more protective in terms of health risk compared to other scenarios (e.g., business center, industrial purpose, etc.). (EPA, 1996a). One of the important reasons for using the pathways selected above is that in scenarios where land use for residential purposes is valid, pollutants will generally reach the receivers via these pathways. Another reason is that the methods, models, and assumptions to be used in the calculation of generic values for these pathways have been developed in a way that can be considered quite standard (EPA, 1996b). For each of these pathways, generic limit values have been determined that the pollutant will not pose a health risk to the recipient. Generic limit values are quite low as they are calculated assuming the worst possible case.

It should be noted that there is no database on contaminated sites or potential sources of contamination in Türkiye. While selecting the sampling locations, the approach was adopted that the pollution potential caused by the Project will be highest in areas where construction activities will be active. For this reason, it was aimed to have baseline data in these areas.

Most of the concentrations of the parameters were detected at the most soil sampling locations, however these concentrations were below limits. The concentration of the parameters exceeding the laboratory detection limits were below the limit values as seen in Table 6-2 above. The soil results showed that there is no serious hydrocarbon or heavy metal contamination for soil around the sampling locations and it can be showed that there was no leachability of any hydrocarbon concentrations into the sub-soil. No historical soil contamination investigation was available at the Project Area. During construction and operational activities, in case contamination is suspected, a sample should be collected for laboratory analysis. If contamination is put in evidence through laboratory analyses, care must be taken during handling and disposal of the detected contaminated soil, in accordance with the Health & Safety and Environmental regulations. The detailed information of the impact assessment for soil is presented in Chapter 7.

Sensitivity Assessment

Sensitivity features	Supported by	Sensitivity value
Soil contamination	Primary data and secondary data	Low-Medium

6.1.7 Hydrology and Surface Water

Definition	Hydrology is the scientific study of the movement, distribution, and management of water on Earth and other planets, including the water cycle, water resources, and environmental watershed sustainability. Hydrology subdivides into surface water hydrology, groundwater hydrology (hydrogeology), and marine hydrology. Domains of hydrology include hydrometeorology, surface hydrology, hydrogeology, drainage-basin management, and water quality, where water plays the central role.
Area of Influence	**AoI:** AoI includes the Project footprint
Rationale for the AoI	**Rationale:** AoI was defined considering the boundaries of the Project Site
Data Sources	**Primary Sources**: Primary Data from groundwater sampling conducted in April 2023.
	Secondary Sources: Secondary Data from National EIA, Academic Journals, Grey Literature and Government Agency Reports & Databases.

The Project Area and its vicinity are located within the Euphrates-Tigris Basin, which is a large river system in Western Asia that discharges into the Persian Gulf. Its principal rivers are the Tigris and Euphrates, along with smaller tributaries. The Euphrates River is the longest river in Western Asia. The river has three riparian countries, Iraq, Syria and Türkiye, and its basin is distributed among five countries with a total estimated population of 23 million (Figure 6-19). Most of the Euphrates stream-flow originates from precipitation in the Armenian Highlands; contributions by the remaining riparian countries are generally small. In addition to some intermittent streams, the Sajur, Balikh and Khabour are the main contributors to Euphrates flow in Syria. Water use in the Euphrates Basin in Iraq, Syria and Türkiye focuses on irrigation, hydropower and drinking water supply, with agriculture consuming the largest share of water (more than 70%)[8].

Additionally, the part of the Euphrates-Tigris basin in Türkiye is one of the 25 major basins of Türkiye determined by the State Hydraulic Works (SHW) considering geographical components including geographical location, climate, and stream network. Euphrates Subbasin is between 40°20'26'' and 43°48'10'' north latitudes and 36°39'17'' and 36°46'36'' east longitudes in South-eastern Anatolia. Its surface area is 122,010 square kilometres, which is approximately 16% of Türkiye. The basin is surrounded by Syria in the south and the Asi (Orontes), Ceyhan (Pyramus), Seyhan (Sarus), Kızılırmak (Halys), Yeşilırmak, Çoruh, Aras (Araks), Lake Van and Tigris Basins from its southwestern border (clockwise) [9].

The most important stream in this basin is the Euphrates Stream, which is the river with the highest water potential in Türkiye. It was formed by the merging of the Murat River, which originated from springs discharging at Diyadin, Ağrı, and Karasu River, which originated from springs discharging at Dumludağ, Erzurum. After passing through Erzincan, Tunceli, Elazığ, Malatya, Diyarbakır, Adıyaman and Gaziantep, it enters Syria, then Iraq. Euphrates merges with Tigris at the Shatt al-Arab, ultimately emptying into the Persian Gulf. The most

[8] UN-ESCWA and BGR (United Nations Economic and Social Commission for Western Asia; Bundesanstalt für Geowissenschaften und Rohstoffe). 2013. Inventory of Shared Water Resources in Western Asia. Beirut.

[9] General Directorate of Water Management (2022). Flood Management Plan of Euphrates-Tigris Basin, Euphrates Subbasin. Ankara: Republic of Türkiye Ministry of Agriculture and Forestry, General Directorate of Water Management.

significant tributaries of the Euphrates are the Murat River, Karasu River, Tohma Creek, Peri Creek, Çaltı Creek and Munzur Creek.

According to the national EIA Report of the Project, there are both seasonal and perennial streams around the Project Area and its vicinity[10]. The nearest water source is the perennial Cırcıp (Duali) Creek, which is 0.13 km east of the Project Area. Although Cırcıp (Duali) Stream is the largest stream in Viranşehir, a significant part of the city's water needs are met by groundwater as its flow rate is far from meeting the water needs of the city. Also there is an unnamed creek is on the west side of the project area.

The location map of both basins and surface water bodies is in Figure 6-20.

6.1.7.1 Baseline Surface Water Quality

A comprehensive monitoring and sampling program was conducted at eleven (11) surface water sampling locations within the Project Area and its vicinity to assess the baseline water quality (Figure 6-20). Monitored parameters were compared with surface water quality standards. Laboratory analyses were conducted by TÜRKAK accredited SEGAL Laboratory. All measurements and samples were collected by trained personnel who completed the Water and Wastewater Sampling Training organized by the Ministry of Environment, Urbanization, and Climate Change.

In order to assess the quality of surface water, only surface water quality criteria are considered, since surface water is not used for drinking. For this reason, as well as in-situ parameters such as electrical conductance, Dissolved Oxygen, pH, the parameters stated in “Surface Water Quality Regulation” (SWQR), Official Gazette No. 28483, Dated 30/11/2012 (Amended: OG-01/02/2023-32091) Annex 5 Table 2 were monitored.

[10] EIA Report of the G4-Viranşehir-1-1 Solar Power Plant (65 MWp/65 MWe, 49.98 ha) Project, Gaziantep Province, Şahinbey District, Kürüm Neighbourhood.

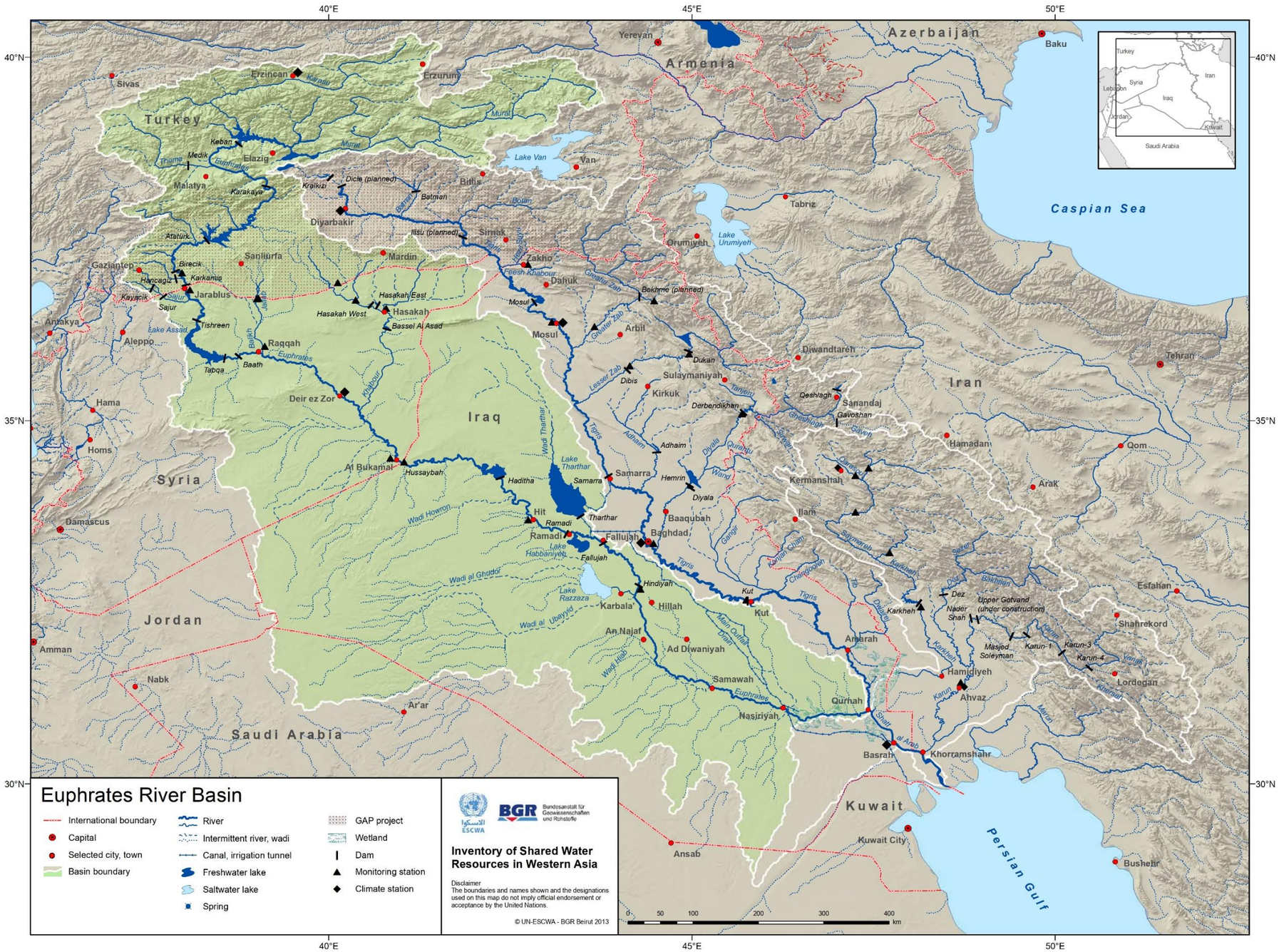
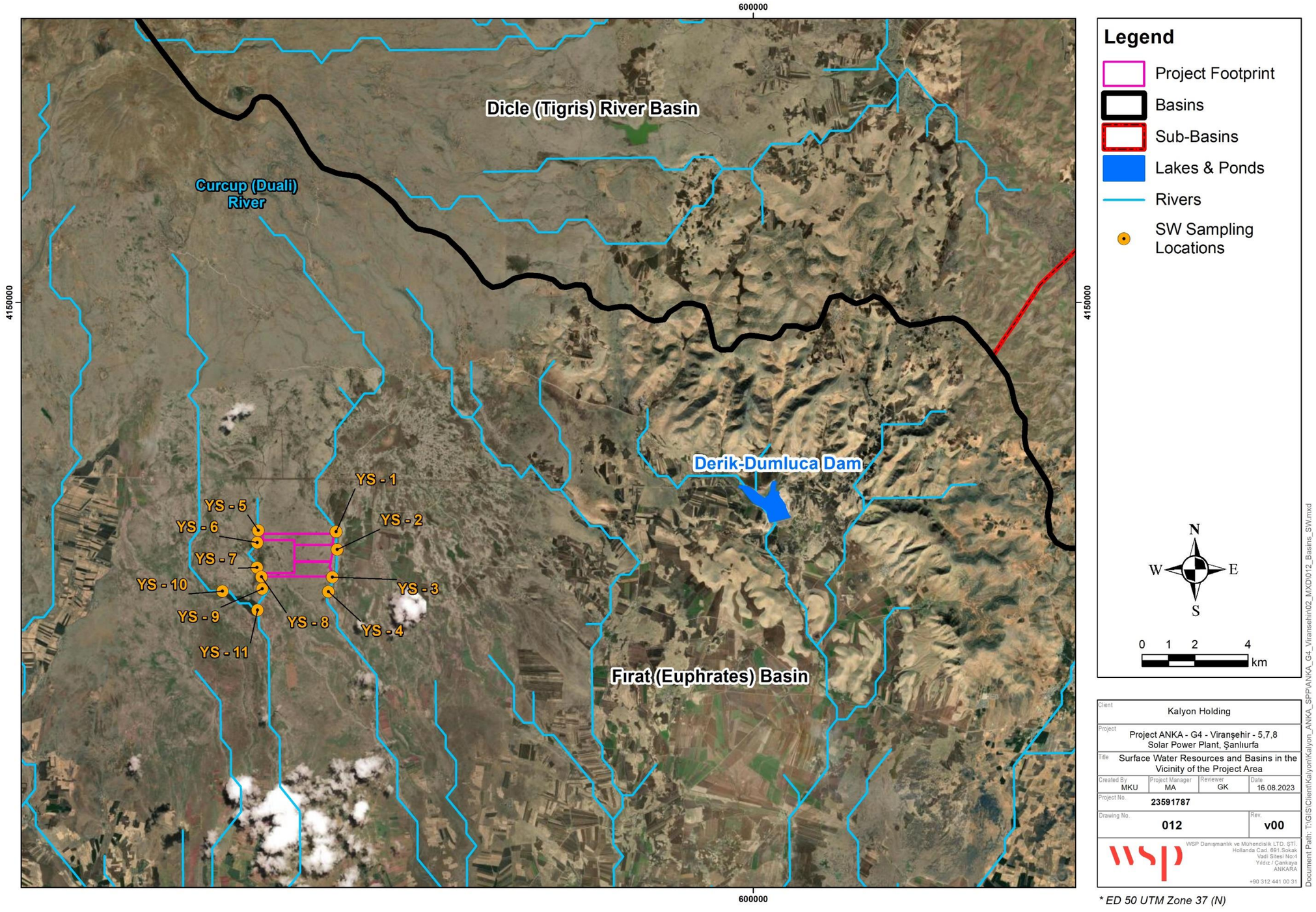


Figure 6-19: Euphrates River Basin[11]

[11] UN-ESCWA and BGR (United Nations Economic and Social Commission for Western Asia; Bundesanstalt für Geowissenschaften und Rohstoffe). 2013. Inventory of Shared Water Resources in Western Asia. Beirut.



* *ED 50 UTM Zone 37 (N)*

Figure 6-20: The Most Significant Surface Waters Near to the Project Area and Surface Water Sampling Locations

In-Situ Measurements

pH, Temperature, Electrical Conductivity and Dissolved Oxygen were measured by using a multiparameter water quality meter (Table 6-24). According to these measurements, the average temperature recorded was 17.95°C, with the lowest and highest values being 15.9°C and 19.6°C, respectively. pH values ranged from 7.60 to 8.80. The range of electrical conductance at 25 °C (EC_{25}) values are between 175 and 391 µS/cm, with an average of 248.2 µS/cm. Dissolved oxygen (DO) values varied between 8.35 and 10.9 mg/L.

Table 6-24: In-Situ Parameters Measured from Surface Water Monitoring Locations

Sampling Location	X (WGS84, Decimal Degrees)	Y (WGS84, Decimal Degrees)	Temperature (°C)	pH	Electrical Conductance @ 25 °C (µS/cm)	Dissolved Oxygen (mg/L)
YS-1	37.4136	39.9520	18.9	8.75	190	8.41
YS-2	37.4075	39.9525	17.5	7.60	380	10.5
YS-3	37.3982	39.9503	17.7	7.70	385	10.7
YS-4	37.3932	39.9486	18.0	7.81	391	10.83
YS-5	37.4142	39.9189	18.9	8.45	200	8.9
YS-6	37.4101	39.9184	19.1	8.50	211	8.83
YS-7	37.4016	39.9182	16.5	8.51	203	8.35
YS-8	37.3984	39.9200	17.1	8.45	195	8.67
YS-9	37.3944	39.9204	18.3	8.39	185	9.05
YS-10	37.3937	39.9034	19.6	8.80	215	10.9
YS-11	37.3872	39.9182	15.9	8.25	175	9.9

Water Quality

The quality of surface water is determined by considering whether the measured values of the specified parameters exceed quality standards. Within the scope of this study, “Surface Water Quality Regulation” (SWQR), Official Gazette No. 28483, Dated 30/11/2012 (Amended: OG-01/02/2023-32091) Annex 5 Table 2 was used to examine surface water quality.

According to SWQR Article-1, the purpose of the regulation is to determine the biological, chemical, physicochemical and hydromorphological qualities of surface water bodies and coastal - transitional waters; to provide classification thereof; to monitor the water quality and quantity thereof; to identify potential uses for such waters; to protect such waters; and to determine the measures to be adopted in order to achieve good water status. In this context, the water bodies are classified according to the criteria presented in Annex-5, Table-2 of the revised regulation. (Amended: OG-01/02/2023-32091).

Water Quality Classes: The intended use for the waters according to quality classes:

Class I: High-quality water (Very Good)

- High potential drinking water supply,
- Suitable for recreational purposes (including body contact, such as swimming),

- Suitable for trout farming, and
- Suitable for animal breeding and farming needs,

Class II: Slightly polluted water (Good)

- Potential drinking water supply,
- Suitable for recreational purposes,
- Suitable for fish farming other than trout,
- Irrigation water, provided that the water quality parameters comply with the criteria set forth in the legislation in force.

Class III: Polluted water (Medium)

- Can be used as water and industrial water for the production of aquaculture products after being subjected to suitable treatment, excluding facilities that require qualified water, such as food and textiles.

Table 6-25 displays the Surface Water Quality Classification results in terms of General Chemical and Physicochemical Parameter Classes as per Annex 5 Table 2 of the SWQR, along with the sampling results. The results indicate that Biochemical Oxygen Demand (BOD5) concentrations at YS-2, YS-4, YS-5, YS-7, YS-8 and YS-11 are between the Class-I (very good) and Class-III limits (4 and 8 mg/L, respectively), so, these samples are classified as Class-II (good) surface water. Additionally, Total Phosphorus concentrations at YS-5, YS-6 and YS-11 are between 0.08 and 0.20 mg/L, which are respectively Class-I and Class-III limits. As a result, except YS-1, YS-3, YS-9 and YS-10, which are Class-I waters, all samples collected from these sampling locations are Class-II waters.

Table 6-25: Assessment of Surface Water Samples According to Surface Water Quality Regulation in terms of General Chemical and Physicochemical Parameter Classes (Annex-5 Table-2)

Parameters	Unit	Water Quality Class			YS-1	YS-2	YS-3	YS-4	YS-5	YS-6	YS-7	YS-8	YS-9	YS-10	YS-11
		I (very good)	II (good)	III (medium)											
Colour (436 nm)	m^{-1}	RES 436nm: ≤1.5	RES 436nm: 3.0	RES 436nm: >4.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Colour (525 nm)	m^{-1}	RES 525nm: ≤1.2	RES 525nm: 2.4	RES 525nm: >3.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Colour (620 nm)	m^{-1}	RES 620nm: ≤0.8	RES 620nm: 1.7	RES 620nm: 2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
pH	-	6.0-9.0	6.0-9.0	6.0-9.0	8.75	7.60	7.70	7.81	8.45	8.50	8.51	8.45	8.39	8.80	8.25
Electrical Conductivity @ 20°C	µS/cm	< 400	1000	> 1000	172.73	345.45	350.00	355.45	181.82	191.82	184.55	177.27	168.18	195.45	159.09
Oil and Grease	mg/L	< 0.2	0.3	> 0.3	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Dissolved Oxygen	mg/L	> 8	6	< 6	8.41	10.50	10.70	10.83	8.90	8.83	8.35	8.67	9.05	10.90	9.90
Chemical Oxygen Demand (COD)	mg/L	< 25	50	> 50	<10	19.20	16.40	17.60	12.80	<10	14.40	14.50	<10	12.00	12.70
Biochemical Oxygen Demand (BOD_5)	mg/L	< 4	8	> 8	<4	8.00	<4	6.00	5.00	<4	6.00	7.00	<4	<4	5.00
Ammonium as N (mg NH_4^+ - N/L)	mg/L	< 0.2	1	> 1	<0.01	<0.01	<0.01	<0.01	0.055	0.060	0.02	0.04	0.05	0.07	0.06
Nitrate as N (mg NO_3^+-N/L)	mg/L	< 3	10	> 10	0.15	<0.1	<0.1	<0.1	0.38	0.51	0.28	0.43	0.65	0.18	0.56
Total Kjeldahl as N (mg N/L)	mg/L	< 0.5	1.5	> 1.5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.25	<0.2
Total Nitrogen as N (mg N/L)	mg/L	< 3.5	11.5	> 11.5	<0.2	<0.2	<0.2	<0.2	0.47	0.59	0.29	0.49	0.70	0.44	0.59
Orthophosphate Phosphorus (mg o-PO_4-P/L)	mg/L	< 0.05	0.16	> 0.16	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Phosphorus (mg P/L)	mg/L	< 0.08	0.2	> 0.2	0.058	0.058	<0.01	0.038	0.105	0.121	<0.01	<0.01	0.04	0.04	0.11
Fluoride (F^-)	µg/L	<1000	1500	>1500	367.00	265.00	198.00	230.00	186.00	306.00	230.00	189.00	207.00	221.00	147.00
Manganese (Mn)	µg/L	<100	500	>500	3.00	<1	<1	1.50	2.20	1.30	<1	<1	<1	<1	<1
Selenium (Se)	µg/L	<10	15	>15	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Sulphur	µg/L	<2	5	>5	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Water Quality Class					I	II	I	II	II	II	II	II	I	I	II

Sensitivity Assessment

Sensitivity Features	Supported by	Sensitivity Value
Absence of surface water elements	Primary and Secondary Data	Low

6.1.8 Hydrogeology and Groundwater

Definition	Hydrogeology is the branch of geology concerned with the distribution and movement of groundwater in the soil and rocks of the Earth's crust (commonly in aquifers).
Area of Influence	**AoI:** AoI includes the Project footprint
Rationale for the AoI	**Rationale:** AoI was defined considering the boundaries of the Project Site
Data Sources	**Primary Sources**: Primary Data from groundwater sampling conducted in April 2023.
	Secondary Sources: Secondary Data from National EIA, Academic Journals, Grey Literature and Government Agency Reports & Databases.

For not only surface water but also groundwater resources management, Türkiye has been divided into 25 basins, considering geographical components including geographical location, climate and stream network. The Project components are within the Euphrates-Tigris Basin among these basins. According to the “Official Water Resources Statistics” published by State Hydraulic Works (SHW) in 2019, 4994.8 hm^3/year of Türkiye’s total 23,032.3 hm^3/year groundwater recharge comes from the Euphrates-Tigris Basin. Furthermore, 3763.7 hm^3/year of Türkiye’s 17,815.3 hm^3/year groundwater operating reserve comes from this basin (Table 6-26).

Table 6-26: Basic Information on Groundwater Basins of Türkiye

Basin No.	Basin	Groundwater Recharge (hm^3/year)	Groundwater Operating Reservoir (hm^3/year)
1	Meriç-Ergene	507.7	498.2
2	Marmara	241.7	210.7
3	Susurluk	780.4	585.9
4	Northern Aegean	289.4	212.9
5	Gediz	1155.9	866.9
6	Küçük Menderes	179.2	179.2
7	Büyük Menderes	1045.4	761.5
8	Western Mediterranean	473.2	316.7
9	Antalya	1164.7	576.3
10	Burdur	106.4	89.5
11	Akarçay	345.4	345.4

Basin No.	Basin	Groundwater Recharge (hm^3/year)	Groundwater Operating Reservoir (hm^3/year)
12	Sakarya	2197.1	1545.2
13	Western Black Sea	641.2	607.6
14	Yeşilırmak	907.2	872.8
15	Kızılırmak	2003.1	1762.9
16	Konya	2597	2023
17	Eastern Mediterranean	96.5	70.5
18	Seyhan	838.8	749.9
19	Asi	393.2	289.5
20	Ceyhan	985.3	533.5
21	Euphrates-Tigris	4994.8	3763.7
22	Eastern Black Sea	490.9	490.9
23	Çoruh	30	20
24	Aras	388.5	294.4
25	Lake Van	179.2	148.2

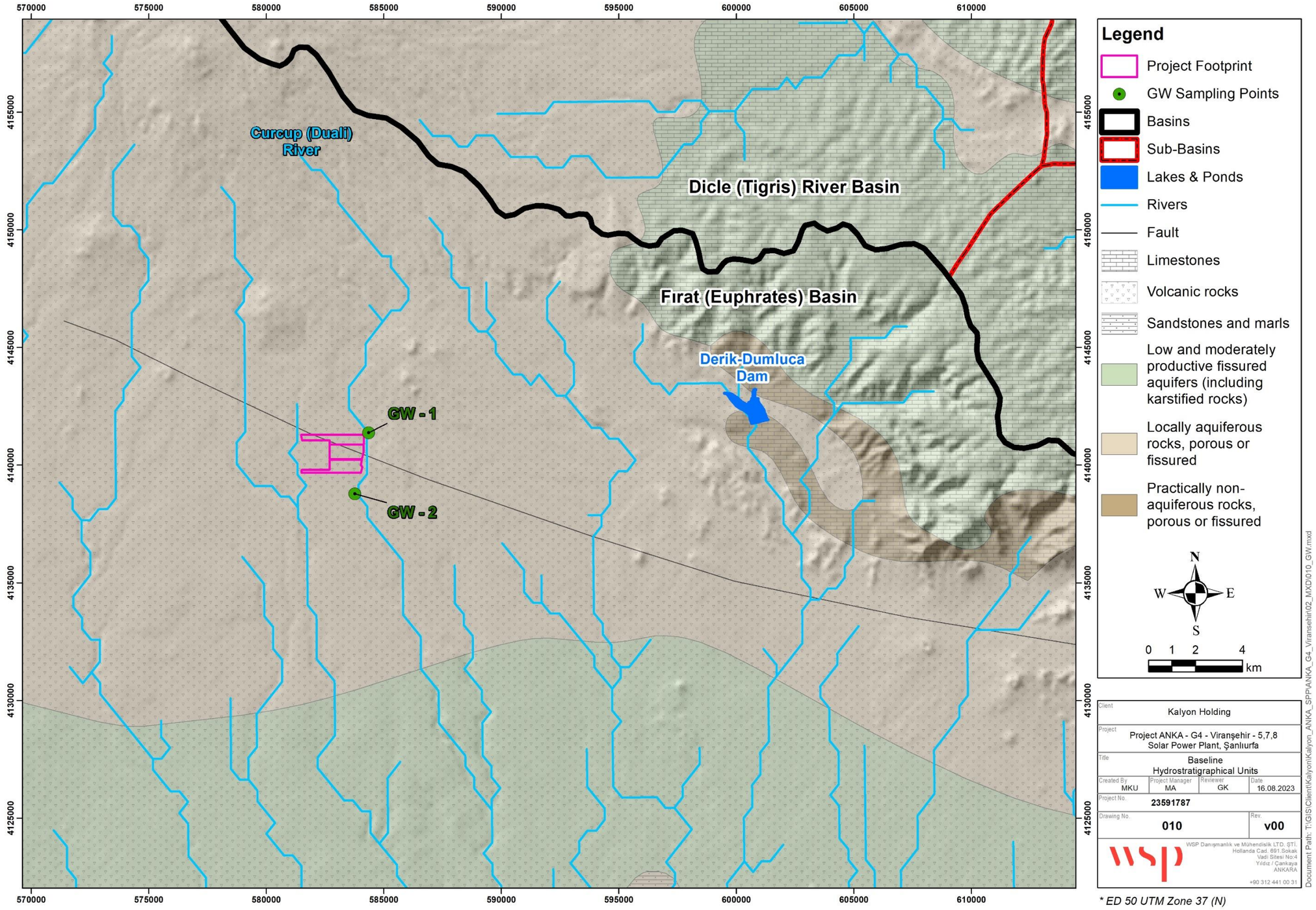
The geological units in the study area were examined in terms of their physical and hydrogeological properties and water-bearing potential, and according to the National EIA, it was decided that Miocene-Pliocene aged basalt units in the basin are generally impermeable. However, according to the International Hydrogeological Map of Europe (Scale: 1/1,500,000) (Figure 6-21), these basalt units can be aquifer units locally.

According to the Geotechnical Report for the Project, in order to determine the vertical and horizontal distribution of the soil, 18 boreholes with a depth of 7 m were drilled and different rock mechanics tests were applied. Although slotted PVC pipelines were installed to these wells after drilling operations were completed in order for monitoring groundwater levels, all wells were observed dry.

6.1.8.1 Baseline Groundwater Quality

A sampling study was conducted at two (2) springs/developed springs within the Project Area and its vicinity to assess the baseline water quality (Figure 6-21). Monitored parameters were compared with groundwater quality standards. Laboratory analyses were conducted by TÜRKAK accredited SEGAL Laboratory. All measurements and samples were collected by trained personnel who completed the Water and Wastewater Sampling Training organized by the Ministry of Environment, Urbanization, and Climate Change.

To assess the quality of groundwater, only groundwater quality criteria are considered, since it is not used for drinking or irrigation. For this reason, as well as in-situ parameters such as electrical conductance, Dissolved Oxygen, pH, the parameters stated in “Regulation on the Protection of Groundwater against Pollution and Deterioration, issued by the Ministry of Agriculture and Ministry, which was published in the Official Gazette dated 07.04.2012 and numbered 28257 (Revised: RG-12/05/2015-29363), were monitored.



* *ED 50 UTM Zone 37 (N)*

Figure 6-21: Hydrostratigraphical Map of the Project Area and Its Vicinity According to the International Hydrogeological Map of Europe (Scale: 1/1,500,000) and Groundwater Sampling Locations

In-Situ Measurements

pH, Temperature, Electrical Conductance and Dissolved Oxygen were measured by using a multiparameter water quality meter (Table 6-27). Based on these measurements, the values of these two springs are not significantly different from each other as expected, since they are not significantly distant from one another.

Table 6-27: In-Situ Parameters Measured from Groundwater Monitoring Locations

Parameters	Unit	Spring-1 (N-71843/23)	Spring-2 (N-71844/23)
X (WGS 84)	Decimal Degree	37.4137	37.3904
Y (WGS 84)	Decimal Degree	39.9531	39.9461
Temperature	°C	15.2	16.0
pH	-	7.7	7.85
Electrical Conductance -at 25°C	µS/cm	430	450
Total Dissolved Solids (TDS)	mg/L	220	230
Salinity	‰	0.21	0.22
Dissolved Oxygen (DO)	mg/L	8.7	8.35
Oxygen Saturation	%	101.3	98.8

Water Quality

The quality of the groundwater was determined by considering whether the measured values of the specified parameters exceed the quality standards. Within the scope of this study, groundwater quality standards were used to examine the groundwater quality.

For the quality standards,

- “Regulation on the Protection of Groundwater against Pollution and Deterioration” (herein after referred as “Groundwater Protection Regulation, GPR”) issued by the Ministry of Forestry and Water Affairs, which was published in the Official Gazette dated 07.04.2012 and numbered 28257 (Revised: RG-12/05/2015-29363)
- Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the Protection of Groundwater Against Pollution and Deterioration

The Groundwater Protection Regulation states that the number and the types of parameters, and the threshold value to be determined for each parameter, will predicate on the groundwater body itself, taking into account the specific conditions that prevail at each groundwater body. According to the regulation, the groundwater quality standards and the threshold values, which indicate that the groundwater is in good status, are determined by the General Directorate of Water Management.

The analysis results of the list of minimum parameters to be taken into consideration are presented in Table 6-28.

Table 6-28: Parameters Measured According to the Groundwater Protection Regulation

Parameters	Unit	Spring-1 (N-71843/23)	Spring-2 (N-71844/23)
Ammonium	mg/L	<0.01	<0.01
Arsenic	mg/L	0.061	<0.005
Cadmium	mg/L	<0.001	<0.001
Chloride	mg/L	20.1	18.1
Electrical Conductivity at 20°C	µS/cm	390.9	409.1
Lead	mg/L	<0.005	<0.005
Mercury	mg/L	<0.0005	<0.0005
Nitrate	mg/L	29	16
Phosphate	mg/L	<0.031	<0.031
Sulphate	mg/L	35.5	37.9
Tetrachloroethene	µg/L	<0.1	<0.1
Trichloroethene	µg/L	<0.1	<0.1

Sensitivity Assessment

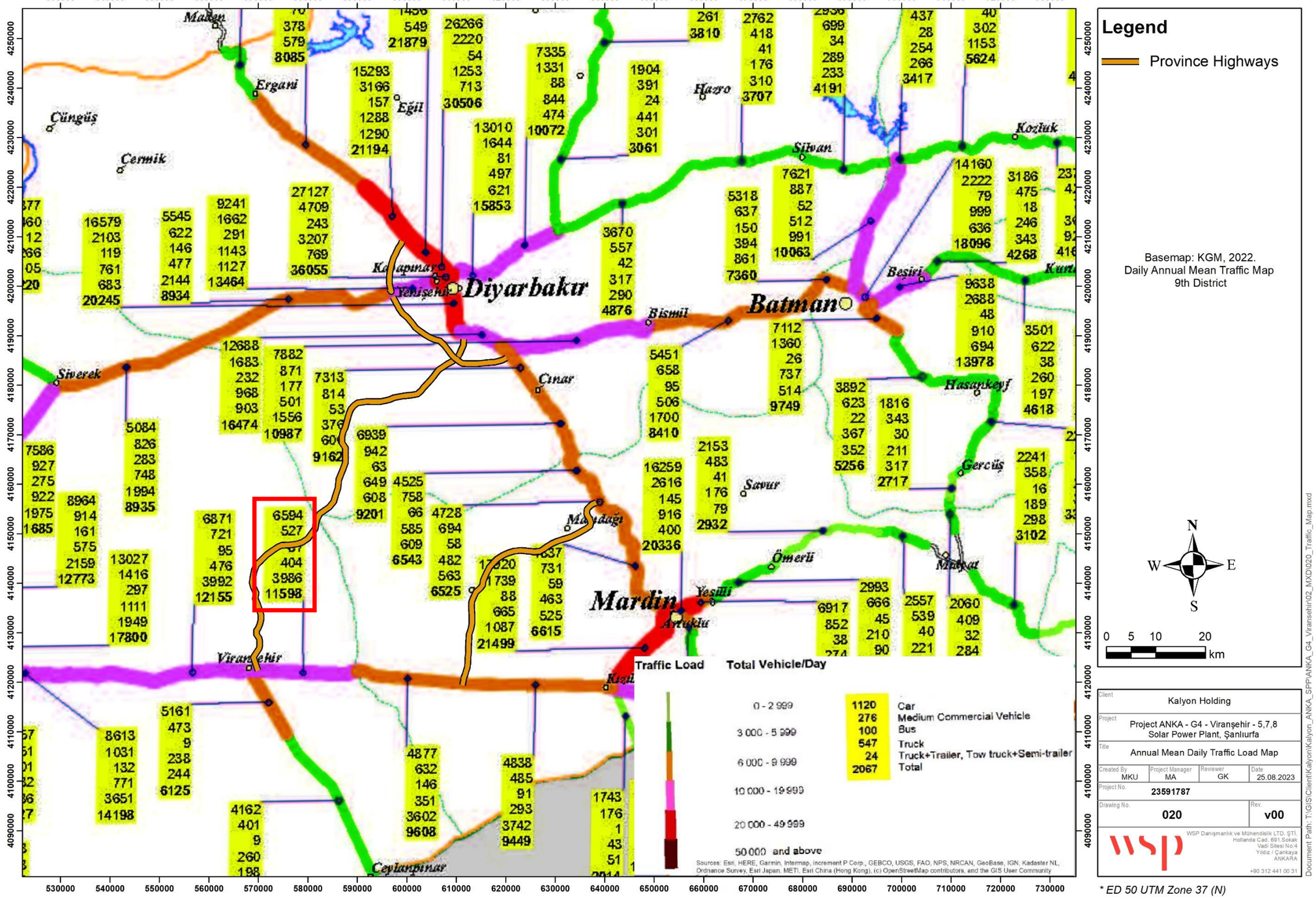
Sensitivity Features	Supported by	Sensitivity Value
Presence of Groundwater in the AoI	Primary and Secondary Data	Low

6.1.9 Traffic

Definition	Traffic can be defined as activities including transport of materials and people from one location to another location which may lead to traffic load.
Area of Influence	2,000 m buffer zone including Project Footprint
Rationale for the AoI	**Rationale:** The nearby receptors (i.e., communities), around the Project Site, potentially exposed to pollutant emissions.
Data sources	**Secondary sources:** Secondary data from scientific papers, grey literature, and databases.

Access to the Project area is provided through the existing cadastral roads and the road deviating from the Şanlıurfa-Mardin Road-D400/E90 highway, and there is no additional road construction situation. The Project area is approximately 13.61 km from Şanlıurfa-Mardin Road-D400/E90 highway. As seen in traffic load map, there is 11,598 vehicle traffic on the Şanlıurfa-Mardin D400/E90 highway. Within the scope of the Project, there is no connection road to the highway. However; In case of a connection to the highway, an application will be made to the 9th Regional Directorate of Highways for a pass permit and the project will be approved. The access road is planned to be connected to the existing registered road and improvements will be made by all Project investors.

The Traffic Volume Map of the Province of Şanlıurfa for the year 2022, which was created by Monitoring Department of the General Directorate of Highways, is given below.



* ED 50 UTM Zone 37 (N)

Figure 6-22 .2022 Current Traffic Loads of the Highways in the Project Area and Its Neighborhood

General Directorate of Highways publishes “Traffic and Access Information” report periodically and this report contains annual average daily traffic values and transport information according to traffic segments of motorways and state roads. Latest issue of this report was published in 2021. The traffic volumes of the nearby highways are given in Table 6-29.

Table 6-29: Highway Traffic Volume Information to be Used in the Construction Phase of the Project

Type Of Vehicle	Traffic Load of the State Road Route to be used
Car	6576
Medium-Duty Commercial Vehicle	553
Bus	80
Truck	426
Truck + Trailer + Tow Truck + Side Trailer	3534
Total	11169

Access road to be used within the scope of the Project is presented in Figure 6-23.

.

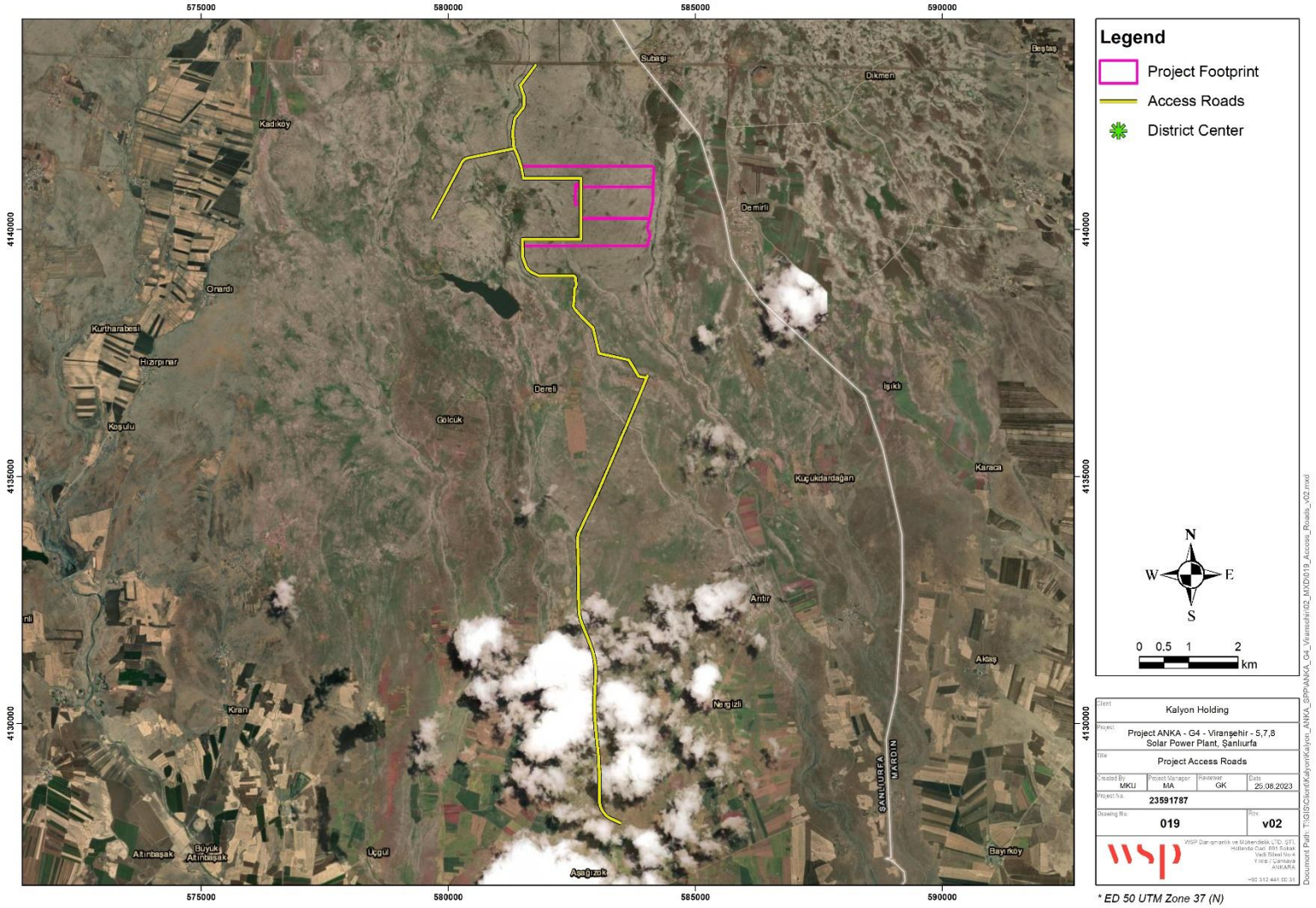


Figure 6-23: Access Roads of the Project

Sensitivity Assessment

Sensitivity features	Supported by	Sensitivity value
Schools and residential areas in the vicinity The existing roads will be used for access to the site Other ongoing projects (under construction and planning stage) around the Project site	Primary and secondary data	Medium-High

6.2 Social Components

Social Impact Assessment (SIA) was produced in accordance with the standards and the requirements of the International Finance Corporation (IFC). The general methodology adopted by WSP for SIA Studies has been designed to be analytical and transparent and to allow for semi-quantitative analysis of the impacts on the various social components. This methodology is based on the consideration that projects can generate both negative and positive impacts whose magnitude can be evaluated considering the different characteristics of the project activities and the environmental and social context. This methodology overall translates into the work steps described in the following sections.

The outcomes of social field studies were linked to analyses of potential impacts on social receptors. In addition, stakeholder engagement is integrated into the entire process, helping guide the baseline data gathering and a proportional impact assessment.

The objectives of SIA are:

a) Identification and assessment of any potentially significant existing and future adverse social impacts associated with the proposed Projects,

b) Assessment of compliance with applicable national legal requirements and international standards/requirements,

c) Determination of the measures needed to prevent, minimize, and mitigate the adverse impacts; and

d) Identification of potential social opportunities, including those that would improve the environmental and social sustainability of the Project and the associated current operations.

6.2.1 Determination of Project Area of Influence

The area of influence (AoI) is the zone that may be influenced by a project. Understanding the AoI is an essential requirement for a SIA. Following that, the social baseline must focus on the AoI, although the baseline may have a broader focus, depending on the nature and impact of the project.

According to the Guidance Note 1 Assessment and Management of Environmental and Social Risks and Impacts of IFC (2012), where the project involves specifically identified physical elements, aspects, and facilities that are likely to generate impacts, environmental and social risks and impacts were be identified in the context of the project's area of influence. This area of influence encompasses, as appropriate:

The area likely to be affected by:

(i) The project and the client's activities and facilities that are directly owned, operated or managed (including by contractors) and that are a component of the project; impacts from unplanned but predictable developments caused by the project that may occur later or at a different location; or indirect project impacts on biodiversity or on ecosystem services upon which Affected Communities' livelihoods are dependent.

(ii) Associated facilities, which are facilities that are not funded as part of the project and that would not have been constructed or expanded if the project did not exist and without which the project would not be viable[12].

12

(iii) Cumulative impacts that result from the incremental impact, on areas or resources used or directly impacted by the project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted.

In short, the AoI should include all project related structures and ancillary facilities (owned or managed) by the client and subcontractors and the associated activities strongly dependent on the project. In addition, areas and communities directly impacted upon by the proposed project and ancillary facilities form part of the AoI. Cumulative impacts and potential unintended, but predictable, project consequences should also be considered in the delineation of the AoI. From a social viewpoint, the AoI perspective is also influenced by direct and induced socio-economic influences (including relocation, livelihood, health, and safety aspects), spatial implications, intrusion impacts and stakeholder typology. Considering the key issues that emerged from the stakeholder engagement process and the associated effects, a spatial focus appears[13]. Please refer to Figure 6-24 in this regard.

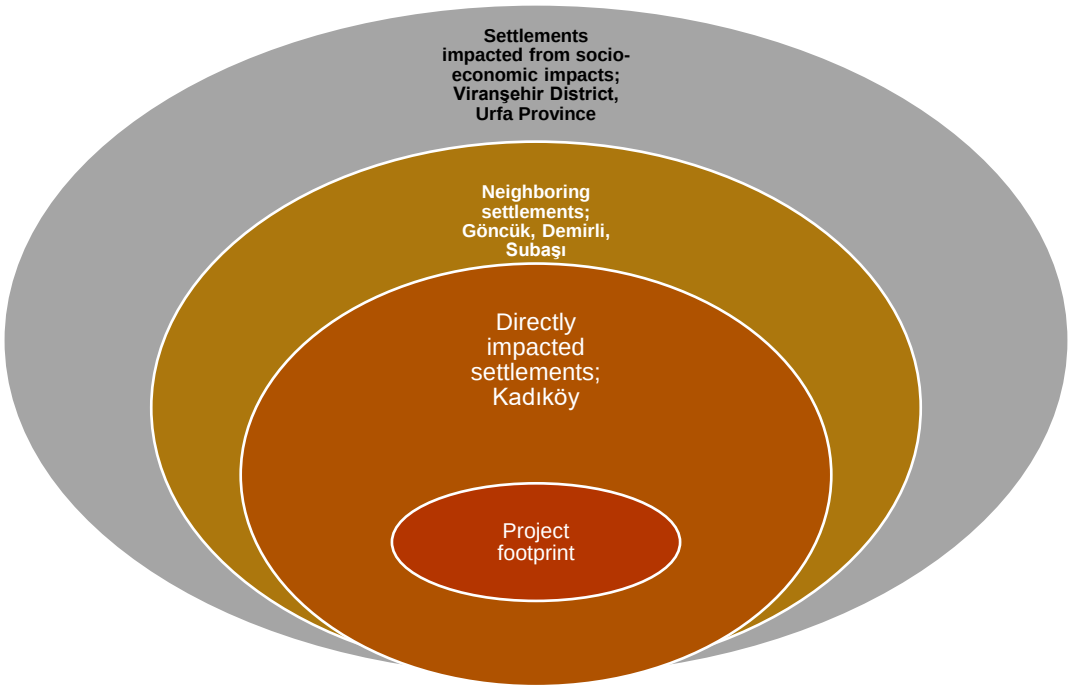


Figure 6-24: Project Area of Influence G4-Viranşehir-5,7,8 Solar Power Plant, Viranşehir District, Şanlıurfa Province

The nearest settlements to located in the social area of influence for each Project that will be developed for ANKA Project is presented the figure above.

The social Area of Influence map is provided in Figure 6-25: Social Area of Influence.

[13] This focus included the construction, operational and closure phases of the Project.

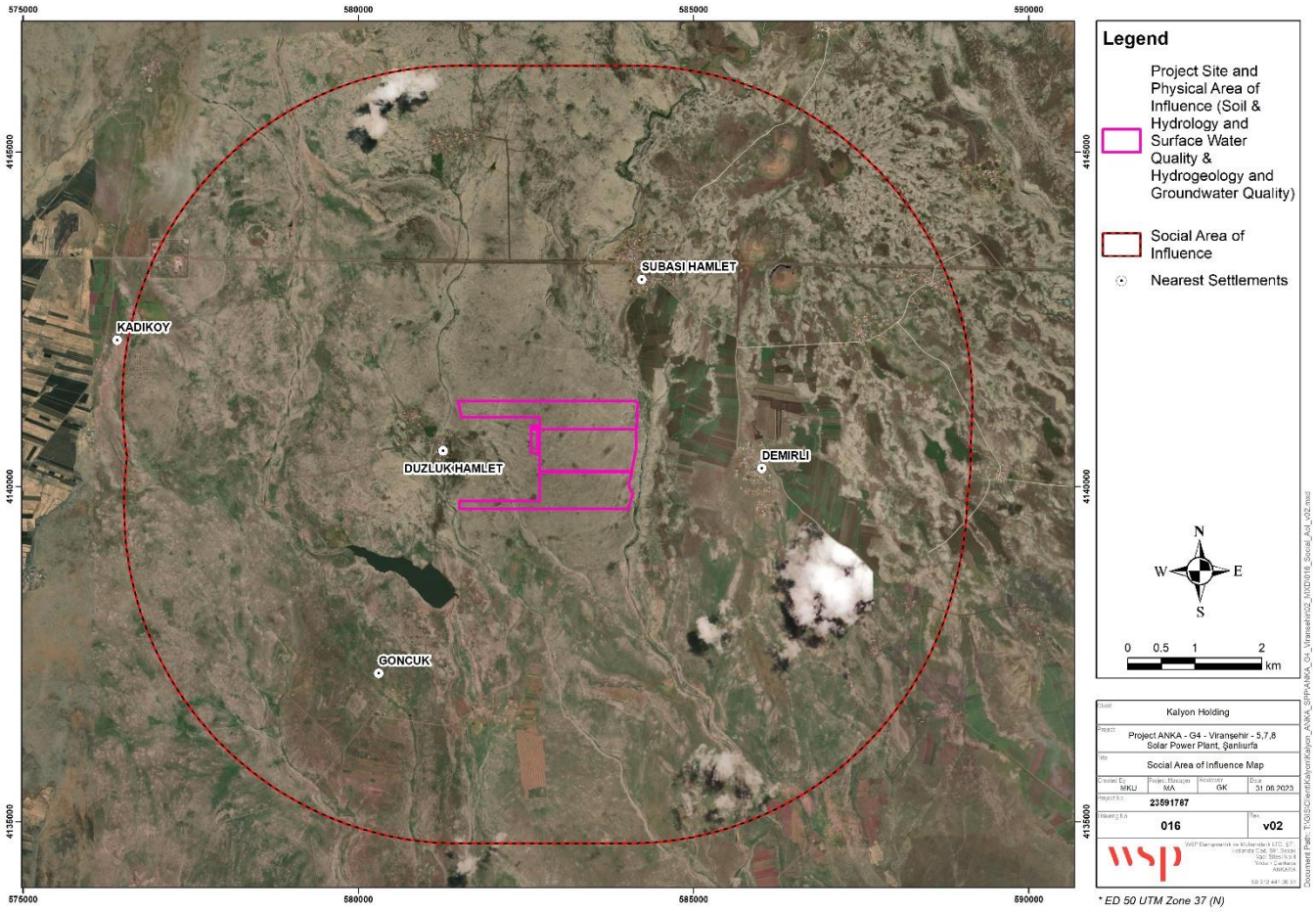


Figure 6-25: Social Area of Influence

6.2.1.1 Desktop Study (Secondary Data)

Secondary Data was be obtained from National institutions (ministries, research institutes, universities, national and local censuses, ministries, web-based published reports, assessment reports of local and national NGOs and Project specific documents such as EIA and ESIA reports. Outputs of the secondary data analysis helped to reach a common understanding about the Project. Secondary data was obtained but not limited to through the following institutional websites:

- Şanlıurfa Governorship
- Şanlıurfa Municipality
- Turkish Statistical Institution,
- Şanlıurfa Provincial Directorate of Environment and Urbanization and Climate Change
- Şanlıurfa Directorate of Agriculture and Forestry
- Development Agencies

6.2.1.2 Field Surveys (Primary Data)

The aim of this survey is to determine the socio-economic status of each settlement inclusive of population, migration and reasons for migration, ethnic composition, age distributions, social facilities (schools, mosques, etc.) in the settlement, education level, local conflicts and problems, livelihoods and main income generation activities, economic production in the settlement, land use, services and infrastructure, ecosystem services, vulnerable groups and perceptions of Project impacts.

According to preliminary analysis and desktop studies:

- Four settlements were determined for Viranşehir-5, Viranşehir-7, and Viranşehir-8 Projects namely: Kadıköy, Gölcük, Demirli, Subaşı neighbourhoods.

Community level surveys were conducted with the Mukhtars of Kadıköy, Subaşı, Gölcük and Demirli neighbourhoods.

Due to the opposition of the local communities to the Project, household surveys could not be conducted in the villages. Therefore, the social impact assessment of this ESIA Report was prepared based on Community Level Surveys with the Mukhtars of the villages within the AoI, key institution interviews and expert judgement since the anticipated and experienced Project social impacts by the local communities cannot be collected through the household surveys.

6.2.2 Administrative Structure

Turkey is subdivided into 81 provinces. Each province is further divided into districts, and each district is divided into villages or neighborhoods according to the respective rural or urban setting, population figures and their connection to the Metropolitan Municipalities. The provincial administrative structure consists of provincial governors, special provincial administrations, municipalities, while the district level administrative structure consist of district governors and district municipalities and villages/neighborhoods are the sub administrative units of the districts. The following sections describe the details and responsibilities of these administrative structures. Figure 6-26 presents the administrative structure as found in the AoI.

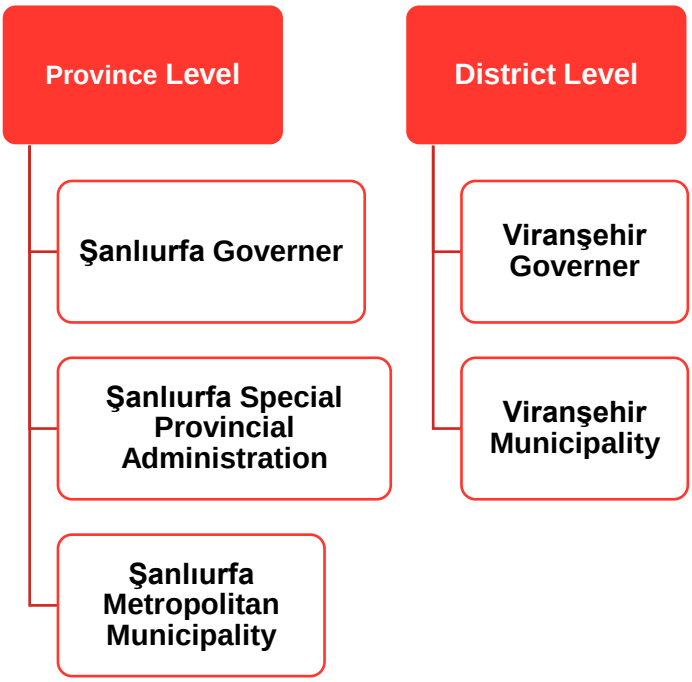


Figure 6-26: Administrative Structure

In reference to Figure 6-26, the following sections expand on the administrative structure.

Provincial Governors

The Governor of a province represents the Turkey Central Administration (central government) at a provincial level. The Governor is appointed by the Council of Ministers with the approval of the President and reports to the Ministry of Interior. The Governor of Şanlıurfa represents the province.

In compliance with the Law number 5442, the responsibilities of the governors as follows:

- To ensure the security of the citizens and the public order,
- To guarantee the coordination and cooperation of different government and non-governmental organisations and institutions,
- To declare and implement legislation and governmental decrees,
- To supervise all provincial public institutions and organizations,
- To collect taxes and other state revenues,
- To preside over official ceremonies as a chief representative of the state,
- To contact consuls and accept their applications and visits,
- To prevent offences by using the police and gendarmerie forces due to their security related power,
- Taking security measures in civil airports, ports and border gates in order to provide border and coast safety,

- Appealing for help from military forces directly in the case of security threatening event which are not able to be prevented by law enforcement forces originally under their authority,
- Being the head of the social assistance and solidarity foundations of the province,
- To be the head of the investment monitoring and coordinating unit which operates for the purpose of monitoring and coordinating public investments and public services of provincial organizations under the authority of the governor,
- Having hierarchical authority over different ministries civil servants who provide public services in the province,
- To permit judicial investigations concerning the formal roles and duties of the civil servants and municipal staffs.

Special provincial administrations

In Turkey, special provincial administrations (SPAs) function at a provincial level. SPAs also have a municipal function in the rural areas. The SPA work towards reducing poverty and improving physical and socio-economic infrastructures, particularly in rural villages.

SPAs provide a broad range of services. The SPAs are in charge of the construction and maintenance of the physical infrastructures for education, healthcare, and sports. The SPAs have a strong community development focus. The emphasis is on preventative health and social services, as well as contributing to the development of industry and trade sectors, including agriculture.

The AoI is mainly composed of rural settlements. The Şanlıurfa Provincial Administration's focus is on these villages.

Municipalities

Municipalities are represented in the respective provincial and district capitals, and in communities with at least 5,000 inhabitants. Approximately 93% of the population of Turkey live within municipal boundaries.

Municipalities prepare master plans and detailed development plans, authorize construction permits, control works and operate the territory of the municipality. Municipalities are responsible for the development of urban infrastructure and provide various services. These services include waste disposal, security, fire, emergency aid, relief, ambulance, traffic, cemeteries, parks and green areas, housing, culture and artworks and maintenance of education facilities.

Villages

Mukhtars represent the village. Mukhtars are elected by villagers through local elections held once every five years. The village, as a public legal entity, has full administrative and financial autonomy. Village administration consists of a Mukhtar, an executive committee, and a village association. The state pays every village Mukhtar a salary approximately equal to the minimum wage for the public services. The Mukhtar discharges functions such as identifying the poor and the provision of assistance, renewing voter registers, informing the relevant agencies of problems and failures in education, health, security, and sanitation.

6.2.3 Population and Demography

6.2.3.1 Introduction

The Project is located in the Viranşehir district of the Şanlıurfa province. Population and demography are the key components to have a good understanding of the characteristics of a community. Information on demographic

profiles at the provincial and district levels was obtained from secondary resources. The demographic information of the villages was collected through the community-level surveys held with the Mukhtars.

6.2.3.2 Province and District Level

According to TURKSTAT data of 2022, the total population of Şanlıurfa is 2,170,110. The male population of Şanlıurfa is 1,093,998 while the female population is 1,076,112. The average household size of the province is 4.88, with a net migration rate of -10.37. There are 13 districts and 1439 neighborhoods in Şanlıurfa.

Please refer to the tables below for the main population indicators of Şanlıurfa.

Table 6-30: Population Distribution of the Şanlıurfa province

Şanlıurfa	Population Indicators
Total Population	2,170,110
Male population	1,093,998
Female population	1,076,112
Net migration rate	-10.37
Population growth rate	12.56
Population Density (person/km^2)	116

Source: TURKSTAT, 2022

As of 2022, the annual population growth rate of Şanlıurfa is determined as 12.56 in thousands, while it is 9.38 in thousands for the Viranşehir District. This rate is 7.05 for Türkiye in general, which means both Şanlıurfa and Viranşehir have higher population growth compared to Türkiye, whereas Viranşehir has a lower population growth rate compared to Şanlıurfa.

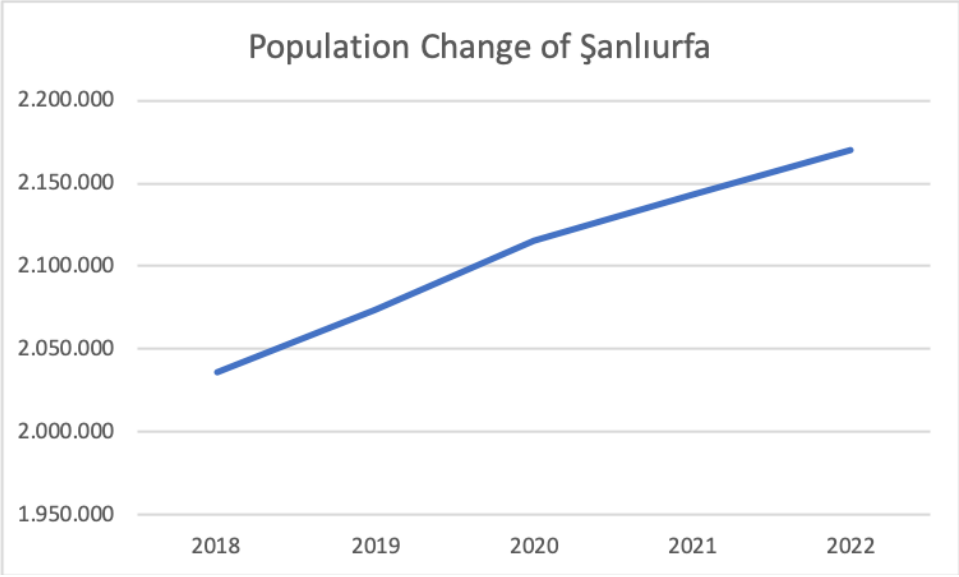


Figure 6-3: Population change of Şanlıurfa in the last 5 years

The trends in the population change of Şanlıurfa in the last five years are given in Figure 6-3. The population of Şanlıurfa has increased continuously in the last 5 years.

Table 6-31, shows the population distribution by districts of Şanlıurfa. The Haliliye, Eyyübiye and Siverek Districts are the central districts of Şanlıurfa. The Haliliye District is the most populous district in the province.

Table 6-31: Population Figures of Districts of Şanlıurfa as of 2022

District	Population	Male Population (%)	Female Population (%)	Urban Population (%)	Rural Population (%)	Population Density (person/km²)
Akçakale	123,721	51	49	100	0	108.53
Birecik	93,613	50	50	100	0	101.42
Bozova	52,680	50	50	100	0	39.67
Ceylanpınar	90,440	50	50	100	0	49.88
Eyyübiye	391,795	51	49	100	0	237.02
Halfeti	41,662	49	51	100	0	64
Haliliye	396,656	50	50	100	0	206.59
Harran	96,072	50	50	100	0	99.35
Hilvan	42,218	51	49	100	0	35.36
Karaköprü	265,035	51	49	100	0	148.81
Siverek	267,942	51	49	100	0	66.34
Suruç	100,961	51	49	100	0	137.93
Viranşehir	207,315	49	51	100	0	83.36

Source: TURKSTAT, 2022

Table 6-32 presents the key information on the Viranşehir district. 207,315 people are living in the Viranşehir district, in which the total female population is more than the total male population. Viranşehir has 145 neighborhoods within its district borders. Since 2014, villages in metropolitan cities have become neighbourhoods.

Table 6-32: Viranşehir District Population Information

Viranşehir	Number
Total population	207,315
Total male population	102,570
Total female population	104,745

Viranşehir	Number
Number of villages within district borders	0
Number of neighborhoods within district borders	145

Source: TURKSTAT, 2022

The change in the Viranşehir population in the last five years is given in the Figure 6-27.

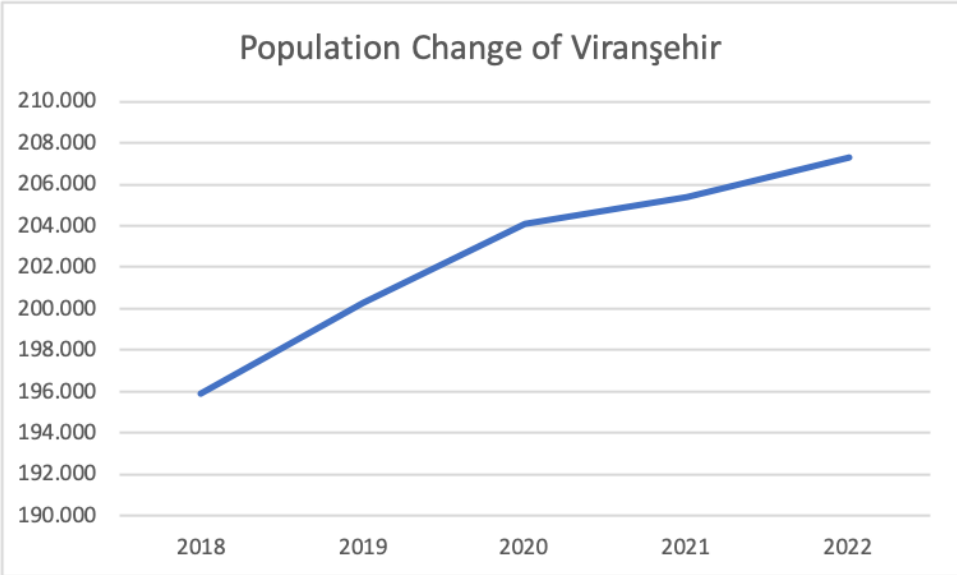


Figure 6-27: Population change of Viranşehir in the last 5 years

The population of Viranşehir has increased continuously in the last 5 years. The population growth of Viranşehir district is similar to Şanlıurfa.

Age and Gender Distribution

The tables below present the age distribution of the population of the Şanlıurfa province and the Viranşehir district.

The age distribution of the Şanlıurfa population in numbers and by percentage is given in Table 6-33.

Table 6-33: Age Distribution of Şanlıurfa Population, as of 2022

Age Group	Population	Population by percentage (%)
0-4	287,991	13.2
5-9	290,306	13.3
10-14	255,594	11.7
15-19	220,337	10.1

Age Group	Population	Population by percentage (%)
20-24	183,260	8.4
25-29	177,238	8.1
30-34	155,802	7.1
35-39	127,934	5.8
40-44	114,931	5.2
45-49	88,952	4
50-54	68,644	3.1
55-59	63,852	2.9
60-64	45,581	2.1
65+	89,688	4.1

Source: TURKSTAT, 2022

In Şanlıurfa, the population aged between 5-9 is the largest group compared to others, while the population aged between 60-64 is the least populous age group. Apart from that, younger generations aged between 0-4 to 20-24 are also predominant in the area compared to middle-aged population.

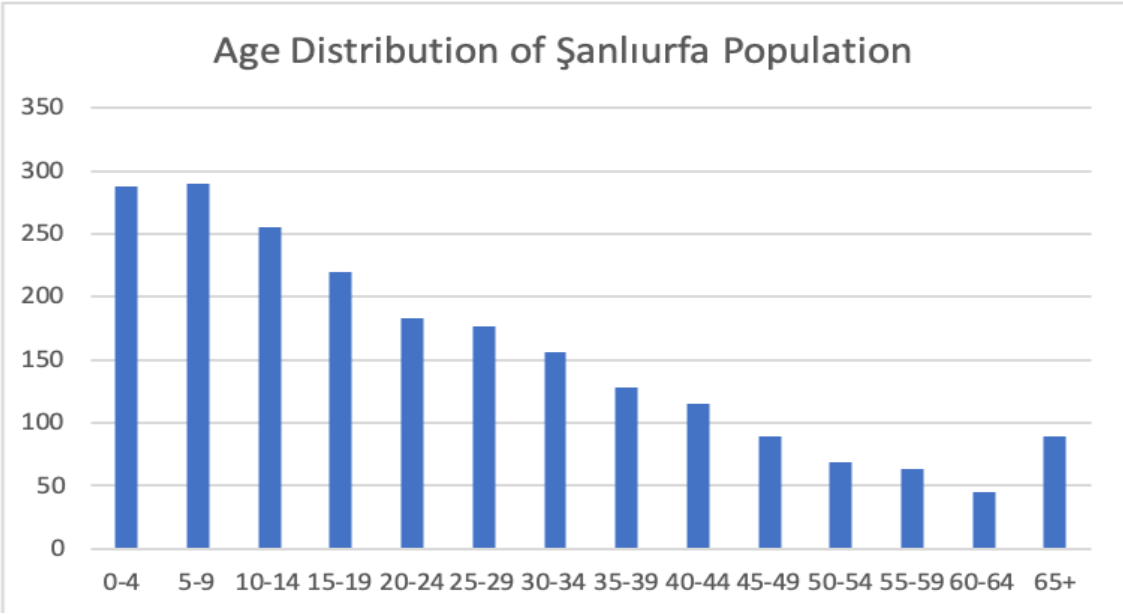


Figure 6-28: Age Distribution of Şanlıurfa Population

The age distribution of the Viranşehir population in numbers and by percentage is given in Table 6-34.

Table 6-34: Age distribution of Viranşehir population, as of 2022

Age Group	Population	Population by percentage (%)
0-4	28,885	13.9
5-9	28,371	13.6
10-14	25,464	12.2
15-19	22,254	10.7
20-24	16,921	8.1
25-29	17,702	8.5
30-34	15,466	7.4
35-39	11,956	5.7
40-44	10,807	5.2
45-49	7,655	3.6
50-54	5,257	2.5
55-59	5,618	2.7
60-64	3,830	1.8
65+	7,129	3.4

The population aged between 0-4 has the highest proportion in the Viranşehir district. Apart from that, age distribution of Viranşehir district is similar to that of Şanlıurfa. (see Figure 6-29).

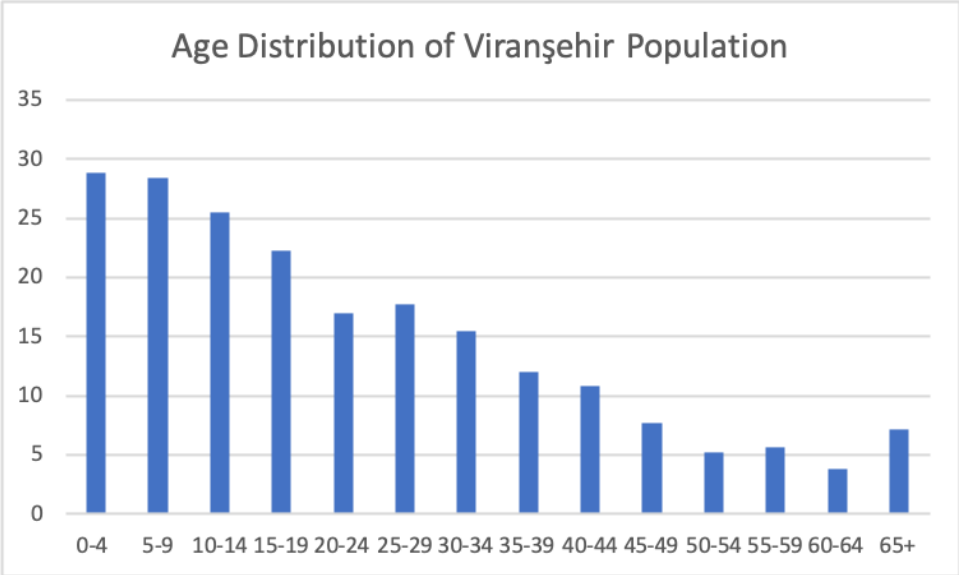
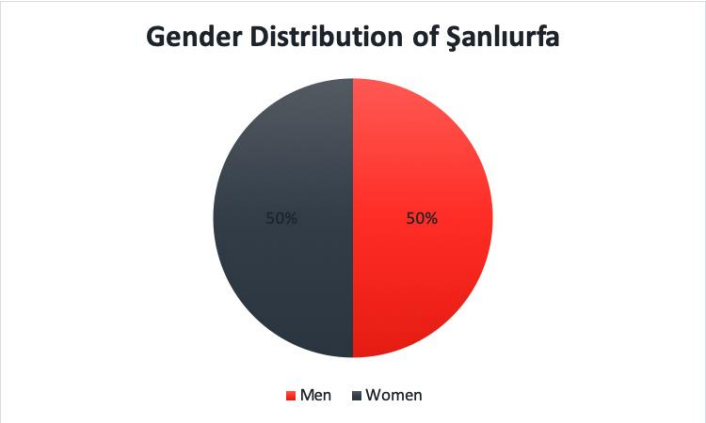


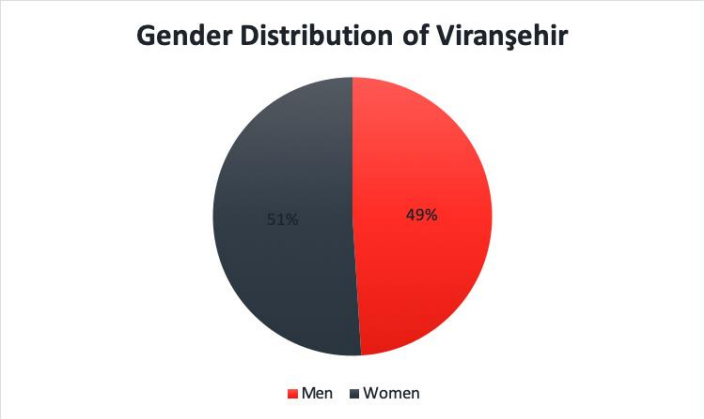
Figure 6-29: Age Distribution of Viranşehir Population

The distributions of population by gender in Şanlıurfa and Viranşehir are presented in the Figure 6-30 and Figure 6-31.



- In Şanlıurfa, as of 2022, the female and male populations have an equal population distribution.

Figure 6-30: Gender distribution of Şanlıurfa population



- In Viranşehir, as of 2022, the female population is more than the male population.

Figure 6-31: Gender distribution of Viranşehir population

6.2.3.3 Village Level

The total population and the number of households in the settlements collected through the Community Level Surveys (CLS) are presented in Table 6-35.

Table 6-35: Total population and number of households of the villages

Province	District	Neighbourhood	Total Population	Number of Households
Şanlıurfa	**Viranşehir**	Kadıköy	1112	350
		Gölcük	1090	500
Mardin	**Derik**	Demirli	1,144	70
		Subaşı	568	100

Seasonal Change

According to the results of the CLS, In the village of Kadikoy, there is a decrease in population during the summer season. The villagers go to cities like Manisa and Izmir as seasonal workers. They work in other cities as seasonal workers for about 6 months. Seasonal change in population of the villages is presented in Table 6-36.

Table 6-36: Seasonal population change in the villages in the last five years

Province	District	Village	Additional Population	Additional number of households	Reason of seasonal population change
Şanlıurfa	**Viranşehir**	Kadıköy	Decrease		Villagers go to other cities as seasonal workers in summer season.

Province	District	Village	Additional Population	Additional number of households	Reason of seasonal population change
		Gölcük	Same		-
Mardin	**Derik**	Demirli	Same		-
		Subaşı	Increase	150	Family visits

Migration

During the CLSs, it has been observed that Kadıköy village has experienced a change in the population in the last five years.

Kadıköy, Gölcük, and Subaşı villages have experienced a population increase in the last 5 years due to marriages and births. However, in Kadıköy village, due to the lack of residence in the village, some people migrate from the village. In Demirli village have experienced a population decrease in the last 5 years due to decline in birth rate.

The reasons for the population change in the settlements and the target migration group are presented in the table below.

Table 6-37: Population change in the V/N in the last five years

Province	District	Village	Change	Reason of population change	Target population group of change
Şanlıurfa	**Viranşehir**	Kadıköy	↑	Marriages and births	Young population
		Gölcük	↑	Marriages and births	Young population
Mardin	**Derik**	Demirli	↓	Decline in birth rate	Young population
		Subaşı	↑	Marriages and births	Young population

6.2.4 Land issues

6.2.4.1 Introduction

Land Use Patterns allows to understand what type of activities are performed on land and what forms of tenure are common in the AoI. Aim of this section is to reflect existing land use, including residential areas, existing industry, agricultural areas of Şanlıurfa and Viranşehir specifically. The information provided in this section was gathered through the available secondary data, GIS studies, in-depth interviews with the Mukhtar and official correspondence from General Directorate of Land Registry and Cadaster.

6.2.4.2 Province and District Level

Land use patterns

The total land use area in Şanlıurfa Province is 1,921,985,24 hectares. The Siverek district of Şanlıurfa is the largest district in terms of surface area. The latest information available on land use of Şanlıurfa is based on the 2018 data of CORINE Land Use Classification System. The distribution of land use of Şanlıurfa according to the latest data available is provided in the Figure 6-32.

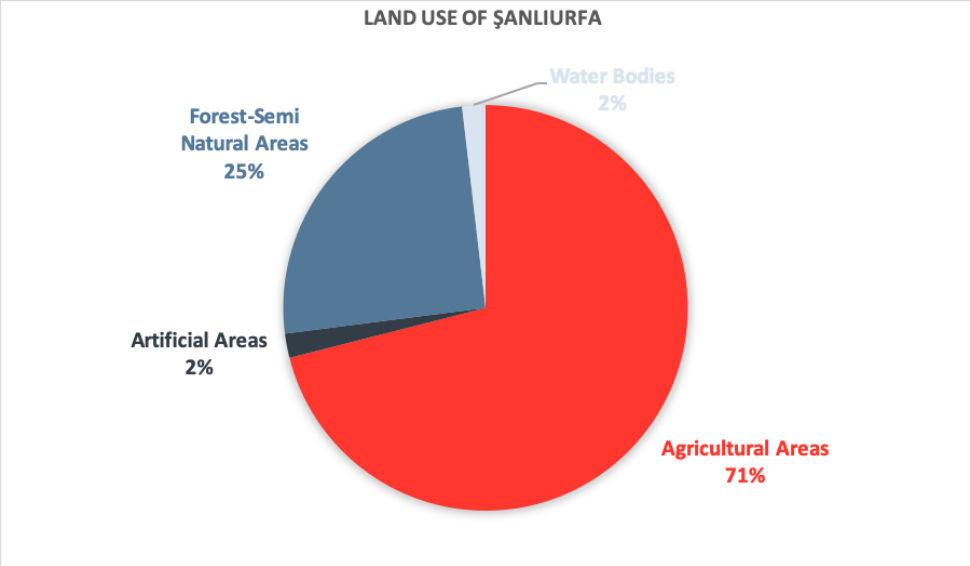


Figure 6-32: Land use of Şanlıurfa

In Şanlıurfa, forest, semi-natural, and agricultural areas comprise almost all the land. Water Bodies and artificial areas comprise 4% of the total land.

According to the 2018 data from the CORINE Land Use Classification System, Viranşehir's land use distribution is provided in the figure below.

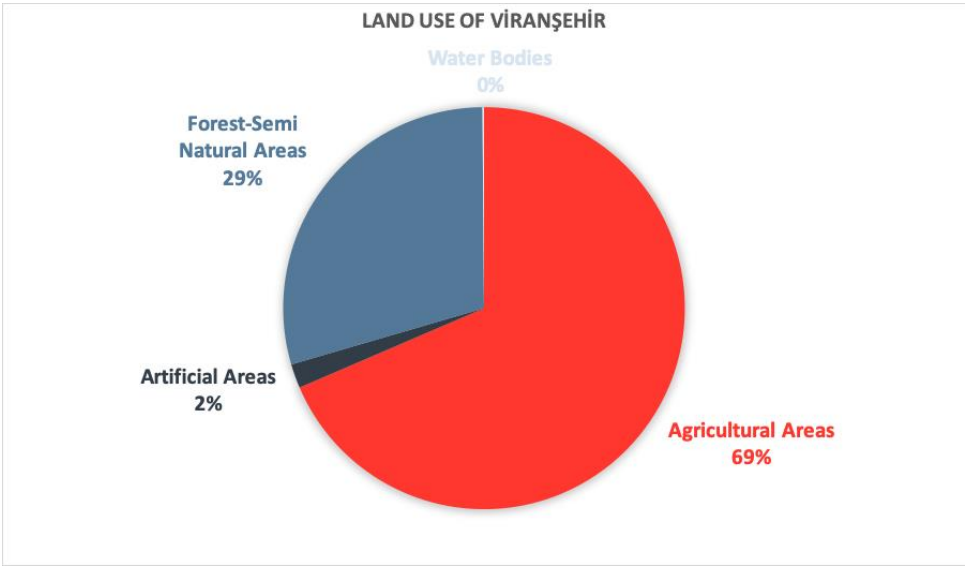


Figure 6-33: Land use of Viranşehir

In Viranşehir, land use distribution is similar to Şanlıurfa. Agricultural and forest-semi natural areas make up most of the land.

Please refer to the Table 6-38 for the detailed land type of the Şanlıurfa province.

Table 6-38: Land Types of Şanlıurfa

Layer	Area (ha)	Percent (%)
Sparse Plant Areas	199743.98	10.39
Natural Grasslands	273387.18	14.22
Unirrigated Arable Lands	180117.59	9.37
Continuously Irrigated Areas	761420.07	39.62
Mixed Agricultural Fields with Natural Vegetation	97393.87	5.07
Bare Cliff	607.28	0.03
Pasture Lands	108971.61	5.67
Plant Exchange Areas	7497.37	0.39
Irrigated Mixed Agricultural Fields	22581.93	1.17
Unirrigated Mixed Agricultural Lands	72923.42	3.79
Irrigated Fruit Areas	18749.32	0.98
Non-Continuous Settlements	17235.02	0.90
Vineyards	10041.49	0.52
Coniferous Forests	1935.51	0.10
Non-Continuous Rural Settlements	4604.90	0.24
Mineral Extraction Sites	1463.76	0.08
Industrial and Commercial Units	3923.97	0.20
Construction Sites	3718.07	0.19
Marshes	1236.17	0.06
Highways, Railways and Related Fields	1811.34	0.09
Water Bodies	32748.1	1.70
Unirrigated Fruit Fields	85978.24	4.47
Continuous City Structure	2876.36	0.16

Layer	Area (ha)	Percent (%)
Waterways	3069.26	0.16

Source: (Şanlıurfa Land Use, 2018)

The total land use area in the Viranşehir district is 229,708.51 hectares. About all of the Viranşehir district is composed of agricultural lands (68.5%) and, forest and semi-natural areas (29.3%) . The detailed land distribution of the district is given in the table below.

Table 6-39: Land Distribution of Viranşehir District

Layer	Area (ha)	Percent (%)
Sparse Plant Areas	22534.31	9.81
Unirrigated Arable Lands	2568,99	1.12
Natural Grasslands	44976.86	19.58
Pasture Lands	4567.98	1.99
Continuously Irrigated Areas	133435.48	58.09
Mixed Agricultural Fields with Natural Vegetation	5610.67	2.44
Irrigated Mixed Agricultural Fields	2508,41	1.09
Irrigated Fruit Areas	0.92	0.00
Unirrigated Mixed Agricultural Lands	8755.57	3.81
Discontinued Rural Settlements	970.92	0.42
Non-Continuous Settlements	1904.98	0.83
Industrial and Commercial Units	185.83	0.08
Mineral Extraction Sites	48.78	0.02
Construction Sites	1178.11	0.51

Source: (Şanlıurfa Land Use, 2018)

6.2.4.3 Village Level

The "G4-VIRANŞEHİR-8 (65 MWp/65MWm/50MWe-90 ha) SPP" on an area of 90 ha with a planned power of 65 MWp/65 MWm/50 MWe is planned to be built and operated by Kalyon Enerji Yatırımları Anonim Şirketi, located in Şanlıurfa Province, Viranşehir District, Kadıköy Neighbourhood, Block 0, Plot 17-18.

6.2.5 Economy and Livelihoods

6.2.5.1 Introduction

This section of the report represents primary and secondary economic activities, ecosystem service usage, employment trends, and issues related to economy and livelihoods of the AoI. The data presented in this section is gathered by the reports of TURKSTAT and Turkish Employment Agency, in addition to the Community Level Surveys. Economy and employment are key social components to understand the livelihood conditions of the local community and of the economic trends that are occurring. In this section, economy, and employment trends of the Şanlıurfa province and the Viranşehir district are presented.

6.2.5.2 Province and District Level

Economic activities and sectors

The majority of Şanlıurfa's economy is based on agriculture and animal husbandry. Approximately %70 of the population is engaged in agriculture. Ceylanpınar Agricultural Enterprises, Turkey's largest farm, is also located within the borders of Şanlıurfa province.

Table 6-40: Land shares in total agricultural land of Viranşehir

Land	Share in total agricultural land (decares)	Percentage
Agricultural fields	983,400	98.3
Fruit land	7,166	0.7
Vegetable land	9,370	0.9

Source: (TUIK, 2022)

According to The Plant Production Report (TUIK, 2022), the ratios of agricultural products in agricultural lands are as follows:

- Wheat: 478,180 decares with 24.9%
- Barley: 71,300 decares with 3.7%
- Lentil: 104,400 decares with 5.4%
- Cottonseed: 359,000 decares with 18.7%
- Cotton: 718,000 decares with 37.4%
- Corn: 183,020 decares with 9.5%
- Silage corn: 4,600 with 0.2%

Cotton, cottonseed and wheat are the main products in the agricultural production of Viranşehir.

Pistachio is the main product that mark up the fruit production of the district. The ratios of fruit crops are as follows:

- Pistachio: 4,400 decares with 61.4%
- Olive: 1,620 decares with 22.6%
- Grape, apple, almond, pomegranate etc. 1,146 decares with 15.9%

The ratios of vegetable crops in the district are as follows:

- Watermelon: 2,000 decares with 21.3%
- Melon: 2,100 decares with 22.4%
- Pepper: 1,950 decares with 20.8%
- Onion: 1,300 decares with 13.9%
- Gherkin: 2,000 decares with 21.3%

Besides agriculture, animal husbandry is another main source of income in the Viranşehir district. While there has been no secondary data on the number of bovines, sheeps and goats; the number of egg poultry and beekeeping businesses in Viranşehir are provided in Table 6-41.

Table 6-41: Number of animals in the Viranşehir district

District	Bovines	Sheeps	Goats	Egg Poultry	Beekeeping Business
Viranşehir	N/A	N/A	N/A	26,000	154

Source: (TUIK, 2022)

Employment

As of 2022, the labour force participation rate of TRC2 (Şanlıurfa, Diyarbakır) Region for the population aged 15 and higher is 40.6%, and the employment rate is 34.5% whereas the unemployment rate of TR71 region is 15% (TURKSTAT, 2022).

Table 6-42: TRC2 (Şanlıurfa, Diyarbakır) Labour Force Indicators

TR71	Total	Male	Female
Labour force participation rate (%)	40.6	64.4	18.1
Employment rate (%)	34.5	54.2	15.9
Unemployment rate (%)	15	12.1	15.9

Source: TURKSTAT, 2021

Gender inequality in employment and labour force participation in Şanlıurfa is apparent since there is a big difference in the rates for the male and female populations. This inequality might indicate and reinforce the predominance of the existing male-breadwinner-female-homemaker model of households.

6.2.5.3 Village Level

Information on the economic structure of the villages in the Project area is presented in this section. The main components of the economic system are average household income, main economic sectors, animal husbandry and agricultural production. The data on these components are obtained through the surveys.

Average household income in the villages and changes in income in the last five years and the reasons behind the change are provided in the table below.

Table 6-43: Average household income

Province	District	V/N	Average household income (TRY)	Changes in income in the last five years	Reasons of change
Şanlıurfa	**Viranşehir**	Kadıköy	10,500	Same	
		Gölcük	3,000	Increase	Developments in animal husbandry
Mardin	**Derik**	Demirli	Unknown		
		Subaşı	Unknown		

The monthly minimum wage in Türkiye, as of June 2023, is determined as 11,402 TRY. The average household income in the villages of the AoI in Viranşehir is 6,250 TRY monthly. While the monthly wages increase in Türkiye generally, considering the high inflation rates and increased prices, there has been no increase in purchasing power. In fact, the purchasing power has been acutely decreasing in Türkiye in the latest years.

Economic activities

The primary, secondary and tertiary income sources of the settlements located in the Area of Influence of the Project are given in Table 6-44. According to the information received from the Muktar and District Directorate of Agriculture there are 38 households using the treasury lands for agriculture consisting of 1,500 decares with adequate pay to the government and the land users request assistance from Kalyon to obtain title deeds of the governmental lands.

Table 6-44: Income sources of the villages of the AoI

Province	District	V/N	Primary Income Source	Secondary Income Source	Tertiary Income Source
Şanlıurfa	**Viranşehir**	Kadıköy	Animal husbandary	Seasonal work	Agriculture
		Gölcük	Animal husbandry	Seasonal work	Agriculture
Mardin	**Derik**	Demirli	Animal husbandry	Agriculture	

Province	District	V/N	Primary Income Source	Secondary Income Source	Tertiary Income Source
		Subaşı	Animal husbandry	Agriculture	

The primary source of income in the village of Kadıkoy is animal husbandry. In addition to animal husbandry, the other primary source of income is seasonal work. Villagers go to cities such as Izmir and Manisa, especially in the summer, and work as seasonal workers for about 6 months.As mentioned before, there are also agricultural production on the treasury lands and the main agricultural products are wheat, barley and lentil. According to the information obtained from the District directorate of agriculture, total production amount for wheat is 1011, 529 kg for per decare in Kadıköy village and total production amount for wheat is 2231, for barley is 177, for lentil is 470 kg per decare in Gölcük.

The primary source of income the village of Gölcük is animal husbandry, the other primary sources of income are seasonal work and agriculture. Villagers go to other cities for especially collect hazelnuts. There are people engaged in agriculture in the village, but they only cultivate barley and wheat. The number of people earning income from agriculture is very low.

The primary source income the village of Demirli is animal husbandry.

Occupational Distribution

The detailed information on occupational distribution of the population of the villages located in the Area of Influence of the Project is not available. Almost all of the households in all villages are engaged in animal husbandry. People engaged in animal husbandry go to other cities as seasonal workers in summer and work as daily workers.

Whether there are changes in job opportunities in the villages in the last five years were asked during social field study. The answers are presented in the table below.

Table 6-45: Changes in job opportunities in the V/Ns in the last five years

Province	District	V/N	Change	Reasons of change
Şanlıurfa	**Viranşehir**	Kadıköy	Same	-
		Gölcük	Increase	Development of animal husbandry
Mardin	**Derik**	Demirli	Decrease	Insufficient pasture area Inadequate number of shepherds
		Subaşı	Same	-

Animal Husbandry

The primary source of income in all villages is animal husbandry. The numbers of animals in the villages are provided in the table below.

Table 6-46: The numbers of animals for animal husbandry in the V/Ns

Province	District	V/N	Number of Cattles	Number of Sheep and Goats	Number of Poultry	Number of Beehives
Şanlıurfa	**Viranşehir**	Kadıköy	429	10179	Unknown	0
		Gölcük	12,000	15,000	Unknown	0
Mardin	**Derik**	Demirli	4,000	5,000	200	0
		Subaşı	3,000	3,000	Unknown	0

Agricultural Production

According to the data received from the District Directorate of Agriculture, 41 enterprises in Kadıköy cultivate wheat on 1011 decares of land, barley on 529 decares of land and lentils on 211 decares of land. According to the same data, 24 enterprises in Gölcük cultivate cotton on 60 decares of land, wheat on 2231 decares of land, barley on 177 decares of land and lentils on 479 decares of land. Wheat, barley, lentil and corn are produced in other villages. In Demirli and Subaşı, the amount of product is not specified. Only wheat and barley are grown in Gölcük village.

Table 6-47: The number of agricultural products produced in the V/Ns annually (tonne)

Province	District	V/N	Wheat	Barley	Lentil	Corn	Clover
Şanlıurfa	**Viranşehir**	Kadıköy	Unknown	Unknown	Unknown		
		Gölcük	20	20			
Mardin	**Derik**	Demirli	Unknown	Unkown	Unkown	Unknown	
		Subaşı	Unknown	Unknown			

Ecosystem Service Usage

Ecosystem services can be used for income sources, household consumption, and hobby purposes. Details of the ecosystem usage for each settlement located in the AoI is provided in the table below.

Table 6-48: Ecosystem service usage in the V/Ns

District	V/Ns	River (Existence, Usage, Fish Type, İrrigation Usage, Household numbers using for irrigation)					Forest (Existence, Usage Purpose, Wood Picking, Income from Wood Picking, Wood Picking for Household Consumption)					Plant picking (thyme, mushroom, etc.) (Existence, Using for income sources, Using for household consumption)			Hunting (Existence, Hunting for household consumption, Animals)			Picnic area (Existence)	Cultural area (Existence, Detail)		Spring water (Existence, Number of households using)		Well water (Existence, Usage Purpose, Number of households using)			Pasture lands (Existence, Usage Purpose, Number of households using)		
Viranşehir	**Kadıköy**	Yes	Drinking water for animals	-	-	-	No	-	-	-	-	No	-	-	No	-	-	No	No	-	Yes		Yes	Drinking, irrigation, potable water	All	Yes	Grazing	All
	Gölcük	Yes	-	-	-	-	No	-	-	-	-	No	-	-	No	-	-	No	Yes	Ancient tomb	Yes		No	-	-	Yes	Grazing	All
Derik	**Demirli**	No	-	-	-	-	No	-	-	-	-	No	-	-	No	-	-	No	No	-	Yes		Yes	-	-	Yes	Grazing	All
	Subaşı	No	-	-	-	-	No	-	-	-	-	No	-	-	No	-	-	No	No	-	Yes		Yes	-	-	Yes	Grazing	All

6.2.6 Vulnerable Groups

6.2.6.1 Introduction

This section of the report represents vulnerable groups in the AoI including province and settlement level. The Mukhtars were asked to identify vulnerable groups in their villages. The existence of vulnerable groups and services specially provided to these groups are given in this section.

6.2.6.2 Province and District Level

Social assistance and solidarity foundations linked with the Provincial Governorship provide support to vulnerable groups at the provincial level. In Şanlıurfa, there are 13 Assistance and Solidarity Foundation (SYDV) affiliated with The Ministry of Family and Social Services established to meet the needs of vulnerable groups and people in need. The list of social assistance and solidarity foundations in the Şanlıurfa province are as follows:

- Akçakale Social Assistance and Solidarity Foundation (SYDV)
- Birecik Social Assistance and Solidarity Foundation (SYDV)
- Bozova Social Assistance and Solidarity Foundation (SYDV)
- Ceylanpınar Social Assistance and Solidarity Foundation (SYDV)
- Halfeti Social Assistance and Solidarity Foundation (SYDV)
- Haliliye Social Assistance and Solidarity Foundation (SYDV)
- Harran Social Assistance and Solidarity Foundation (SYDV)
- Hilvan Social Assistance and Solidarity Foundation (SYDV)
- Karaköprü Social Assistance and Solidarity Foundation (SYDV)
- Merkez Social Assistance and Solidarity Foundation (SYDV)
- Siverek Social Assistance and Solidarity Foundation (SYDV)
- Suruç Social Assistance and Solidarity Foundation (SYDV)
- Viranşehir Social Assistance and Solidarity Foundation (SYDV)

In addition to social assistance and solidarity foundations, in Şanlıurfa, there are also 10 social services centres responsible for the supply and maintenance of social services.

Children and Older Population

While age does not create vulnerability by itself, certain problems experienced commonly by a particular group of people due to their age create social vulnerability. In this case, older adults may be considered a vulnerable group regarding physical, social, economic, and environmental factors. It is observed that the majority of the population within the Project impact area is older adults. Considering the relatively lower education levels of the older population and their difficulties in adapting to the changes arising from the Project, this group is considered as a vulnerable group.

Various projects are organized so that the older population can receive the necessary services. One of them is the Older Adults Support Program (YADES). YADES is a program that provides the protection and support of the older

adults over the age of 65 who reside in Turkey and need service, and care for those who need care in the places where they live. With the Older Adults Support Program (YADES), social services are provided primarily to the older adults who live alone at home or live with their spouse or a relative and need home care and social support services. YADES is a project carried out by the Ministry of Family and Social Services.

In provinces, assisted living is one of the services provided by public and private institutions. Assisted living is a centre that provides a social life where older adults, who have difficulty sustaining their lives above a certain age, are cared for 24 hours a day and life. There is no public centre in Şanlıurfa, but there are private centres.

When it comes to children as a vulnerable group, The United Nations Convention on the Rights of the Child (UNCRC) recognizes children's special vulnerability, emphasizing the need to provide special care and protection to children based on their physical and mental immaturity (OECD, Changing the Odds for Vulnerable Children: Building Opportunities and Resilience, 2019).

There are only 1 Directorate of Children's Homes Coordination Center as a public institution located in Şanlıurfa, affiliated with The Ministry of Family and Social Services Şanlıurfa Provincial Directorate.

People with disabilities

Metropolitan and district municipalities provide social services for people with disabilities. All municipalities have a unit or directorate responsible for social services provided for vulnerable groups. The type and the scope of these social services vary according to the different numbers and needs of people with disabilities living in the provinces and districts.

There is no provincial-level data on the population of people with disabilities living in Şanlıurfa. In Şanlıurfa, there are 2 institutions affiliated with The Ministry of Family and Social Services Şanlıurfa Provincial Directorate that provide special care for people with disabilities. These institutions are as follows:

- Şanlıurfa People with Disabilities Coordination and Living Centre
- Karaköprü Barrier Free Life Care and Rehabilitation Centre Directorate

Unemployed people and people living in poverty

According to the Labour Market Research Şanlıurfa Province 2022 Result Report by Turkish Employment Agency, as of September 2022, the number of registered unemployed people in Şanlıurfa is 97,765. 37.7% of this number consisted of women, and the unemployment rate of young people aged 18-24 is 30.3 per cent (Turkish Employment Agency, 2022). It can be said that the number of registered unemployed people has increased compared to the 2021 number of 90,524 (Turkish Employment Agency, 2021). However, the percentage of unemployed younger population has decreased from 40.2% in 2021 to 30.3% in 2022 despite the increased number of registered unemployed people.

As of January 2023, the poverty line is determined as 30,379 TRY, and the hunger threshold is 8,782 TRY. The persistent at-risk-of-poverty rate, calculated using four-year panel data, includes individuals who have been poor at 60% of equivalent household disposable median income in the last year and for at least two of the previous three years. According to 2021 Income and Living Conditions Survey Regional Results, the persistent at-risk-of-poverty rate increased by 0.1 percentage points compared to the previous year and became 13.8% in Turkey (TURKSTAT, 2022). TRC2 Region (Şanlıurfa, Diyarbakır) has the ratio of relative at-risk-of-poverty-rate is 13.44%.

6.2.6.3 Village and Neighborhood Level

The number of individuals identified as vulnerable in the villages through the HHS is presented in the table below.

Table 6-49: Vulnerable groups in the V/Ns

District	Settlement	Illiterate	Cannot speak Turkish	Seasonal worker	Mobile beekeeper	Refugee	Woman headed households	Living with social aid	At education age but not involved in education	Bedridden Patients	Living alone over 70 years old	People with physical disabilities	People with mental disabilities	Earthquake victims	Persons engaged in unauthorized agricultural activities on public lands	Persons with unauthorized structures on public lands (house, workplace, barn, hut, etc.)
Viranşehir	Kadıköy	100	100	350 (household)	1 (household)	0	2	Unknown	0	5	5	1	6	0	38 households use treasury land for agricultural activities	0
	Gölcük	200	0	200	0	0	5	0	0	6	7	10	2	0	0	0
Derik	Demirli	10	0	350	0	0	0	0	0	0	0	5	0	0	There are farmers on public land, but the number is unknown	
	Subaşı	5	80	150	0	0	6	50	0	0	0	2	0	0	0	

6.2.7 Education

6.2.7.1 Introduction

This section provides baseline information on the Project impact area, including education facilities and personnel, quality of the education, literacy levels, access to higher education and local challenges. Baseline information is presented from the provincial to the Project impact level. The secondary sources and the Ministry of Education's Reports are used for the provincial and district level data and primary information is used for the village level education baseline.

6.2.7.2 Province and District Level

Education facilities and personnel

According to the National Education Statistics Formal Education 2021/2022 data by the Ministry of National Education, there are 3680 schools, 728.422 students, 34.718 teachers and 23.058 classrooms in Şanlıurfa. The selected education indicators of the province are presented in the table below.

Table 6-50: Formal Education Indicators of Şanlıurfa

2021-2022 Academic Year	Public	Private
Total Number of Students	696,426	31,996
Total Number of Teachers	32,324	2,394
Total Number of Schools	3,475	205
Total Number of Classrooms	20,813	2,245
Number of Schools with Boarding Houses	95	0
Number of Boarding Students	15,565	0
Preschool		
Number of Students	64,068	2,513
Number of Teachers	2,497	228
Number of Schools	1,307	77
Number of Classrooms	1,977	273
Number of Students Falling to Schools	49	32
Number of Students Falling to Teachers	25	11
Number of Students Falling on The Classroom	32	9
Primary school		
Number of Students	249,475	3,089
Number of Teachers	10,983	261
Number of Schools	1,253	24
Number of Classrooms	8,516	274

2021-2022 Academic Year	Public	Private
Number of Students Falling to Schools	198	128
Number of Students Falling to Teachers	22	11
Number of Students Falling on The Classroom[14]	30	11
Lower Secondary School		
Number of Students	225,431	4,803
Number of Teachers	12,576	436
Number of Schools	743	33
Number of Classrooms	6,464	432
Number of Students Falling to Schools	289	145
Number of Students Falling to Teachers	17	11
Number of Students Falling on The Classroom[15]	30	11
General Secondary Education (High School)		
Number of Students	116,070	10,836
Number of Teachers	3,668	888
Number of Schools	92	54
Number of Classrooms	2,228	743
Number of Students Falling to Schools	600	200
Number of Students Falling to Teachers	19	12
Number of Students Falling on The Classroom	30	14
Vocational and Technical Secondary Education		
Number of Students	41,382	10,755
Number of Teachers	2,600	581
Number of Schools	80	17
Number of Classrooms	1,628	523
Number of Students Falling to Schools	491	632
Number of Students Falling to Teachers	15	18
Number of Students Falling on The Classroom	22	20

[14] Since primary and lower secondary school students can study in the same school and use the same class, the number of students per classroom is calculated jointly.

2021-2022 Academic Year	Public	Private
Special Education	**Public + Private**	
Number of Students (Primary School)	964	
Number of Students (Lower Secondary School)	600	
Number of Allocated Classrooms (Lower Secondary School)	228	
Number of Allocated Classrooms (Primary School)	408	
Transporting and Transported Education (Primary+Lower Secondary School)	**Public + Private**	
Number of Transporting Central Schools	857	
Number of Transported Schools and Transported Settlement Places without a School	2,738	
Number of Total Transported Primary School Students	24,243	
Number of Total Transported Lower Secondary School Students	36,497	
Transporting and Transported Education (Upper Secondary Education)	**Public + Private**	
Number of Transporting Central Schools	144	
Number of Transported Students (Upper Secondary Education)	24,813	

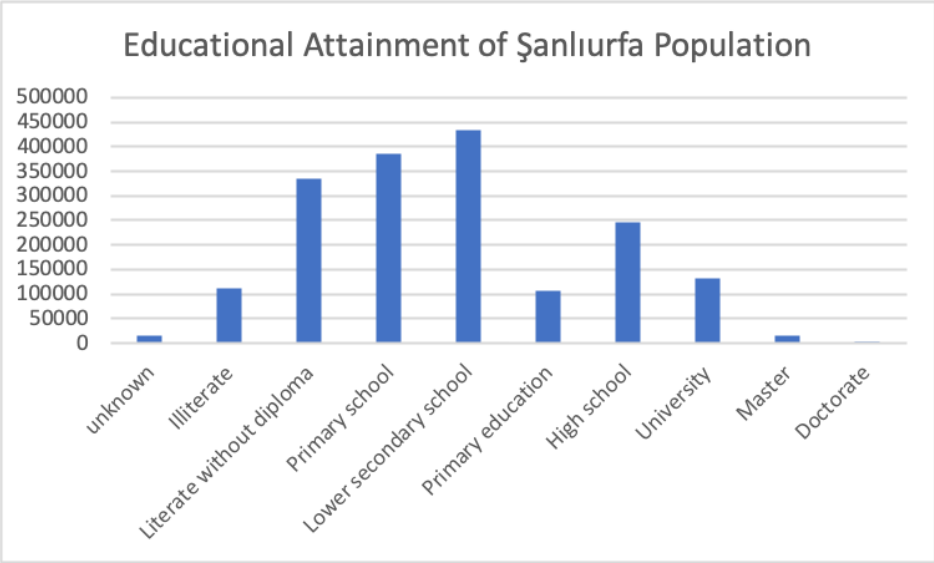
Source: The Ministry of National Education, 2022

Quality of education

No information and data are available on the quality of education at the district and province levels. There are international statistics available on the quality of education comparing different countries. Turkey ranks 36 among 41 OECD countries according to the OECD Better Life Index (OECD, 2022).

Literacy and education levels

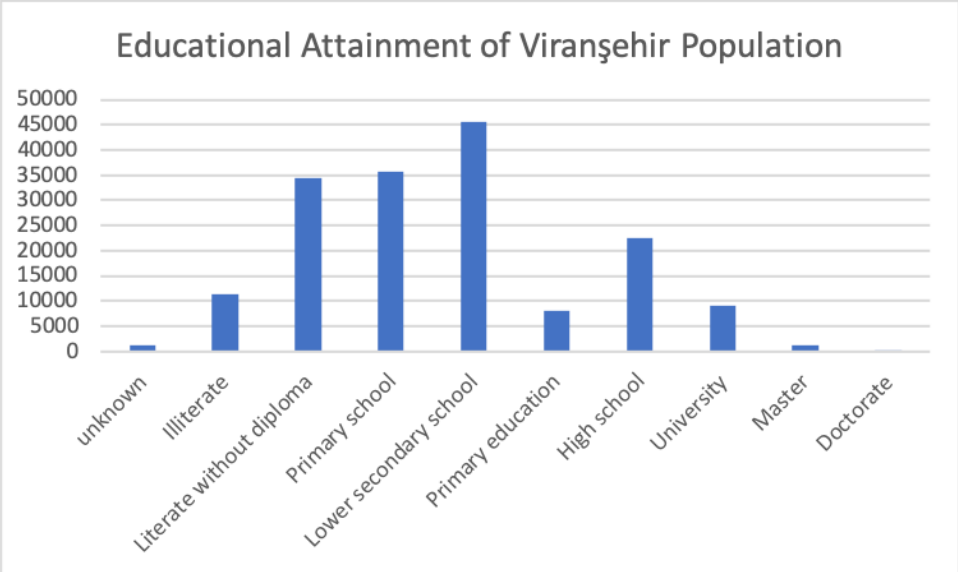
The proportion of both province and district population by literacy and educational levels are presented in the figures and tables below.



- In Şanlıurfa, lower secondary school graduates are the largest group of people in the province. Similar to the lower secondary school graduates, primary school graduates are also high. Also, literate group without group high.

Figure 6-34: Educational Attainment of Şanlıurfa Population

Source: (TURKSTAT, Population and Housing Census, 2022)



- Viranşehir has a similar picture to Şanlıurfa in terms of the educational attainment of the district population. While lower secondary school graduates are the highest in numbers, primary school graduates and literate without diploma group are also high.

Figure 6-35: Educational Attainment of Viranşehir Population

Source: (TURKSTAT, Population and Housing Census, 2022)

Access to higher education

Harran University is the only university in the Şanlıurfa province. The total number of students as of 2021-2022 academic year is 25,995 and the total number of academics is 1,202. Established in 1992, the university has 14 faculties, 1 state conservatory, 3 institutes, 4 colleges and 14 vocational schools of higher education. There are 50 undergraduate and 139 graduate programs at the university. Viranşehir Health College and Viranşehir Vocational School located in the AoI, Viranşehir district.

6.2.7.3 Village and Neighborhood Level

Education facilities and personnel

The existence of schools in the villages/ were asked to Mukhtars during the field study. The schools and their proximity to the V/Ns are presented in the table below.

Table 6-51: Schools in the V/Ns

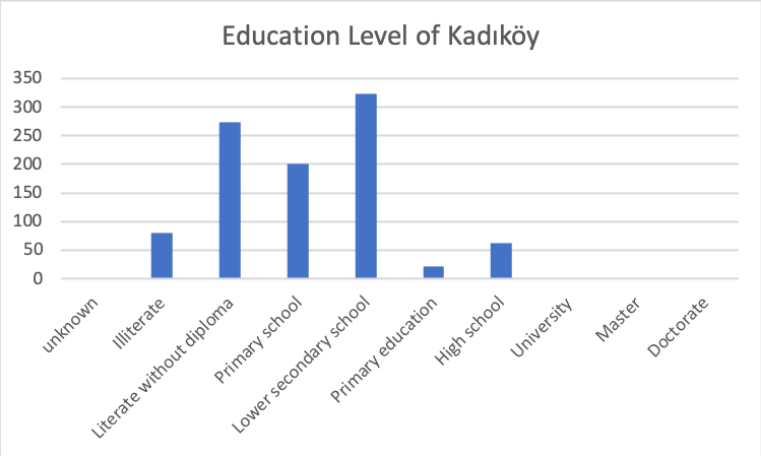
District	V/N	Does V/N have a preschool?	Nearest school and proximity	Does V/N have a primary school?	Nearest school and proximity	Does V/N have a lower secondary school?	Nearest school and proximity	Does V/N have a secondary school (high school)?	Nearest school and proximity
Viranşehir	**Kadıköy**	Yes		Yes		Yes		No	Viranşehir
	Gölcük	No	Yuvalıca 7 km	Yes		No	Yuvalıca 7 km	Yes	
Derik	**Demirli**	Yes		Yes		Yes		No	Pirinçli 18 km
	Subaşı	Yes		Yes		Yes		No	Pirinçli 3-4 km

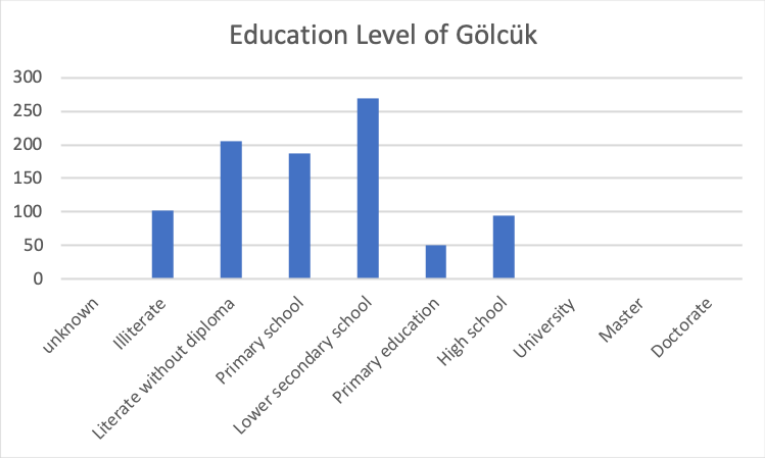
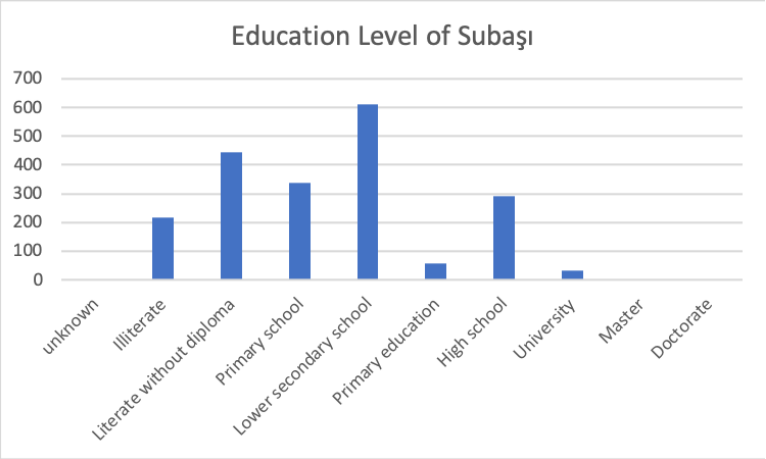
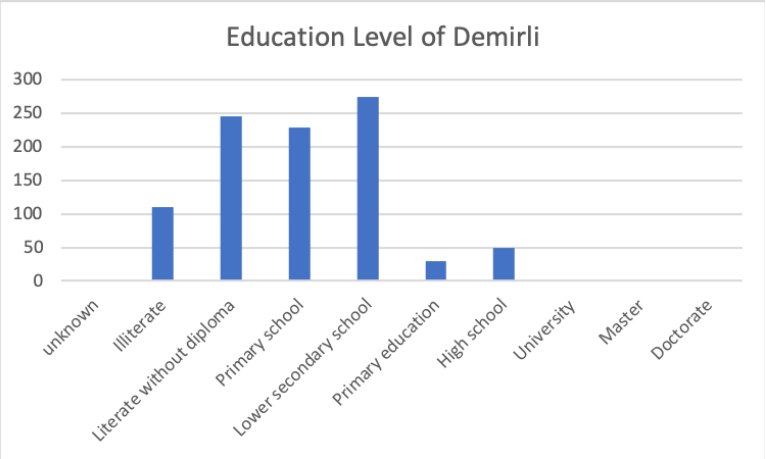
Transported education is the education carried out in villages with low populations and dispersed settlements by the daily transportation of students within the scope of compulsory education to central schools in larger settlements such as districts and provinces (The Ministry of National Education, 2022). Since there are preschool, primary and lower secondary schools in the village of Kadikoy, only secondary education students study with transported education. In the village of Gölcük, preschool and lower secondary school students study with transport education. In Demirli and Subaşı villages, only high school students study with transport education.

Education Levels

Education levels of the village population was gathered from both the TURKSTAT data and the Mukhtars provided in the table below.

Table 6-52: Education levels of the V/N population

District	V/N	Education Levels
Viranşehir	Kadıköy	

District	V/N	Education Levels
	Gölcük	
Derik	Subaşı	
	Demirli	

Source: (TURKSTAT, Population and Housing Census, 2022)

6.2.8 Health

6.2.8.1 Introduction

Health issues and facilities aim at identifying the main health determinants in the AoI, the presence of health structures and the level of service provided to local communities. This section aims to provide information on health indicators of Şanlıurfa, Viranşehir, and the local Area of Influence. The baseline information presented in this section has been gathered from key informant interviews and relevant secondary data.

6.2.8.2 Province and District Level

Healthcare facilities and personnel

According to the Provincial Heath Directorate of Şanlıurfa, 28 institutions provide health services in Şanlıurfa. The city has 13 State Hospitals, 5 Private Hospital, 4 Oral and Dental Health Centre, 2 Dialysis Centres, 2 Medical Centre, 1 University Hospital and 1 Training and Research Hospital. The total number of beds in the province is 4216. A total of 11,241 health personnel work in Şanlıurfa and there are 1.2 doctors per thousand people.

Some selected health-related statistics of Şanlıurfa Province are presented in Table 6-53.

Table 6-53: Health Indicators of Şanlıurfa

Health Indicators	Quantity
Number of Hospitals	20
Number of Bed	4,216
Number of Hospital Bed per 10,000 Population	19.7
Number of Qualified Bed	2,286
Number of Intensive Care Unit Bed	1,224
Proportion of Qualified Bed[16]	76.4
Intensive Care Unit Bed per 10,000 Population	5.7
Number of Family Medicine Unit	660
Population per Family Medicine Unit	3,247

Source: (General Directorate of Health Service & General Directorate of Public Health, 2021)

There is one public hospital located in the Viranşehir district:

- Viranşehir State Hospital

6.2.8.3 Village Level

During the social field study, the quality of the healthcare services was questioned at the local level. It was informed that there are no primary healthcare units in the Kadıköy Village. During the mukhtar interviews, it was stated that there were no doctor visits to the village. Villagers go to Viranşehir to benefit from health services.

[16] Intensive care unit beds are not included.

6.2.9 Utilities, infrastructure, and services

6.2.9.1 Introduction

This section provides baseline information on infrastructure and services in the Project impact area, including housing, water sources, wastewater and sanitation, electricity, heating source, waste disposal, fire services, police service, telecommunication, transportation and public space and recreation. Infrastructure and services are key social components that allow having an understanding of the type of infrastructures present in the AoI, of the access for local communities and of the level of services provided. Baseline information is presented on Şanlıurfa and Viranşehir district located in the AoI through the information gathered through the secondary and the primary data.

6.2.9.2 Province and District Level

Housing

The data for the building permit statistics of the Şanlıurfa Province according to Building Permit Statistics, I. Quarter: January-March (2023) is presented in the table below.

Table 6-54: Data for the Building Permit Statistics of the Şanlıurfa Province

Number of Buildings by Building License	Number of Flats by Building License	Total floor area According to Building License (m^2)	Number of Buildings by Occupancy Permit	Number of Flats by Occupancy Permit	Total floor area According to the Occupancy Permit
75	815	206,977	159	1935	380,146

Source: (TURKSTAT, Building Permit Statistics, I. Quarter: January-March, 2023)

Other detailed data about the housing of the Şanlıurfa province is also presented in the tables below.

Table 6-55: Number of Households by Ownership Status of Housing Unit

Province	Number of households residing in dwellings	Owner (%)	Tenant (%)	Other (%)	Unknown
Şanlıurfa	411,421	66.6	24.9	7.7	0.8

Source: Turkish Statistical Institute, 2021

Table 6-56: Number of Households by Number of Rooms in the Housing Unit

Province	Number of households residing in dwellings	Average number of rooms in dwellings	Number of Rooms (%)			
			1-2	3	4	5+
Şanlıurfa	411,421	3.6	8.1	33.6	45.2	13.1

Source: Turkish Statistical Institute, 2021

Water sources (drinking, utility, irrigation)

The water sources are divided into surface water and groundwater. Streams, natural lakes, ponds and reservoirs are surface waters. According to the Environmental Status Reports, some selected stream data of Şanlıurfa province is presented in the table below.

Table 6-57: Rivers of Şanlıurfa Province

Stream Name	Flowrate (m^3/sec)
Diphisar Stream	0.116
Karatepe Stream	0.516
Sırrın Creek	0.126
Hamdun Creek	0.086
Bulaklı	0.198
Balıklıgöl	0.116
Çiçekalan Stream	0.018
Ayran	0.015
Fıstıközü Stream	0.015
Büyükgöl	0.023
Hacıkamil Creek	0.661
Hacıhıdır Creek	0.639
Kahnik Creek	0.198
Küçükgöl	0.023
Üçpınar Stream	0.038
Bentbahçesi	0.147
Narlıkaya	0.023
Bucak	0.075
Güllüce	0.018
Balluca	0.030
Karahisar	0.868
Y.Girlavik	0.107
Fırat Stream	950

Source: Şanlıurfa Province Environmental Status Report, 2021

According to the Şanlıurfa Province 2021 Year Environmental Status Report (2022), for the drinking and utility water of the district centres, 115,393,000 m³/year water is supplied from Atatürk Dam Pond and 115,167,000 m³/year water is supplied from underground wells (including caisson wells).

According to the 2022 Environmental Status Report, there are 4 Organised Industrial Zones in Şanlıurfa: Şanlıurfa Birecik Organised Industrial Zone, Şanlıurfa Central Organised Industrial Zone, Siverek Organised Industrial Zone, Viranşehir Organised Industrial Zone. Only Viransehir Organised Industrial Zone is active.

Wastewater and Sanitation

Drinking and wastewater services are provided throughout Şanlıurfa. For this purpose, 1 central drinking water treatment plant and a total of 4 wastewater treatment plants in the districts (Akçakale, Hilvan, Siverek,

Bozova) are actively operated. Works on the construction of drinking water treatment plants in other districts (Birecik, Ceylanpınar, Suruç, Viranşehir, Halfeti, Harran) are ongoing.

Table 6-58: Wastewater Recovery and Reuse in Şanlıurfa in 2021

WASTEWATER DISPOSAL AFTER TREATMENT							
Amount of wastewater discharged to receiving bodies (m^3/year)	Amount of wastewater discharged to sewerage system (m^3/year)	Municipal Reuse (m^3/year)	Agricultural Reuse (m^3/year)	Industrial Reuse (m^3/year)	Environmental/Ecological Reuse (m^3/year)	Water Supply to Another Facility (m^3/year)	Total (m^3/year)
67,106,440	30,000	0	0	425,340	22,750	0	67,584,530

Source: (Ministry of Environment, Urbanization and Climate Change, 2022)

The infrastructure data for wastewater, drinking water, potable water, and sanitation of the Şanlıurfa province as of 2020 are presented in the tables below.

Table 6-59: The Infrastructure Data for Wastewater and Sanitation of Şanlıurfa Province

The number of wastewater treatment plants	The ratio of Municipal Population Provided with Wastewater Treatment Service to Total Municipal Population (%)	Daily wastewater treatment amount per person (L/cap.day)	The ratio of Municipal Population Provided with Sewage Service to Total Municipal Population (%)
4	44.1	186	65

Source: Turkish Statistical Institute, 2020

Table 6-60: The Infrastructure Data for Drinking and Potable Water and Sanitation of the Şanlıurfa province

The number of drinking and potable water treatment plants	The ratio of Municipal Population Provided with Drinking and Potable Water Network to Total Municipal Population (%)	Total Amount of Water Drawn for Drinking and Potable Water Network (Thousand M3/Year)	The ratio of Municipal Population Provided with Drinking and Potable Water Treatment Services to Total Municipal Population (%)	The amount of Water Treated in Drinking and Potable Water Treatment Plants (Thousand M^3/Year)
1	95	125,109	68	90,109

Source: Turkish Statistical Institute, 2020

Electricity

Turkey Electricity Distribution Inc. (TEDAŞ) is the state economic enterprise responsible for the distribution and retail sale of electrical energy in Turkey. TEDAŞ consists of a central organization and a provincial organization. TEDAŞ provincial organization was privatized by dividing it into 21 regional electricity distribution companies. For the Şanlıurfa Province, the supply and the distribution company is Dicle Electricity Distribution Inc. Co. (DEPSAŞ).

Dicle Electricity Distribution Inc. Co. provides 23.2 billion kWh of electricity distribution service to its 1.75 million subscribers in 6 provinces and 68 districts, including Şanlıurfa, Diyarbakır, Mardin, Batman, Siirt and Şırnak.

The total electricity consumption is 6,304,821 megawatt-hour (MWh), and the total electricity consumption per capita is 2,942 kilowatt-hours (Kwh) in the Şanlıurfa province (TURKSTAT, Energy Statistics, 2021).

Heating source

According to the Natural Gas Sector Report for 2022 of the Energy Market Regulatory Authority, in 2022 the national natural gas consumption amount was 53,521.06 million standard cubic meters (Sm^3) in Türkiye.

In 2022, 210.601 million Sm^3 of pipe gas, 4.291 million Sm^3 of liquefied natural gas (LNG), 2.109 million Sm^3 of Compressed Natural Gas (CNG), and a total of 217.002 million Sm^3 of natural gas were consumed in Şanlıurfa (Energy Market Regulatory Agency, 2022).

Waste disposal

There is one Central Solid Waste Landfill Facility in Şanlıurfa. This facility receives 1,200 tonnes of domestic waste on a daily average.

The number of waste treatment facilities in Şanlıurfa province as of 2021 is presented in the table below.

Table 6-61: Waste Management Facilities inŞanlıurfa

Facility Type	Number
Landfill (Municipality)	1
Licensed Packaging Waste Collection, Separation and Recycling Facilities	7
Hazardous Waste Recovery Facilities	0
Waste Oil Recovery Facility	1
Vegetable Waste Oil Recovery Facility	0
Waste Battery and Accumulator Recovery Facility	0
End-of-life Tire Recovery Facility	0
End-of-Life Vehicle Temporary Storage Areas	0
End-of-Life Vehicle Processing Facility	0
Medical Waste Sterilisation Facility	1
Non-Hazardous Waste Recovery Facility	5
Waste Electrical and Electronic Equipment Processing Facility	0
Mine Waste Disposal Facility	0

Source: (Provincial Directorate of Environment, Urbanization and Climate Change, 2022)

Fire service

According to the Laws of Municipalities, it is the duty of municipalities to establish fire organizations. Under this law, Municipality of Şanlıurfa and district municipalities has fire organizations. According to the Şanlıurfa Municipality 2022 Year Activity Report, the Şanlıurfa Fire Department intervened a total of 9666 incidents in 2022, including 1458 fires, 433 traffic accidents, and 2094 live rescue.

The services provided by the Şanlıurfa Fire Department are as follows:

- Fire Fighting Service (Workplace, Housing, Vehicle, Factory, Warehouse, Stubble, Workshop fires etc.),
- Rescue Service (Response to incidents requiring rescue),
- Rescue in traffic accidents (The trapped casualty is rescued as quickly as possible and handed over to the medical teams),
- Rescue of all living beings (trapped animals such as cats, dogs, birds, etc.)
- Supporting all kinds of search and rescue in the field, above water and underwater
- First Aid Service
- Protection
- Response to floods (Water discharge, rescue, etc.) service
- Support service to rescue efforts in natural disasters and extraordinary situations.

Police

In Turkey, internal security is carried out by the general directorate of security and the police force affiliated with it. There is Şanlıurfa Provincial Police Department, and Viranşehir District Police Department. In addition, there are gendarmerie stations affiliated to the gendarmerie general command in areas outside the jurisdiction of the police, which is in service as Viranşehir District Gendarmerie Command in the Viranşehir district.

Telecommunications

Turkish Telecommunication Anonymous Company (Türk Telekom) was established by the state to provide telecommunication services to Turkey. It provides services in broadband internet, fixed telephone, mobile and digital TV broadcasts. Şanlıurfais also provided with the same services. In addition to Türk Telekom, Turkcell and Vodafone Türkiye are the other two main telecommunication companies that provide services in Türkiye.

Transport (incl. accidents) and road infrastructure (port and harbours, airport)

Highway

Şanlıurfa is affiliated with the 9th Regional Directorate of Highways, which has a coverage area of 60,395 km² and includes Diyarbakır, Siirt, Batman, Şırnak, Mardin and Şanlıurfa provinces within its borders. According to the website of the 9th Regional Directorate of the General Directorate of Highways, 146 km motorway, 2045 km state road, 2659 km provincial road, and a total of 4850 km of road are within the region of responsibility of the 9th Regional Directorate of Highways. The population of the region is 6,368,771, and there are 106 people per km².

Table 6-62: Road Network in Şanlıurfa Province

Road Network by Surface Type (km)								
	Asphalt Roads			Parquet	Stabilize	Soil	Other Roads	Network Length
	Asphalt Concrete	Surface Coating	Total					
Motorway	146	-	146	-	-	-	-	146
State Road	1029	954	1983	10	-	-	52	2045
Provincial Road	357	1913	2270	40	21	48	280	2659
Total	1532	2867	4399	50	21	48	332	4850

Source: (General Directorate of Highways, 2023)

Railway

Şanlıurfa city centre does not have a railway connection. Following the Turkey-Syria border, the Mersin-Adana railway line to Nusaybin is 60 km from the Şanlıurfa province.

Airway

Şanlıurfa GAP airport is the only airport in Şanlıurfa. The distance to the city center is 35 km. The apron capacity is 8 aircraft and it provides service with a 12.000 m2 terminal building.

Public space and recreation

According to the latest data of Turkish Statistical Institute (Library and Museum Statistics, 2021), in Şanlıurfa as of 2021 there are:

- 4 theatres with a total of 2380 seats
- 26 cinema halls with a total of 2867 seats
- 12 Public libraries with a total of 233,085 books inside
- 2 museums affiliated with the Ministry of Culture and Tourism with a total of 62,962 artifacts
- 2 private museums
- 3 ruins

According to the Şanlıurfa Province 2021 Year Environmental Status Report (2022) there is a national park in the Harran district of Şanlıurfa, which is Tek Tek Dağları National Park; also in Şanlıurfa, there is a natural park in the Karaköprü district, which is Gölpınar Natural Park.

6.2.9.3 Village Level

The existence and sufficiency of infrastructure, utilities, and services in the settlements derived from the results of the Community Level Surveys are presented in the table below.

Table 6-63: Infrastructure, utilities and services in the V/N

District	V/N	Electricity		Drinking water		Potable water		Irrigation water		Sewage system		Heating source		Waste disposal		Telecommunication services		Internet		Roads		Health units		School		Mosque		Cemetery		Transportation	
Viranşehir	Kadıköy	Yes	IN	Yes	S	Yes	S	No	-	No	IN	Stove	S	Yes	S	Yes	IN	Yes	S	Yes	IN	No	IN	Yes	S	Yes	S	Yes	S	No	IN
	Gölcük	Yes	IN	No	IN	Yes	IN	Yes	IN	No	IN	Stove	IN	No	IN	No	IN	No	IN	Yes	IN	No	IN	Yes	IN	Yes	IN	No	IN	No	IN
Derik	Demirli	Yes	IN	Yes	IN	Yes	IN	Yes	IN	Yes	IN	Stove	IN	No	IN	Yes	IN	No	IN	Yes	IN	No	IN	Yes	S	Yes	IN	Yes	S	No	IN
	Subaşı	Yes	IN	No	IN	Yes	IN	Yes	IN	No	IN	Stove	IN	No	IN	Yes	IN	No	IN	Yes	S	Yes	IN	Yes	S	Yes	IN	Yes	S	No	IN

*S: Sufficient; IN: Insufficient

Kadıköy

- Irrigation water is extracted from wells. Electricity is used to extract water from the well. In this process, there are electricity cuts in the village to reduce the electricity load.
- There is no sewerage system in the village.
- Düzük hamlet of Kadıköy village is the area that will be most affected by the Project. There are telecommunication problems in Düzük hamlet.
- In the village, the roads are not sufficient.
- There is no health centre in the village. There is also no doctor visit to the village. Therefore, they go to Viranşehir district, 24 km away, to benefit from health services.
- There are no public transportation services in the village. There are public transportation services only in the Düzlük hamlet, but they move if they reach enough people, so there are public transportation problems.

Gölcük

- Electricity cuts are very frequent in the village of Gölcük.
- There is no drinking water service in the village, as the existing drinking water in the village is not of drinking quality. Although there are utility water and irrigation water to be used, they are not sufficient.
- There is no sewerage system.
- The source of heating in the village is stove. However, it is stated that the heating sources are not sufficient.
- Waste in the village is not collected by the municipality.
- There is no internet infrastructure in the village. The telecommunication system is also not sufficient.
- The roads in the village are not sufficient.
- There is no health unit in the village. Visits to the doctor are very rare. Villagers go to Viranşehir to access the health system.
- There is a school in the village, but not for all levels of education. Some of the students go to school via transported education.
- It is stated that the mosque in the village is insufficient.
- There is no cemetery in the village. They use central cemeteries in the districts.
- There is no public transportation service in the village.

Demirli

- Electricity cuts are very frequent in the village of Demirli.
- There is drinking water, utility water and irrigation water in the village, but they are insufficient both in quantity and quality.
- The sewerage system is not sufficient in the village.
- The source of heating in the village is stove. However, it is stated that the heating sources are not sufficient.
- Waste in the village is not collected by the municipality.

- There is no internet infrastructure in the village. The telecommunication system is also not sufficient.
- The roads in the village are not sufficient.
- There is no health unit in the village.
- It is stated that the mosque in the village is insufficient.
- There is no public transportation service in the village.

Subaşı

- Electricity cuts are very frequent in the village of Subaşı.
- The village has no drinking water service, as the existing water is not of drinking quality. Although there are utility water and irrigation water to be used, they are insufficient both in quantity and quality.
- There is no sewerage system.
- The source of heating in the village is stove. However, it is stated that the heating sources are not sufficient.
- Waste in the village is not collected by the municipality.
- There is no internet infrastructure in the village. The telecommunication system is also not sufficient.
- The health unit is not sufficient.
- It is stated that the mosque in the village is not sufficient.
- There is no public transportation service in the village.

6.2.10 Cultural Heritage

The Project impact area for cultural heritage is defined as project footprint (including access roads). Impacts (if any) on cultural heritage may only occur in the Project footprint (including access roads) because of the overlapping of the Project components with archaeological heritages.

The official correspondences about cultural heritage assets are conducted during local EIA studies. An official letter was sent from Şanlıurfa Regional Directorate of Cultural Heritage and Museums in 10.10.2022. Accordingly, within the Project area,

- There is **no** element within the scope of Law No. 2863 in the area. In this direction, there is no objection to the construction of a G4- Viranşehir- 5,7,8 GES (195 MWp/65MWm/150MWe)projects by Kalyon Enerji Yatırımları A.Ş. in the area.
- However, in the event that any movable or immovable cultural property is found during the physical and construction activities to be carried out in the said area, the works should be stopped and the nearest civil Authority or the relevant museum directorate should be applied in accordance with Article 4 of the Law No. 2863.

Sensitivity assessment

Sensitivity features	Supported by	Sensitivity value
Absence of archaeological heritage in the AoI	Official Letters	Low

6.2.11 Visual Aesthetics

Visual aesthetics represent the visual appeal, the perception of beauty and therefore the likability of a subject. In this case the areas interested by the Project is referred, and visual aesthetic parameters are used as important indicators of the visual quality of these areas.

The project area and its surrounding are consisting of pastureland and village settlements. The general aesthetic state of Project area and its surroundings ranges from natural to modified. In order to determine baseline visual view of the visual receptors, 5 viewpoint is selected (see Table 6-64 and Figure 6-36). The pictures from these areas were taken towards to Project area (see Figure 6-37 - Figure 6-41)

Table 6-64: Selected Viewpoints

No	Description	Distance to the Project Area (km)
1	Düzlük Hamlet	0.25
2	Subaşı Hamlet	1.61
3	Demirli Neighborhood	1.43
4	Dereli Hamlet	2.78
5	Kadıköy Neighborhood	4.40

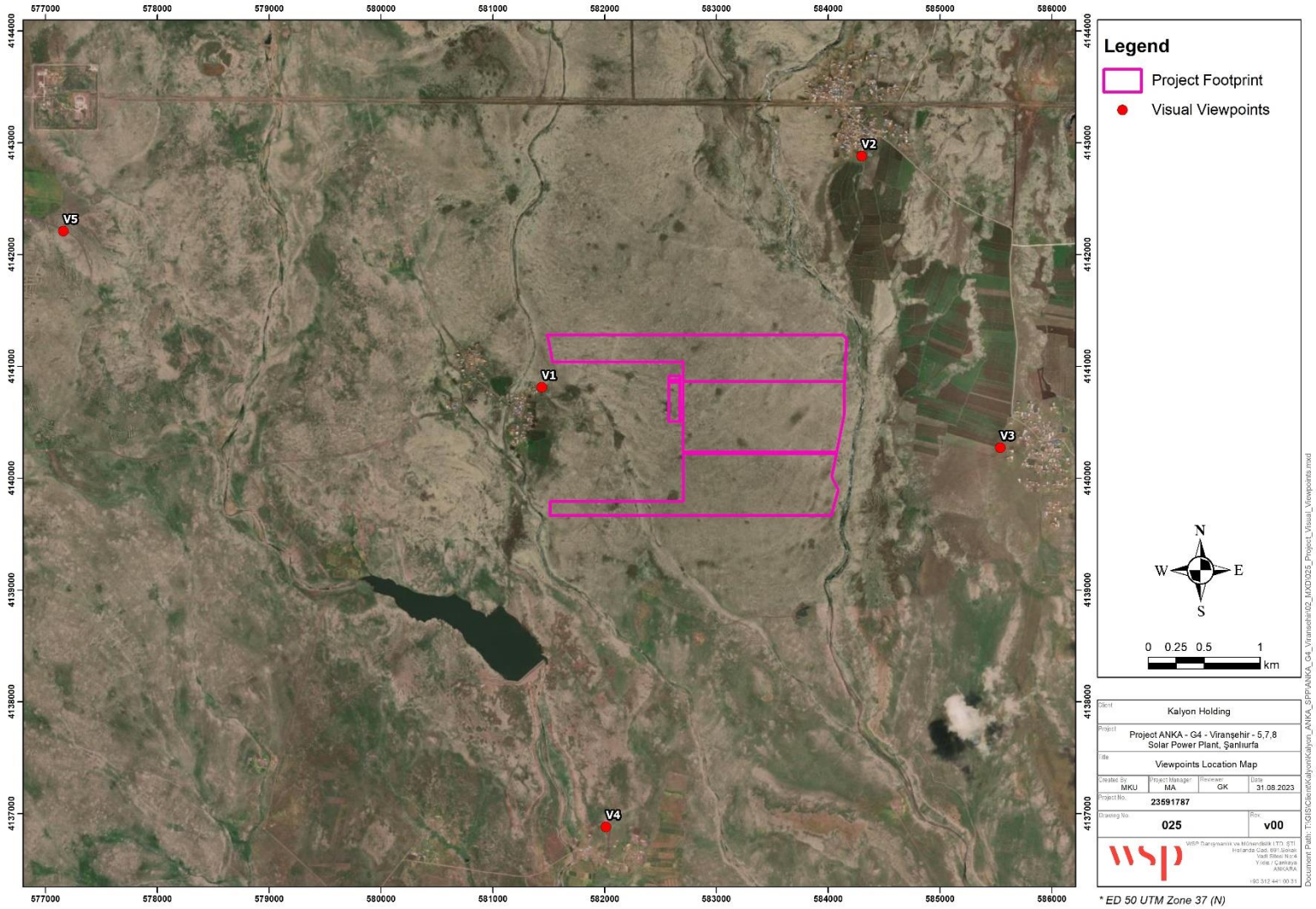


Figure 6-36: Selected Viewpoints

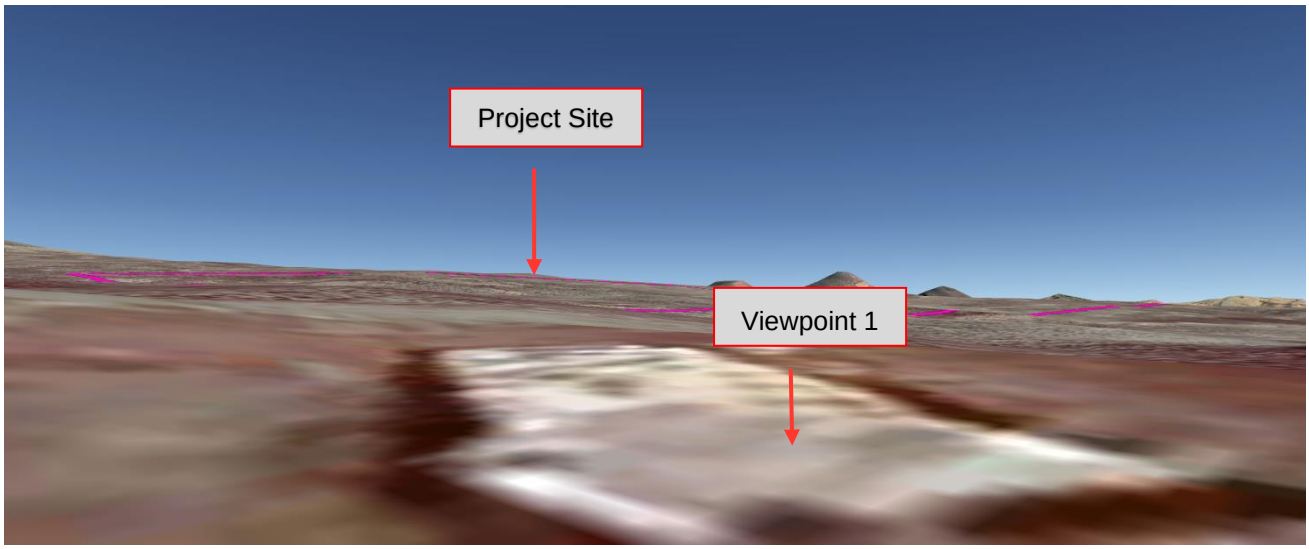


Figure 6-37: Project area View from Viewpoint 1

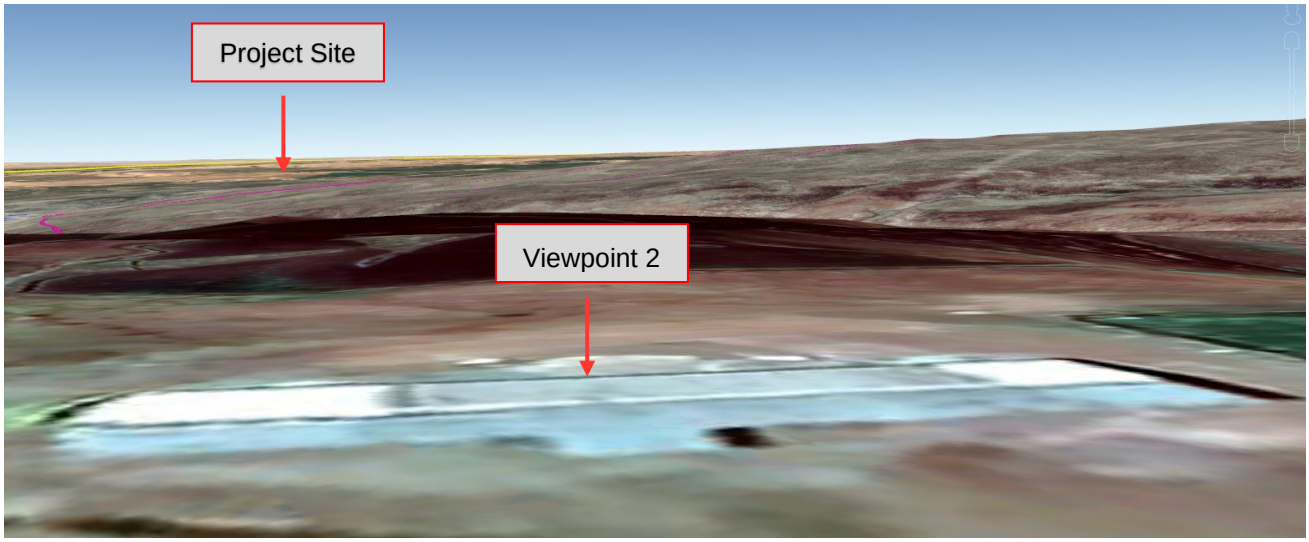


Figure 6-38: Project area View from Viewpoint 2

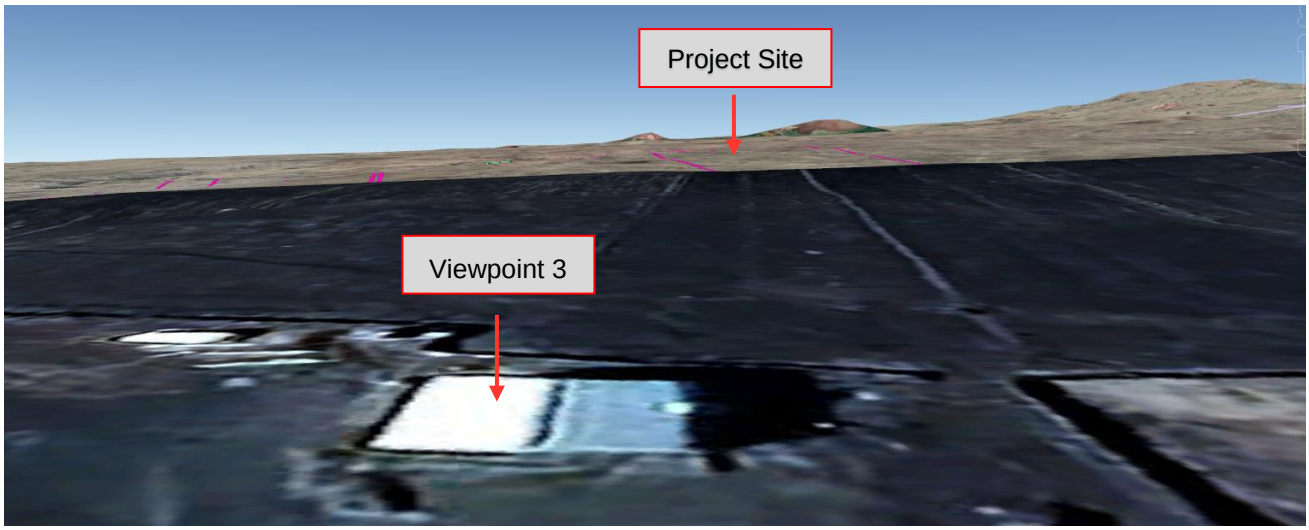


Figure 6-39: Project area View from Viewpoint 3

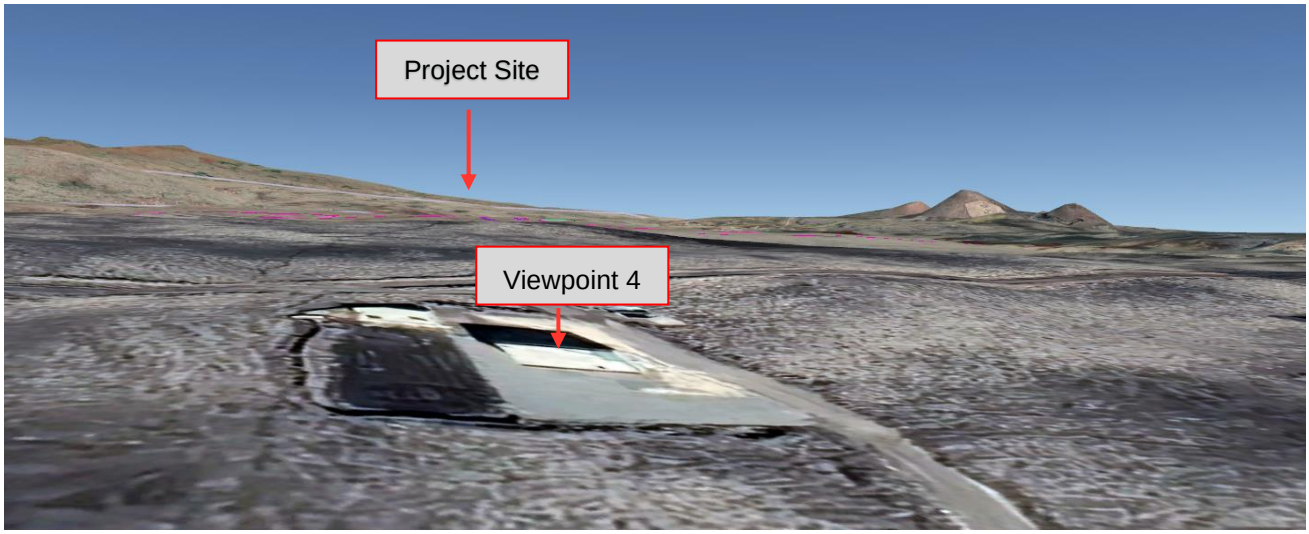


Figure 6-40: Project area View from Viewpoint 4

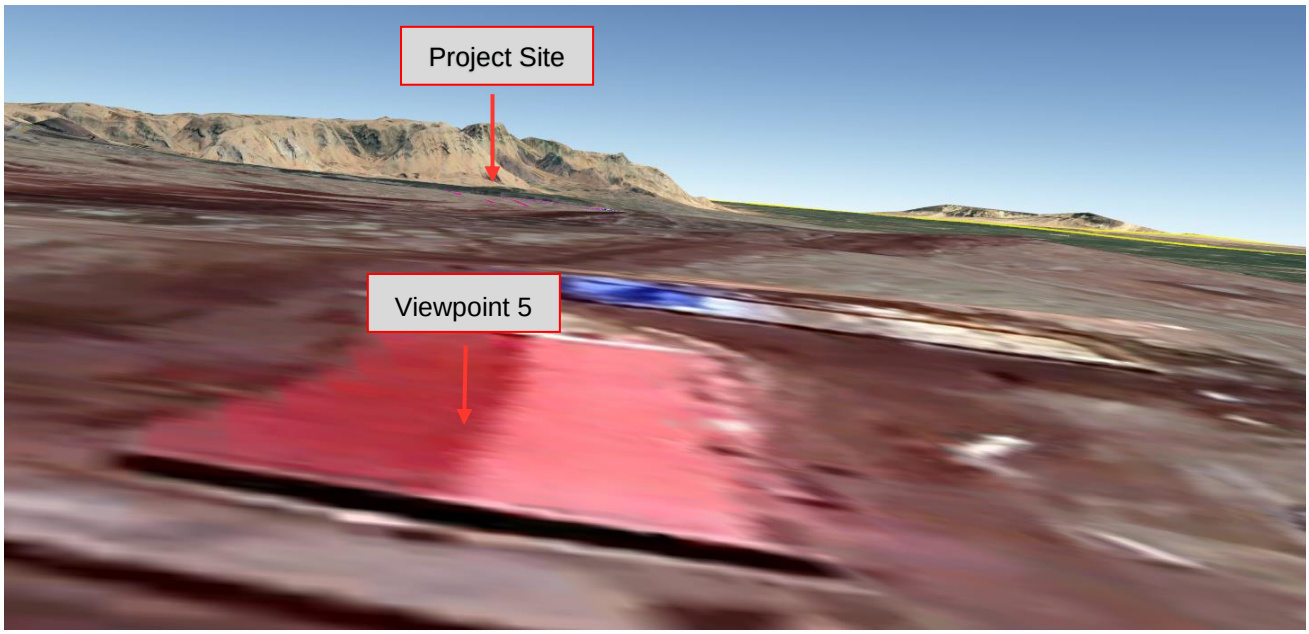


Figure 6-41: Project area View from Viewpoint 5

Sensitivity Assessment

The table below summarizes the analysis of sensitivity related to the Visual Aesthetics component.

Sensitivity features	Supported by	Sensitivity value
Presence of four settlement within 2 km of Project Area. Absence of areas of touristic interest within the visual zone of visual influence. Presence of roads and volume of traffic within the visual zone of visual influence.	Primary and Secondary data	Medium-Low

6.3 Biological Components

6.3.1 Study areas

Two types of study areas were identified for the assessment. A wider Regional Study Area was identified and considered during the initial literature review to assess the species and habitats potentially occurring within the vicinity of the project Area, while an Area of Influence more focused on the project area was identified for future detailed studies. These areas are described below.

6.3.1.1 Regional Study Area (RSA)

The biodiversity Regional Study Area (RSA) is a broad area surrounding the Project containing a geographically distinct assemblage of species, natural communities, and environmental conditions. For the baseline assessment, the RSA allows the use of a literature review to determine the species and habitats potentially occurring within and in the vicinity of the Project.

For this Project, a terrestrial RSA and a freshwater RSA have been identified based on a bio-geographic approach:

- the terrestrial RSA corresponding to the “Eastern Mediterranean Conifer-Sclerophyllous-Broadleaf Forests – PA1207” terrestrial ecoregion (Olson *et al.*, 2001[17]), which is part of the broader biome category “Mediterranean Forests, Woodlands and Scrub” ;
- the freshwater RSA corresponding to the Khabur River Basin, which is part of the “Lower Tigris and Euphrates - 441” freshwater ecoregion (Abell *et al.*, 2008[18]; Figure 6-43).

[17] Olson D., Dinerstein E., Wikramanayake E., Burgess N., Powell G., Underwood E., D'amico J., Itoua I., Strand H., Morrison J., Loucks C., Allnutt T., Ricketts T., Kura Y., Lamoreux J., Wettengel W., Hedao P., Kassem K. (2001). Terrestrial Ecoregions of the World: A New Map of Life on Earth. BioScience. 51. 933-938. 10.1641/0006-3568(2001)051[0933:TEOTWA]2.0.CO;2.

[18] Abell R., Thieme M., Revenga C., Bryer M., Kottelat M., Bogutskaya N., Coad B., Mandrak N., Balderas S., Bussing W., Stiassny M., Skelton P., Allen G., Unmack P., Naseka A., Ng R., Sindorf N., Robertson J., Armijo E., Petry P. (2008). Freshwater Ecoregions of the World: A New Map of Biogeographic Units for Freshwater Biodiversity Conservation. BioScience. 58. 403-414. 10.1641/B580507.

Figure 6-42: Biodiversity terrestrial Regional Study Area (RSA)

Figure 6-43: Biodiversity freshwater Regional Study Area (RSA)

6.3.1.2 Area of Influence (AoI)

The Project Biodiversity Area of Influence (AoI), defined as the area beyond which no detectable effects on biodiversity are expected, was designed as a 1 km buffer from the borders of the Project Site. The AoI also includes an appropriate area to support the design of a Biodiversity Management Plan (BMP). The AoI covers an extension of 1,565.88 ha within the provinces of Şanlıurfa and it is included in the wider RSA.

The AoI is illustrated in Figure 6-44.

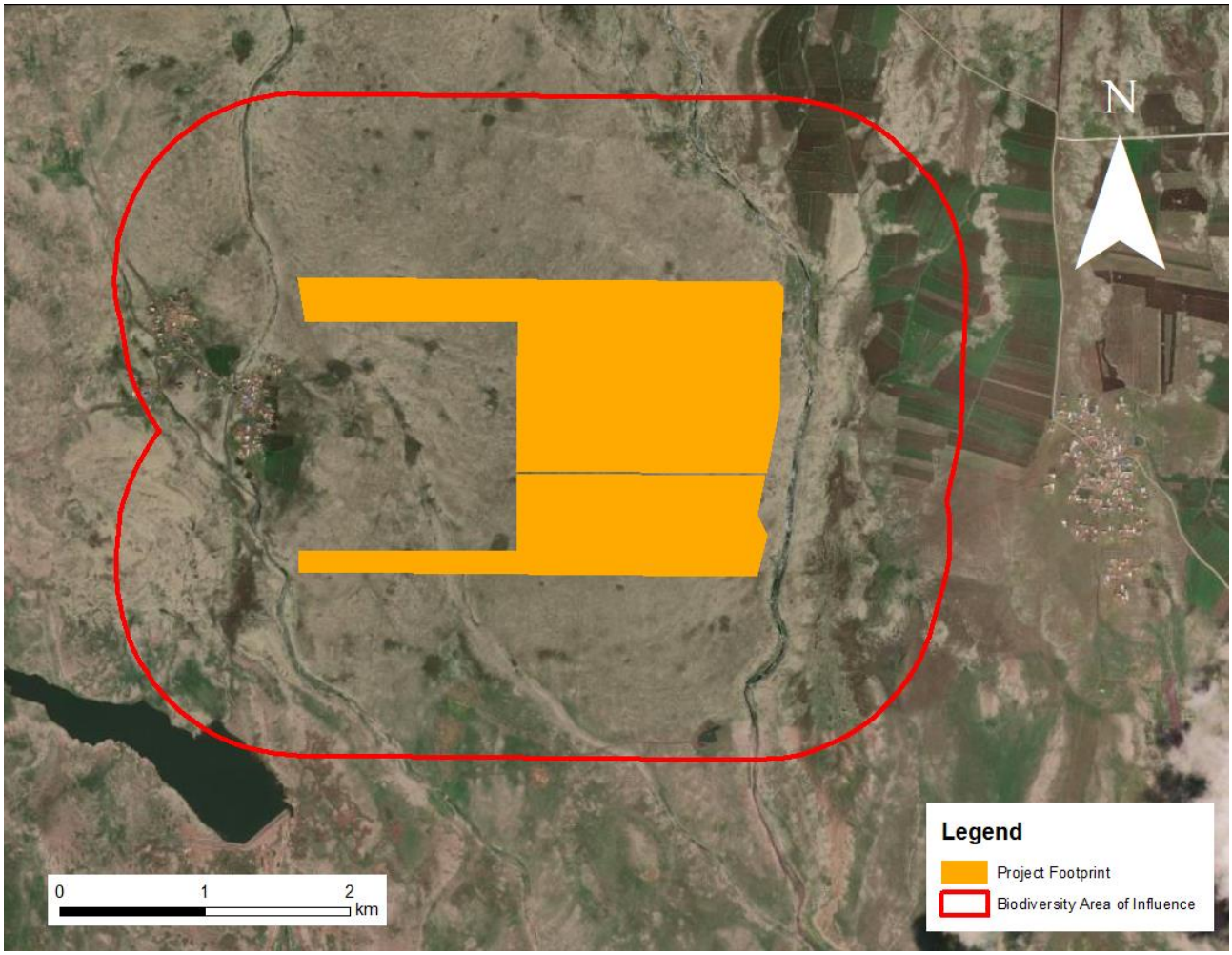


Figure 6-44: Biodiversity Area of Influence

6.3.2 Methodology

6.3.2.1 Desktop studies

The desktop studies conducted focused on the above defined RSA with the aim of gathering available data on terrestrial and freshwater species and habitats of conservation concern, including local and global distributional ranges, regional and global conservation statuses, ecological niches, phenology, life cycle, etc. Scientific literature and official websites were considered in order to give an overview of the biodiversity sensitive elements potentially present in the area. In addition, previous reports prepared for the Project were taken into consideration.

Habitat types were identified and mapped in the entire AoI at a fine scale (1:10,000) according to EUNIS classification based on satellite image and literature information, including Corine Land Cover. The procedure used for the habitat mapping was as follows:

1. A general land cover map was created using the Corine Land Cover 2018 v.2020_2021 available on the Copernicus website.
2. The CORINE Land Cover classes were converted into EUNIS Habitat using the highest possible definition level (level 3 at least) by analysing appropriate satellite imagery;
3. EUNIS habitat types were then categorized into modified or natural habitats according to PS6 (IFC, 2012).

Scientific publications and web sources considered are chronologically listed below.

- Scientific publications and other official publications used for desktop analysis:
  - Abell Robin *et al.* "Freshwater ecoregions of the world: a new map of biogeographic units for freshwater biodiversity conservation." *BioScience* 58.5 (2008): 403-414.
  - Baytop T. (1994). Turkiye Bitki Adları Sozlugu (Turkish Dictionary for Plant Names). Ataturk Kultur, Dil ve Tarih Yuksek Kurumu, Turkiye Dil Kurumu Yayınları: 578: Ankara.
  - Byfield A., Ataay S., Ozhatay N., (2010). Important Plant Areas in Turkey: 122 Key Turkish Botanical Sites. WWF Türkiye, Istanbul.
  - Davis P.H. (ed.). (1965-1988) Flora of Turkey and the East Aegean Islands, vol. 1-10, Edinburgh Univ. Press: Edinburgh.
  - Edmonson J. (2002) Türkiye bitkileri kırmızı kitabi (eğrelti ve tohumlu bitkiler)/Red Data Book of Turkish Plants (Pteridophyta and Spermatophyta). Edited by T. Ekim, M. Koyuncu, M. Vural, H. Duman, Z. Aytaç & N. Adıgüzel. Ankara: Turkish Association for the Conservation of Nature, and Van Centennial University. 2000. ix+ 246pp., 96 colour plates. ISBN 975 93611 0 8. (hardback). Edinburgh Journal of Botany, 59(3), 459-466.
  - Eken G., Bozdogan M., Isfendiyaroglu S., Kilic DT., Lise Y. (editors) 2006. Key Biodiversity Areas of Turkey, Nature Society, Ankara.
  - Ekim T. et al. (2000). Turkiye Bitkileri Kirmizi Kitabı (Red Data Book of Turkish Plants). Turkiye Tabiatını Koruma Dernegi. Yayın No:18.
  - Erdoğan C., Sevil S., Ronald F. (2015). Freshwater fishes of Turkey: A revised and updated annotated checklist. Biharean Biologist. 9. 141-157.
  - Erdoğan C., Ronald F., Sevil S., Soheil E. (2018). Endemic freshwater fishes of Turkey. 4. 1-39.
  - Kirwan G., Boyla, K., Castell P., Demirci B., Ozen M., Welch H., & Marlow, T. (2008). Birds of Turkey: A Study in the Distribution, Taxonomy and Breeding of Turkish Birds.
  - Krystufek B. & Vohralík V. (2005). Mammals of Turkey and Cyprus.
  - Kurnaz M. (2020). Species list of Amphibians and Reptiles from Turkey. Journal of Animal Diversity. 2. 10-32. 10.52547/JAD.2020.2.4.2.
  - Olson D. M., Dinerstein E., Wikramanayake E. D., Burgess N. D., Powell G. V. N., Underwood E. C., D'Amico J. A., Itoua I., Strand H. E., Morrison J. C., Loucks C. J., Allnutt T. F., Ricketts T. H., Kura Y., Lamoreux J. F., Wettengel W. W., Hedao P., Kassem K. R. (2001) Terrestrial ecoregions of the world: a new map of life on Earth. Bioscience 51(11):933-938
  - Takhtajan A. (1986) Floristic regions of the world. University of California Press, Berkley/Los Angeles/London.

- Wettengel W. W., Hedao P., Kassem K. R. (2001) Terrestrial ecoregions of the world: a new map of life on Earth. Bioscience 51(11):933-938.
- Wilson J. B., Peet R. K., Dengler, J., Pärtel, M. (2012) Plant species richness: The world records. Journal of Vegetation Science, 23(4), 796–802.
- Yaşar C., Çiçek K., Mulder J., Tok C. (2021). The distribution and biogeography of amphibians and reptiles in Turkey. North-Western Journal of Zoology.
- Zohary M. (1973) Geobotanical foundations of the Middle East, 2 vols. Gustav Fischer Verlag, Stuttgart.

- Web sources:
  - Birdlife International (http://www.birdlife.org/);
  - Bizimbitkiller.org.tr - Nezahat Gokyigit Botanical Garden Service (https://bizimbitkiler.org.tr/yeni/demos/technical/);
  - Data Basin – Terrestrial Ecoregions of the World (https://databasin.org/datasets/68635d7c77f1475f9b6c1d1dbe0a4c4c/);
  - Doğa dernegi (https://www.dogadernegi.org/);
  - EIONET Forum – Reports on European Red List of Habitats (https://forum.eionet.europa.eu/european-red-list-habitats/library) ;
  - European Environment Agency (https://eunis.eea.europa.eu/index.jsp);
  - FishBase ver. 02/2023 (https://www.fishbase.se/search.php);
  - Freshwater Ecoregions of the World (http://www.feow.org/);
  - Invasive Species Specialist Group (http://issg.org);
  - IUCN World Database on Protected Areas (https://www.iucn.org/theme/protected-areas/our-work/parks-achieving-quality-and-effectiveness/world-database-protected-areas-wdpa);
  - IUCN Red List of Threatened Species (https://www.iucnredlist.org);
  - Plantlife – Important Plant Areas (https://www.plantlifeipa.org/home);
  - Royal Botanic Gardens Kew – Plants of the World Online (https://powo.science.kew.org/);
  - World Database of Key Biodiversity Areas (http://www.keybiodiversityareas.org/site/mapsearch);
  - World Database on Protected Areas (http://www.protectedplanet.net/);
  - WWF database for ecoregions and biomes (https://www.worldwildlife.org/);
  - The Cornell Lab of Ornithology – Birds of the World (https://birdsoftheworld.org/bow/home);
  - Turkish Plants Data Service (TÜBİVES) - Version 2.0 BETA (http://194.27.225.161/yasin/tubives/index.php).

6.3.2.2 Additional field studies

Due to the social sensitivity at site, it was not possible to perform any of the planned field surveys during Spring and Summer 2023. Therefore, all the information included in the present Baseline assessment and all the

information used for the development of the Critical Habitat assessment reported in section 6.3.4 was obtained through desktop studies. For this reason, it is essential to highlight the unavoidable partiality of the results within the present assessment and to conclude that the performance of additional field studies in the next future will be of fundamental importance.

The additional field studies will be conducted in Spring and Summer 2024, and they will focus on the following components:

- terrestrial flora and habitats;
- terrestrial fauna;
- freshwater habitats;
- freshwater fauna.

For terrestrial flora, habitats, and fauna survey a total of 8 sampling points (SPs) has been defined. The list of the SPs with relative coordinates (WGS84 – UTM Zone 37N) is presented in Table 6-65 and their location is shown in Figure 6-45. Each SP was selected in order to include different habitats and to identify the flora and vegetation structure of the Project area, potential critical flora and fauna species, and potential critical habitats. Areas consisting of natural habitats and critical species were given priority sampling points selection.

At each SP a detailed survey will be performed, with the aim to collect data and information on the flora and fauna species which could be present in the area surrounding the selected SP. In addition, at each SP EUNIS habitat categories will be verified on the ground, with regards to the definition of Natural Habitats and Modified Habitats (IFC 2012, PS6). This survey will be performed in June, during the flowering period, in order to collect also data on the phenology of the flora species present.

Table 6-65: Terrestrial flora, habitats, and fauna sampling points and relative coordinates

ID	Coordinates (Decimal Degrees, WGS84 - UTM Zone 37N)	
	Longitude	Latitude
SP01	39.924014	37.399293
SP02	39.930825	37.399005
SP03	39.937945	37.402080
SP04	39.934833	37.406434
SP05	39.935405	37.412105
SP06	39.924493	37.412343
SP07	39.925007	37.408586
SP08	39.928617	37.402807

For freshwater fauna and habitats survey a total of 2 SPs has been defined. The list of the SPs with relative coordinates (WGS84 – UTM Zone 37N) is presented in Table 6-66 and their location is shown in Figure 6-45. The location of the SPs was chosen so to cover the extent of the freshwater surface within the AoI, in order to identify the different freshwater habitats and to identify critical freshwater fauna species present in the AoI, in particular focusing on the vertebrate fauna (i.e., freshwater fishes). Areas consisting of natural habitats and critical species were given priority sampling points selection.

At each SP a detailed survey will be performed, with the aim to collect data and information on the freshwater vertebrate fauna species which could be present in the area surrounding the selected SP. In addition, at each SP EUNIS habitat categories will be verified on the ground, with regards to the definition of Natural Habitats and Modified Habitats (IFC 2012, PS6). This survey will be performed twice, in Spring 2024 and in Autumn 2024, in order to gather information on all the fish species potentially present in the freshwater habitats within the Project AoI during the different seasons.

Table 6-66: Freshwater fauna and habitats sampling points and relative coordinates

ID	Coordinates (Decimal Degrees, WGS84 - UTM Zone 37N)	
	Longitude	Latitude
FW01	39.946432	37.418704
FW02	39.950353	37.394689

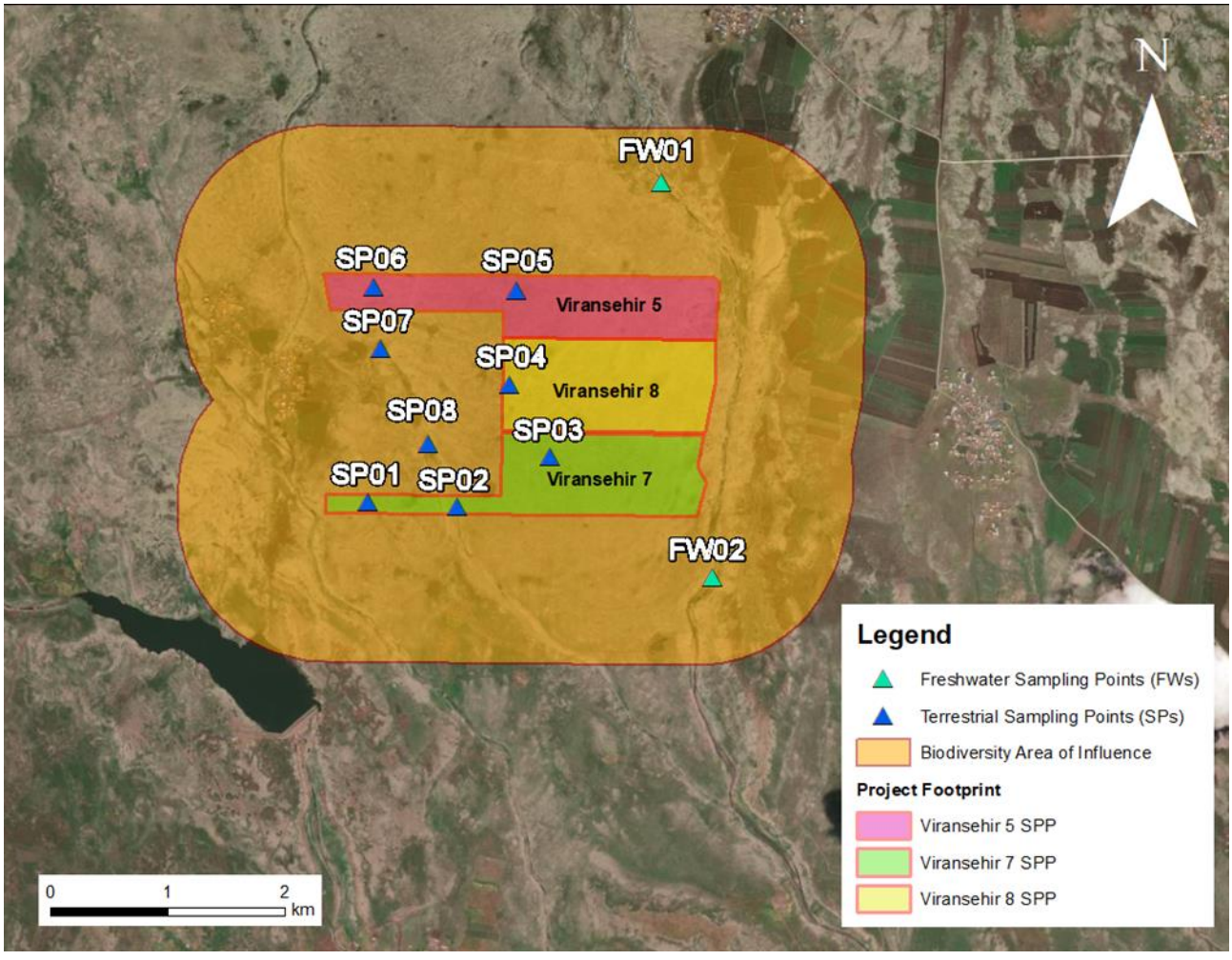


Figure 6-45: Location of flora, fauna and habitats sampling points

6.3.3 Results

6.3.3.1 Landscape overview

The Project AoI is located at an elevation ranging approximately between 760 m and 880 m a.s.l. within the "**Eastern Mediterranean Conifer-Sclerophyllous-Broadleaf Forests (PA1207)**" terrestrial ecoregion (Olson *et al.*, 2001[19]), which is part of the broader biome category "Mediterranean Forests, Woodlands and Scrub".

This terrestrial ecoregion covers South-eastern Türkiye, but also portions of Syria, Iraq, Lebanon, Israel, Palestinian territories, and Saudi Arabia. The climate in this ecoregion is Mediterranean. In South-eastern Turkey, this ecoregion is bounded by mountains and forest ecoregions to the north, and deserts to the east and south. This terrestrial ecoregion includes different vegetation typologies, mainly broadleaf sclerophyllous shrublands (maquis and garrigue), pine forests, dry oak woodlands and steppes. In general, semi-desertic grasslands and steppe ecosystems are known as areas with high biodiversity (Wilson *et al.*, 2012)[20], since they could host endemic flora and fauna species. Although very rich in terms of biodiversity, steppe ecosystems in Türkiye are largely ignored in favour of forests, both in the protected area network and as a target by conservation organizations. Due to the lack of protection and recognition, steppe ecosystems in Türkiye are threatened by overgrazing, habitat loss due to conversion into arable land or forestry plantation.

In addition, the Project AoI is located within the "**Lower Tigris and Euphrates - 441**" freshwater ecoregion (Abell *et al.*, 2008[21]), but also at approximately 20 km from the border with the "Upper Tigris and Euphrates – 442" freshwater ecoregion (Abell *et al.*, 2008). Therefore, the AoI is located in an intermediate position in the Tigris-Euphrates River system. This River system is bounded by the Zagros Mountains to the south-east, the Persian Gulf to the south, the deserts of Arabia and Syria to the west, the northern Anatolia (430) and Western Transcaucasia (433) freshwater ecoregions to the north. Most of the "Lower Tigris and Euphrates" ecoregion is comprised of large marsh and lake areas that are surrounded by a flat landscape. The Tigris and Euphrates meander across the plain and end up partly as an inland delta with extensive marshes near the head of the Persian Gulf. On the contrary, in "Upper Tigris and Euphrates" ecoregion there are occasional smaller lakes, but no extensive marsh and lake habitats like those of the lower section of the river system.

The Project AoI is not located within the boundaries of any legally protected area or internationally recognized *area*. However, the AoI is located approximately at 8.6 km from Karacadağ Key Biodiversity Area (KBA) and Important Bird Area (IBA) (Figure 6-46). Other internationally recognized areas are all located at a distance higher than 20 km from the AoI.

Karacadağ KBA and IBA is located on abroad basaltic shield volcano, also known as "Mount Masia", with an elevation ranging between 850 to 1,981 m a.s.l. and an extension of 135,696 ha[22].This mountain includes wetlands, within a more desertic landscape context. Indeed, this area includes the most significant water sources in the *region*. There are a large number of springs on the southern side of Karacadağ, flowing towards Viranşehir and Şanlıurfa. The river Khabur, originating from a source at the southwestern slope of Karacadağ, flows into the Euphrates further south at Circesium. The only IBA trigger species is Lesser Kestrel (*Falco naumanni*, LC). The freshwater habitats in the area are severely threatened by agricultural expansion and intensification, but also by livestock farming and ranching.

[19] Olson D., Dinerstein E., Wikramanayake E., Burgess N., Powell G., Underwood E., D'amico J., Itoua I., Strand H., Morrison J., Loucks C., Allnutt T., Ricketts T., Kura Y., Lamoreux J., Wettengel W., Hedao P., Kassem K. (2001). Terrestrial Ecoregions of the World: A New Map of Life on Earth. BioScience. 51. 933-938. 10.1641/0006-3568(2001)051[0933:TEOTWA]2.0.CO;2.

[20] Wilson, J. B., Peet, R. K., Dengler, J., & Pärtel, M. (2012). Plant species richness: The world records. Journal of Vegetation Science, 23(4), 796–802.

[21] Abell R., Thieme M., Revenga C., Bryer M., Kottelat M., Bogutskaya N., Coad B., Mandrak N., Balderas S., Bussing W., Stiassny M., Skelton P., Allen G., Unmack P., Naseka A., Ng R., Sindorf N., Robertson J., Armijo E., Petry P. (2008). Freshwater Ecoregions of the World: A New Map of Biogeographic Units for Freshwater Biodiversity Conservation. BioScience. 58. 403-414. 10.1641/B580507.

[22] Karacadağ Key Biodiversity Area – Source: https://www.keybiodiversityareas.org/site/factsheet/24085

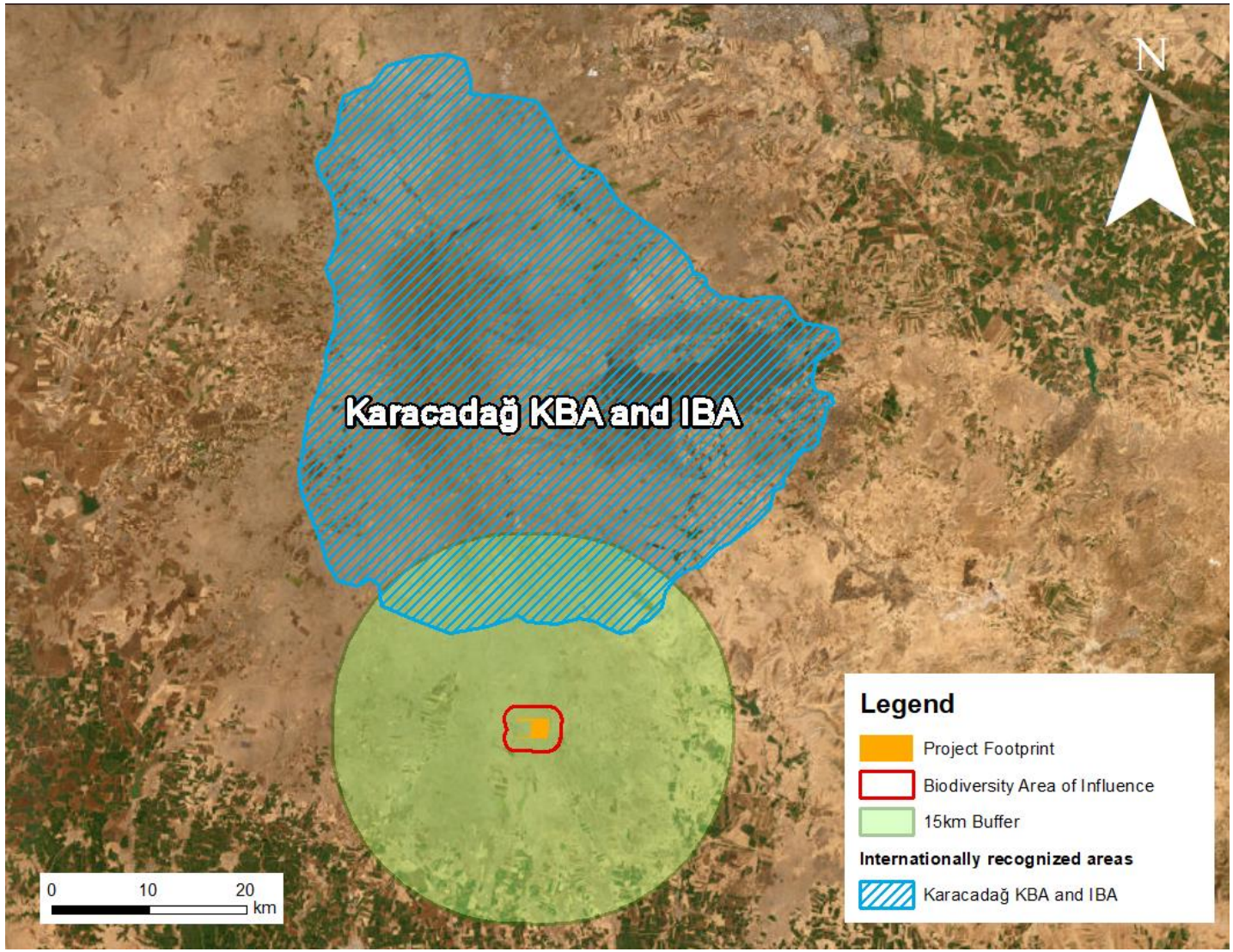


Figure 6-46: Internationally recognized areas for biodiversity in the proximity (15 km) of the Project AoI

6.3.3.2 Habitats and vegetation

The Natural and Modified habitats present within the AoI were determined based on literature review and analysis of satellite images on Google Earth. A field survey, to be performed in June 2024, will be necessary to confirm the habitats identified though the desktop study.

The great majority of the habitats present within the AoI are characterized by Natural Habitats (89% of the total AoI) and, in particular, by continental inland salt steppes (E6.2, 87%). In addition, temporary and permanent rivers (C2.5, 1% and C2.3, <1% respectively) flowing from North to South are also present on the left and on the right side of the Project footprint.

The Modified Habitats present in the AoI (11% of the total AoI) are mainly characterized by intensive unmixed crops (I1.1, 7%), followed by residential buildings of villages (J1.2, 4%), and highly artificial non-saline standing waters (J5.3, <0.1%).

Natural habitats present in the AoI are characterized by medium anthropic disturbance levels, mainly due to pressure (grazing) on saline habitat and the related potential loss of habitat. The continental inland salt steppes (E 6.2 EUNIS Habitat Code) are characterized by the presence of a few endemic species (flora and fauna) and, compared to other types of lowland grasslands, they are less sensitive to grazing pressure. In addition, because of the high salt concentration in the soil, competitive species have limited capacity to spread.

The habitat map of the AoI according to EUNIS habitat classification system is available in Figure 6-47 and the calculations are presented in Table 6-67. A brief description for each EUNIS Natural Habitat identified in the area is reported below based on literature data.

A field survey, to be performed during the flowering period in June 2024, will be necessary to collect direct information on the flora and to identify the dominant species, the characteristic species, and to confirm the presence within the AoI of the species of conservation concern identified through desktop study.

Table 6-67: EUNIS habitat types present in the Biodiversity Area of Influence

EUNIS Code	EUNIS Habitat Type	Total AoI	
		ha	%
Natural habitats			
C2.3	Permanent non-tidal, smooth-flowing watercourses	12.15	<1
C2.5	Temporary running waters	16.60	1
E6.2	Continental inland salt steppes	1,364.47	87
	Subtotal	*1,393.22*	*89*
Modified habitats			
I1.1	Intensive unmixed crops	110.80	7
J1.2	Residential buildings of villages	60.66	4
J5.3	Highly artificial non-saline standing waters	1.20	<0.1
	Subtotal	*172.67*	*11*
	Total	***1,585.88***	***100***

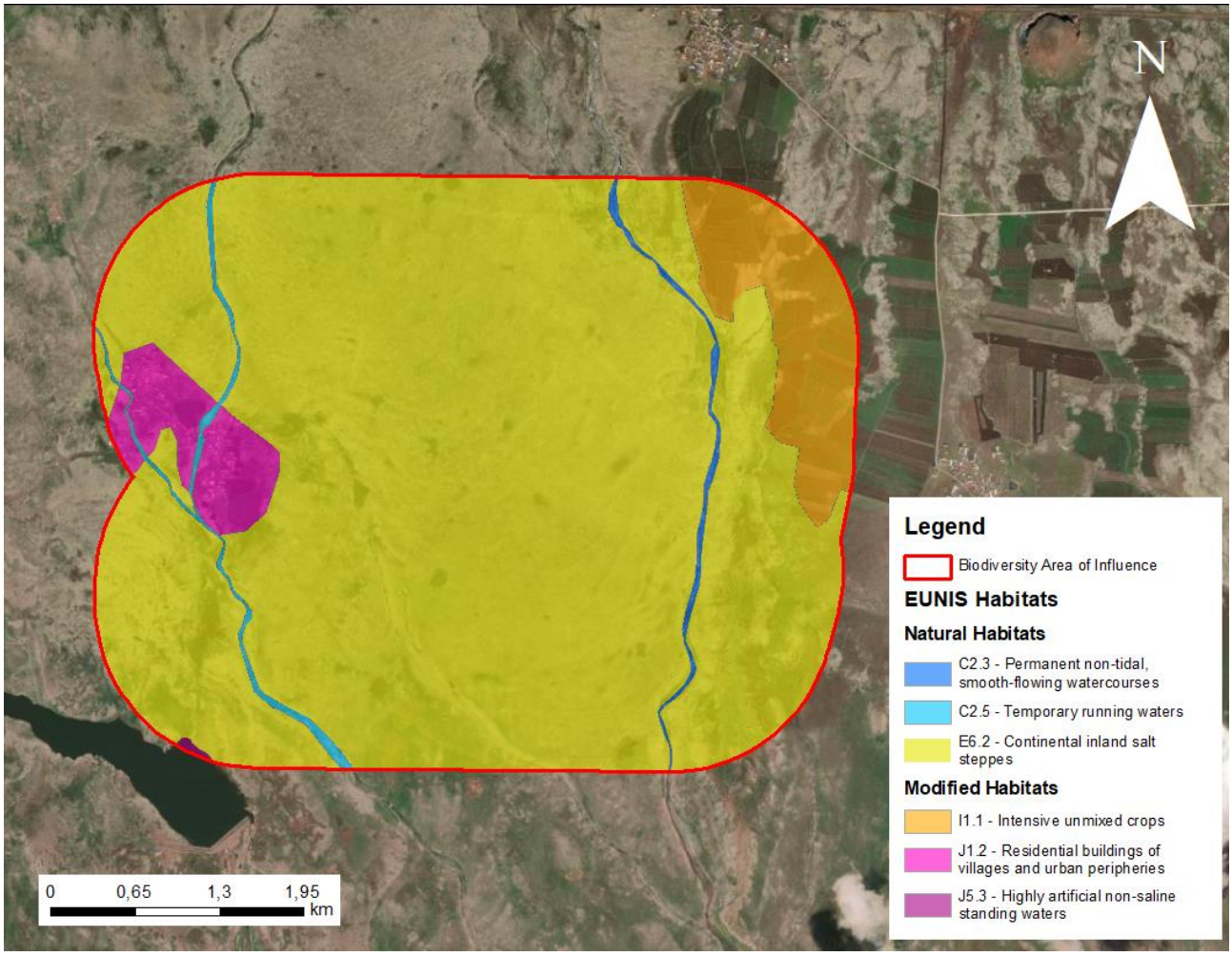


Figure 6-47: EUNIS habitat map of the Biodiversity Area of Influence

C2.5 – Temporary running waters

This habitat type includes temporary freshwater streams and rivers in the European temperate region. These water bodies are characterized by strong fluctuations in water level, which includes dry periods, alternating with long periods of running water. These fluctuations in water level are related to the level of the underlying water table and the amount of precipitation. The seasonal cycle of wetting and drying results into characteristic plant communities that have adapted to these situations. The main channels are often dominated in spring by aquatic *Ranunculus* beds, consisting mainly of *Ranunculus peltatus* or *R. penicillatus* subsp. *pseudofluitans*. Grasses and herbs are dominating the shores and accompanying marshes, including annual species that appear in autumn after re-wetting of the shores. If the dry period is prolonged and the hydrologic conditions very irregular these temporary streams could also scarcely vegetated.

C2.3 - Permanent non-tidal, smooth-flowing watercourses

This habitat includes permanent watercourses with non-turbulent water and their associated pelagic and benthic animal, algal and plant communities. The habitat includes slow-flowing rivers, streams, brooks, rivulets, rills and also relatively fast-flowing rivers with laminar flow. The bed is generally composed of mud or sand. Sand or mud islands, seasonally uncovered by water or permanently emerging, are included in littoral zone (C3 Habitat Code) and not in this habitat. On the opposite, this habitat includes stretches of streams and rivers at mid and low-altitude with an average flow velocity below 0.2 m/sec. The water is mesotrophic and buffered. The vegetation is mainly constituted by rooted and floating Euro-Asiatic macrophytes, mainly with potamid, batrachid and utricularid growth forms, which belong to the Potamogetonion and Batrachion fluitantis

communities. Potamid vegetation can be accompanied in slowly flowing parts of the river bed by nymphaeid species such as *Nymphaea alba* and *Nuphar lutea*. Also amphibian macrophytes may occur in this habitat with their aquatic form. Vegetation cover of the habitat, usually, does not exceed 30% of the total area of a river stretch.

E6.2 Continental inland salt steppes

Salt steppes (also known as alkali steppes) occur on plains in the Eurasian steppe and forest-steppe zones from the Great Hungarian Plain through the Danube Lowland in Romania and Bulgaria to Ukraine, Russia, Kazakhstan and Mongolia. The vegetation matrix of the salt steppe is formed of steppe grassland dominated by *Festuca pseudovina* and *Artemisia santonicum*, and grassland of *Puccinellia distans* agg. at muddy sites that are wet or shallowly flooded in spring but dry out for long periods in summer. On less saline soils, generalist halo-tolerant species are common, including *Bromus hordeaceus*, *Elymus repens*, *Inula britannica*, *Plantago lanceolata*, and *Poa bulbosa*. With increasing salt concentration, these species become rarer while obligate or facultative halophytes increase in frequency, for example *Cerastium dubium*, *Plantago maritima*, *Scorzonera cana* and *Tripolium pannonicum*. Within this saline grassland matrix, patches of one to few square metres with different saline vegetation occur, reflecting small differences in microtopographic position and salt concentration. However, this vegetation can also be found on steep slopes and slope bases: patches of open vegetation with *Pholiurus pannonicus* and *Plantago tenuiflora* are found in erosion troughs that are flooded in spring but dry out for a long period in summer.

Salt steppes have traditionally been used as livestock pastures and this type of management continues in many areas still today. They are less sensitive to overgrazing or abandonment than other types of lowland grasslands, because they are well-adapted to disturbance and have a high resilience, in addition competitive species have limited capacity to spread in saline habitats. Intensive agriculture, with relative ploughing, fertilizing or drainage, causes the strongest alterations for this habitat. Indeed, on drained habitats salt concentration decreases and competitive non-halophytic grasses and dicots can spread. If this effect is combined with cessation of grazing, the salt steppe can change into closed grasslands composed of generalist non-halophytic species.

6.3.3.3 Fauna species

Based on literature review, 232 vertebrate fauna species were determined as potentially present within the AoI. These include 3 fish species, 3 amphibian species, 30 reptile species, 166 bird species, and 30 mammal species (of which 8 bats).

Among fauna species identified as potentially present within the AoI, "**species of conservation concern**" were defined by considering the fauna species classified as Near Threatened (NT), Vulnerable (VU), Endangered (EN), or Critically Endangered (CR) at a global or regional level according to IUCN Red List of Threatened Species[23]. 31 fauna species of conservation concern were identified, of which 2 fish species, 1 reptile species, 24 bird species and 4 mammal species. Detailed information on the identified fauna species of conservation concern are reported specifically for the different taxa in the following sections.

It is important to remember that all the information included in the present chapter was collected through a desktop analysis and a literature review. Therefore, the fauna species reported in the following sections can be considered only as potentially present in the AoI, and a field survey will be necessarily performed in order to confirm the presence of the identified species and/or to identify other species.

6.3.3.3.1 Fishes

According to literature review, 5 fish species were identified as potentially present within the AoI. Of these, 2 species (*Garra elegans* and *Morone saxatilis*) are classified as Least Concern (LC) at a global level according

[23] The International Union for the Conservation of Nature Red List of Threatened Species – Source: https://www.iucnredlist.org/

to IUCN Red List of Threatened Species, and one species (*Luciobarbus subquincunciatus*) is classified as Critically Endangered (CR). The threat status of Steindachner's Cat (*Glyptothorax steindachneri*) has not been evaluated yet by IUCN. In addition, the introduced Eurasian Carp (*Cyprinus carpio*) is considered as potentially present within the AoI. No endemic or restricted range species were identified. Therefore, based on the IUCN threat assessment at a global level, only one species (*Luciobarbus subquincunciatus*) was identified as species of conservation concern. Additional information on all the species identified as potentially present is reported in

A freshwater fauna field survey will be necessary to confirm the presence of these species and to identify other fish species present within the AoI.

Table 6-68: Fish species potentially present within the AoI.

Order	Species	English Name	IUCN Global Status	End./ RR	Obs./ Lit.
Cypriniformes	*Cyprinus carpio*	Eurasian Carp	Introduced	-	L
Cypriniformes	*Luciobarbus subquincunciatus*	Leopard Barbel	CR	-	L
Cypriniformes	*Garra elegans*	Mesopotamian Garra	LC	-	L
Perciformes	*Morone saxatilis*	Striped Bass	LC	-	L
Siluriformes	*Glyptothorax steindachneri*	Steindachner's Cat	NE	-	L

6.3.3.3.2 Amphibians

According to literature review, 3 amphibian species were identified as potentially present within the AoI. Of these, two species (*Hyla savignyi* and *Pelophylax ridibundus*) are classified as Least Concern (LC) at a global level according to IUCN Red List of Threatened Species, while one species (*Bufotes variabilis*) is classified as Data Deficient (DD). No endemic or restricted range species were identified. Therefore, no amphibian species of conservation concern were identified.

The complete list of the amphibian species identified as potentially present within the AoI, based on literature review, is reported in Table 6-69. A terrestrial fauna field survey will be necessary to confirm the presence of these species and to identify other amphibian species present within the AoI.

Table 6-69: Amphibian species potentially present within the AoI.

Order	Species	English Name	IUCN Global Status	End./ RR	Obs./ Lit.
Anura	*Bufotes variabilis*	Varying Toad	DD	-	L
Anura	*Hyla savignyi*	Lemon-Yellow Tree Frog	LC	-	L
Anura	*Pelophylax ridibundus*	Marsh Frog	LC	-	L

6.3.3.3.3 Reptiles

According to literature review, 30 reptile species were identified as potentially present within the AoI. Of these, one species (*Testudo graeca*) is classified as Vulnerable (VU) at a global level according to IUCN Red List of Threatened Species, one species (*Rafetus euphraticus*) is classified as Endangered (EN), while all the other species are classified as Least Concern (LC). No endemic or restricted range species were identified.

Therefore, based on the IUCN threat assessment at a global level, 2 out of 30 species were identified as species of conservation concern. Additional information on these species is reported in Table 6-70.

The complete list of the reptile species identified as potentially present in the AoI, based on literature review, is included in **Appendix D**. A terrestrial fauna field survey will be necessary to confirm the presence of these species and to identify other reptile species present within the AoI.

Table 6-70: Reptile species of conservation concern potentially present within the AoI.

Order	Species	English Name	IUCN Global	End./RR	Obs./Lit.*
Testudines	*Rafetus euphraticus*	Euphrates Softshell Turtle	EN	-	L
Testudines	*Testudo graeca*	Common Tortoise	VU	-	L

6.3.3.3.4 Birds

Türkiye is crossed by the Black Sea/Mediterranean flyway, a major global flyway for migratory land and water birds[24]. This important flyway is divided into three major migratory routes through Türkiye. Although the Project Site is not located along any major migration routes (Figure 6-48), using a precautionary approach, information regarding all the migratory species crossing the Regional Study Area (RSA) was considered in order to determine a list of the bird species potentially present within the AoI.

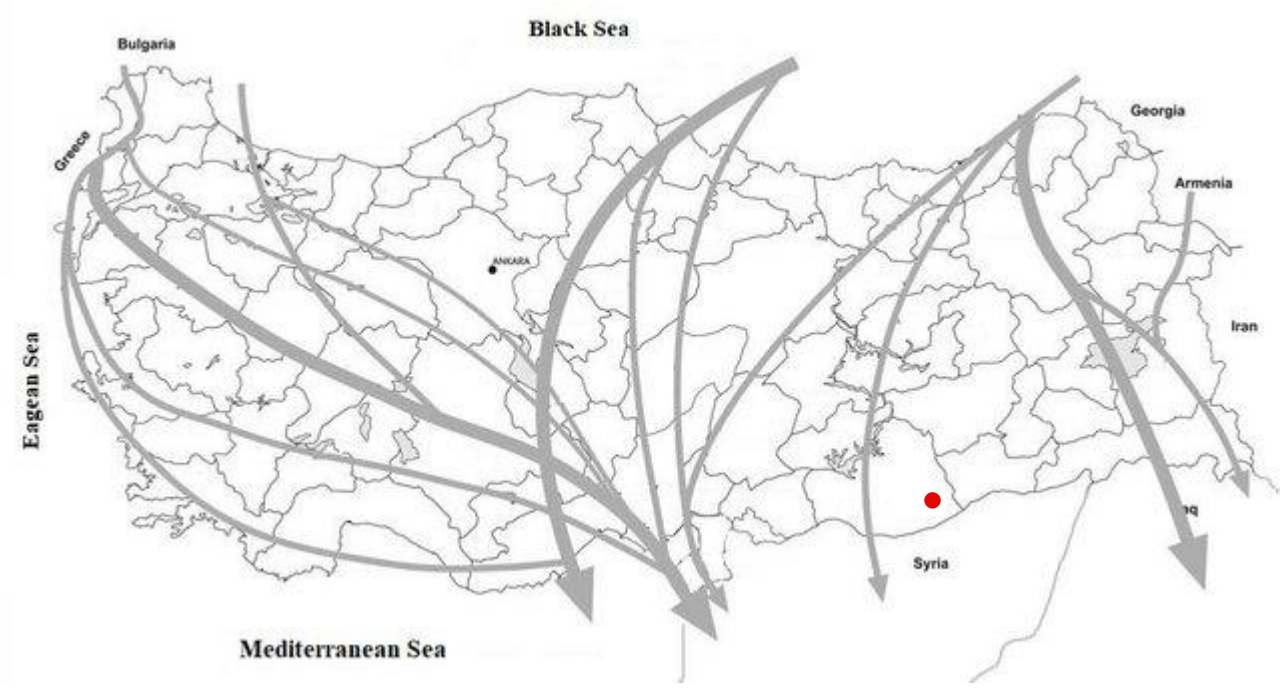


Figure 6-48: Bird Migratory Route in Türkiye and location of the project site as a red point (Source: Hacioğlu et al. 2017)

Therefore, according to literature review, a total of 166 bird species were identified as potentially present within the AoI. Of these, 13 species are classified as Near Threatened (NT) at a global level according to IUCN Red List of Threatened Species, 5 species are classified as Vulnerable (VU), 4 species are classified as Endangered (EN), and 1 species is classified as Critically Endangered (CR). All the remaining potentially present 143 species are classified as Least Concern (LC). No endemic or restricted range species were identified. Therefore, based on the IUCN threat assessment at a global level, 23 out of 166 species were

[24] http://datazone.birdlife.org/home

identified as species of conservation concern. Additional information on these species is reported in Table 6-71.

The complete list of the bird species identified as potentially present in the AoI, based on literature review, is included in **Appendix D**. A terrestrial fauna field survey will be necessary to confirm the presence of these species within the AoI.

Table 6-71: Bird species of conservation concern potentially present within the AoI.

Order	Species	English Name	IUCN Global Status	End./ RR	Phenology	Migratory	Obs./ Lit.
Accipitriformes	*Aegypius monachus*	Cinereous Vulture	NT	-	Extant (non-breeding)	Full Migrant	L
Accipitriformes	*Aquila heliaca*	Eastern Imperial Eagle	VU	-	Extant (passage)	Full Migrant	L
Accipitriformes	*Aquila nipalensis*	Steppe Eagle	EN	-	Extant (passage)	Full Migrant	L
Accipitriformes	*Circus macrourus*	Pallid Harrier	NT	-	Extant (passage)	Full Migrant	L
Accipitriformes	*Clanga clanga*	Greater Spotted Eagle	VU	-	Extant (passage)	Full Migrant	L
Accipitriformes	*Neophron percnopterus*	Egyptian Vulture	EN	-	Extant (breeding)	Full Migrant	L
Anseriformes	*Aythya nyroca*	Ferruginous Duck	NT	-	Extant (non-breeding)	Full Migrant	L
Anseriformes	*Marmaronetta angustirostris*	Marbled Teal	NT	-	Extant (non-breeding)	Full Migrant	L
Anseriformes	*Oxyura leucocephala*	White-headed Duck	EN	-	Extant (passage)	Full Migrant	L
Charadriiformes	*Gallinago media*	Great Snipe	NT	-	Extant (passage)	Full Migrant	L
Charadriiformes	*Glareola nordmanni*	Black-winged Pratincole	NT	-	Extant (passage)	Full Migrant	L
Charadriiformes	*Limosa limosa*	Black-tailed Godwit	NT	-	Extant (passage)	Full Migrant	L
Charadriiformes	*Numenius arquata*	Eurasian Curlew	NT	-	Extant (passage)	Full Migrant	L
Charadriiformes	*Vanellus gregarius*	Sociable Lapwing	CR	-	Extant (passage)	Full Migrant	L
Columbiformes	*Streptopelia turtur*	European Turtle-dove	VU	-	Extant (breeding)	Full Migrant	L
Falconiformes	*Falco cherrug*	Saker Falcon	EN	-	Extant (passage)	Full Migrant	L
Falconiformes	*Falco vespertinus*	Red-footed Falcon	VU	-	Extant (passage)	Full Migrant	L
Otidiformes	*Otis tarda*	Great Bustard	VU	-	Extant (resident)	Full Migrant	L

Order	Species	English Name	IUCN Global Status	End./ RR	Phenology	Migratory	Obs./ Lit.
Otidiformes	*Tetrax tetrax*	Little Bustard	NT	-	Extant (non-breeding)	Full Migrant	L
Passeriformes	*Emberiza cineracea*	Cinereous Bunting	NT	-	Extant (breeding)	Full Migrant	L
Passeriformes	*Lanius senator*	Woodchat Shrike	NT	-	Extant (breeding)	Full Migrant	L
Passeriformes	*Turdus iliacus*	Redwing	NT	-	Extant (passage)	Full Migrant	L
Pelecaniformes	*Pelecanus crispus*	Dalmatian Pelican	NT	-	Extant (passage)	Full Migrant	L

6.3.3.3.5 Mammals

According to literature review, 30 mammal species were identified as potentially present within the AoI. Of these, two species (*Myotis capaccinii* and *Vormela peregusna*) are classified as Vulnerable (VU) at a global level according to IUCN Red List of Threatened Species, one species (*Nannospalax ehrenbergi*) is classified as Data Deficient (DD), while all the other species are classified as Least Concern (LC). No endemic or restricted range species were identified. Therefore, based on the IUCN threat assessment at a global level, 2 out of 30 mammal species were identified as species of conservation concern. Additional information on these species is reported in Table 6-72.

The complete list of the mammal species identified as potentially present in the AoI, based on literature review, is included in **Appendix D**. A terrestrial fauna field survey will be necessary to confirm the presence of these species and to identify other mammal species present within the AoI.

Table 6-72: Mammal species of conservation concern potentially present within the AoI.

Order	Species	English Name	IUCN Global Status	End./ RR.	Obs./ Lit.
Carnivora	*Vormela peregusna*	Marbled Polecat	VU	-	L
Chiroptera	*Myotis capaccinii*	Long-fingered Bat	VU	-	L

6.3.4 Critical Habitat Assessment

A screening based on the information available from the desktop study performed was conducted to identify the potential presence of Critical Habitats (CHs) within the AoI according to IFC Performance Standard 6 (PS6).

Flora species were excluded from the present Critical Habitat Assessment, since the literature and web sources identified and listed in section 6.3.2.1 were considered not sufficiently valuable and detailed in order to obtain an exhaustive assessment of the flora species potentially present within the AoI. Indeed, it was assumed that flora species potentially present within the AoI and potentially triggering CH could have not been identified based on the incomplete literature and web sources available. For this reason, a detailed flora field survey, to be conducted at the beginning of next flowering season in June 2024, will be necessary, in order to get valuable information on flora species present within the AoI and to conduct a robust Critical Habitat Assessment for flora species.

Therefore, the Critical Habitat Assessment implemented in the present chapter will focus on the identification of Critical Habitats triggered by freshwater and terrestrial fauna species.

6.3.4.1 Criterion 1: Habitat of significant importance to Critically Endangered and/or Endangered species

The presence of fauna species having Endangered (EN) or Critically Endangered (CR) conservation status according to global IUCN criteria was considered.

As a result, 7 fauna species were identified as potentially triggering CH based on this criterion. These species include:

- 1 fish species:
  - Leopard Barbel (*Luciobarbus subquincunciatus*, CR).
- 1 reptile species:
  - Euphrates Softshell Turtle (*Rafetus euphraticus*, EN).
- 5 bird species:
  - Steppe Eagle (*Aquila nipalensis*, EN);
  - Saker Falcon *(Falco cherrug,* EN*)*;
  - Egyptian Vulture (*Neophron percnopterus*, EN);
  - White-headed Duck (*Oxyura leucocephala*, EN);
  - Sociable Lapwing (*Vanellus gregarius*, CR).

Based on literature review, these species are considered only as potentially present within the AoI. In order to assess the importance of the AoI for the selected species, the following thresholds were applied (Guidance Note 6, GN72, IFC 2019):

a) areas that support globally important concentrations of an IUCN Red-listed EN or CR species (> 0.5% of the global population AND >5 reproductive units of a CR or EN species);

b) areas that support globally important concentrations of an IUCN Red-listed VU species, the loss of which would result in the change of the IUCN Red List status to EN or CR and meet the thresholds in GN70(a);

c) as appropriate, areas containing nationally/regionally important concentrations of an IUCN Red-listed EN or CR species.

The Criterion 1a thresholds were applied on all fauna species having EN or CR conservation status according to global IUCN criteria or local assessments.

All the Vulnerable species listed as potentially present have a wide distribution range, therefore it is excluded that they could meet the thresholds for Criterion 1b: “Areas that support globally important concentrations of an IUCN Red-listed Vulnerable (VU) species, the loss of which would result in the change of the IUCN Red List status to EN or CR and meet the thresholds in GN72”.

No areas containing nationally/regionally important concentrations of an IUCN Red-listed EN or CR species was identified within or around the study area, therefore criterion 1c was not applied.

In order to apply the thresholds identified in Criterion 1a an “Ecologically Appropriate Area of Analysis” (EAAA) and the Extent of Occurrence (EOO) have been identified for each species, according to the following principles:

- For fish species: the EAAA was defined to include the catchment area of the Khabur River in which the AoI lies. The defined EAAA reaches an extension of 2,963 km^2 (Figure 6-49).
- For reptile species: considering the ecological requirements of the only reptile species potentially triggering CH (*Rafetus euphraticus*), which is almost exclusively riverine and anyway strongly connected to various freshwater habitats[25], the EAAA was considered as corresponding to the EAAA defined for fish species. The defined EAAA reaches an extension of 2,963 km^2 (Figure 6-49).
- For bird species: the EAAA was defined to include a sufficient ecologically homogeneous area around the AoI to support the presence of the species assessed. This homogeneous area is bounded by agricultural fields to the south and by the mountainous slopes of Karacadağ to the north. The defined EAAA reaches an extension of 684 km^2 (Figure 6-50).

The EOO was obtained from literature (IUCN and BirdLife) for all the species.

The results of the critical habitat assessment for Criterion 1 are detailed in Table 6-73. Since all the assessed species were identified only as potentially present based on literature information and insufficient data on the actual presence of the species within the AoI are available, species that could trigger critical habitats were identified only as triggering “Potential Critical Habitat”.

The ecology of species screened as potentially triggering CH is described in detail in section 6.3.5.

[25] The IUCN Red List of Threatened Species – Assessment for Euphrates Softshell Turtle (*Rafetus euphraticus*) – section “Habitat and Ecology” – Source: https://www.iucnredlist.org/species/19070/1956551#habitat-ecology.

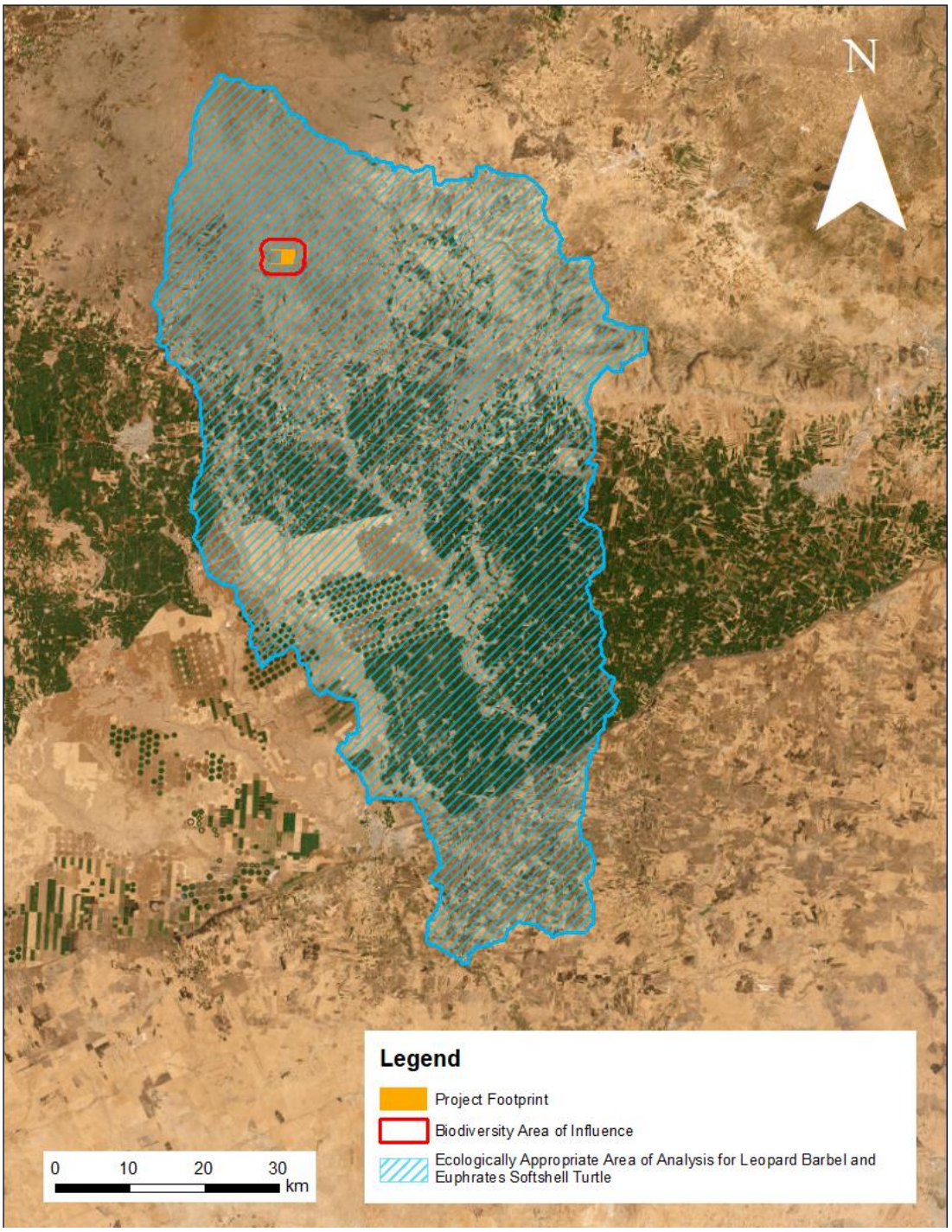


Figure 6-49: Ecologically Appropriate Area of Analysis (EAAA) for fish and reptile species

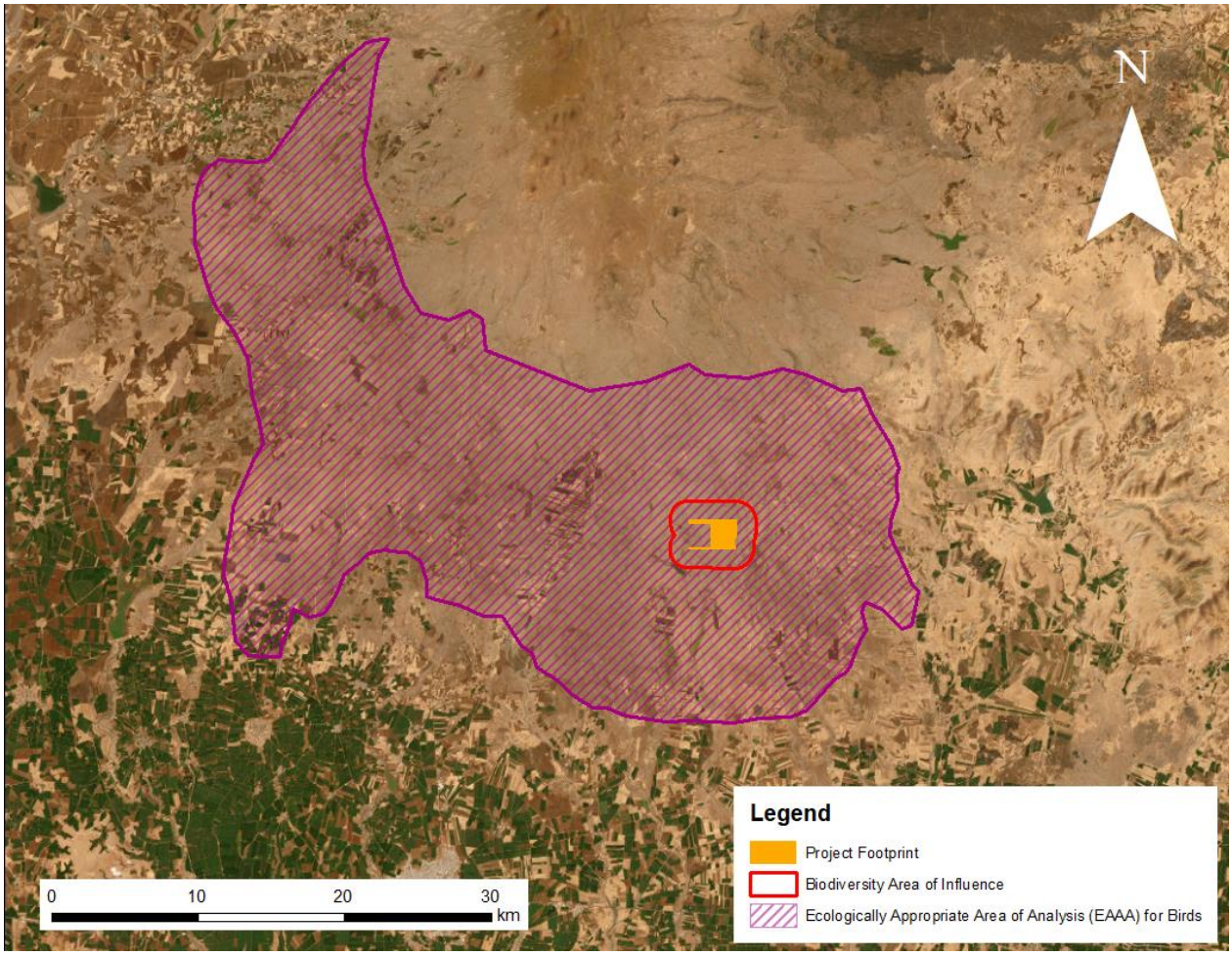


Figure 6-50: Ecologically Appropriate Area of Analysis (EAAA) for bird species

Table 6-73: Screening of fauna species potentially triggering Critical Habitat according to Criterion 1 (IFC, 2019)

Taxon	Species	Common name	Global IUCN Status	National IUCN status	End./ RR	Lit./ Obs.	EOO (km^2)	0.5% of EOO (km^2)	EAAA (km^2)	EAAA is ≥ 0.5% of EOO	Critical Habitat
Fish	*Luciobarbus subquincunciatus*	Leopard Barbel	CR	-	-	L	250,396	1,252	2,963	Yes	PCH
Reptile	*Rafetus euphraticus*	Euphrates Softshell Turtle	EN	-	-	L	389,627	1,948	2,963	Yes	PCH
Bird	*Aquila nipalensis*	Steppe Eagle	EN	-	-	L	47,500,000	237,500	684	No	-
	Falco cherrug	Saker Falcon	EN	-	-	L	43,200,000	216,000		No	-
	Neophron percnopterus	Egyptian Vulture	EN	-	-	L	58,000,000	290,000		No	-
	Oxyura leucocephala	White-headed Duck	EN	-	-	L	14,100,000	70,500		No	-
	Vanellus gregarius	Sociable Lapwing	CR	-	-	L	6,130,000	30,650		No	-

6.3.4.2 Criterion 2: Habitats of significant importance to endemic or geographically restricted species

According to criterion 2 (Guidance Note 6, GN74, IFC 2019), the presence of endemic or restricted-range species (EOO less than 50,000 km^2 for terrestrial vertebrates and plants; global range of less than or equal to 500 km linear geographic span for coastal, riverine, and other aquatic species that do not exceed 200 km width at any point) was considered.

However, no fauna species potentially triggering CH according to Criterion 2 were identified.

6.3.4.3 Criterion 3: Habitats supporting globally significant migratory or congregatory species

The presence of Key Biodiversity Areas (KBAs) and Important Bird Areas (IBAs) identified for congregatory species and of Wetlands of International Importance designated under criteria 5 or 6 of the Ramsar Convention was considered. However, the AoI is not located within any KBA, IBA or Ramsar Site. Karacadağ KBA and IBA represents the closest internationally recognized area, since it is located approximately at 8.6 km from the borders of the AoI. The only migratory bird species triggering Karacadağ IBA is Lesser Kestrel (*Falco naumanni*). However, since Karacadağ IBA is a mountainous and volcanic area, with elevation ranging between 850 m and 1,981 m a.s.l., while the AoI mainly hosts grassland habitats and it is located at an elevation ranging approximately between 760 and 880 m a.s.l., the ecological differences were assumed to be high enough not to consider the bird species triggering Karacadağ IBA in the present assessment.

Therefore, a list of all the migratory bird species potentially crossing the AoI was obtained from literature (IUCN). From this list, all the bird species which were considered to be only in transit (passage) in the AoI, based on literature information, were excluded. In addition, since the presence of wetlands within the AoI is minimal and no large water bodies are included, all the migratory bird species strongly connected to freshwater habitats were excluded (e.g., Anatidae, Ardeidae, Scolopacidae). From this selection process, a list of 88 migratory bird species was obtained.

In order to assess the importance of the AoI for these species, the following thresholds were applied (Guidance Note 6, GN78, IFC 2019):

a) areas known to sustain, on a cyclical or otherwise regular basis, ≥ 1 percent of the global population of a migratory or congregatory species at any point of the species' lifecycle.

b) areas that predictably support ≥ 10 percent of the global population of a species during periods of environmental stress.

Estimates of the global population for the assessed bird species were available from literature (BirdLife), but no estimates of the local populations within the AoI were available. Therefore, in order to assess the potential presence of Critical Habitat according to Criterion 3a, an Ecologically Appropriate Area of Analysis (EAAA) was defined to include a sufficient ecologically homogeneous area around the AoI to support the presence of the species assessed. This homogeneous area is bounded by agricultural fields to the south and by the mountainous slopes of Karacadağ to the north. The defined EAAA reaches an extension of 684 km^2 (Figure 6-50). The EAAA was then compared with the Extent of Occurrence (EOO) for each species, which represents the global population estimate, in order to identify if that area could potentially meet Criterion 3 threshold: if the EAAA is ≥ 1% of the EOO, the area is defined as potentially triggering Critical Habitat (GN78, IFC 2019). The results of the CH screening are discussed below and reported in Table 6-74.

As a result of the screening, no species potentially triggering Critical Habitat according to Criterion 3 were identified.

Table 6-74: Screening of migratory bird species potentially triggering Critical Habitat according to Criterion 3a (IFC, 2019)

Scientific name	Common name	Global IUCN Status	Lit./ Obs.	Status in the AoI (according to IUCN)	Extent of Occurrence (km2)	Ecologically appropriate area of analysis (km2)	1% of EOO	EAAA is ≥ 1 % of EOO	Critical Habitat
Accipiter nisus	Eurasian Sparrowhawk	LC	L	Non-Breeding	82,000,000	684	820,000	No	-
Aegypius monachus	Cinereous Vulture	NT	L	Non-Breeding	36,500,000		365,000	No	-
Alauda arvensis	Eurasian Skylark	LC	L	Non-Breeding	42,900,000		429,000	No	-
Alaudala heinei	Turkestan Short-toed Lark	LC	L	Resident	13,640,000		136,400	No	-
Anthus campestris	Tawny Pipit	LC	L	Breeding	22,100,000		221,000	No	-
Anthus spinoletta	Water Pipit	LC	L	Non-Breeding	31,400,000		314,000	No	-
Apus apus	Common Swift	LC	L	Breeding	39,800,000		398,000	No	-
Burhinus oedicnemus	Eurasian Thick-knee	LC	L	Breeding	27,000,000		270,000	No	-
Buteo buteo	Eurasian Buzzard	LC	L	Non-Breeding	75,500,000		755,000	No	-
Buteo rufinus	Long-legged Buzzard	LC	L	Resident	32,300,000		323,000	No	-
Calandrella brachydactyla	Greater Short-toed Lark	LC	L	Breeding	24,800,000		248,000	No	-
Caprimulgus europaeus	European Nightjar	LC	L	Breeding	33,200,000		332,000	No	-
Carduelis carduelis	European Goldfinch	LC	L	Resident	26,600,000		266,000	No	-
Carpospiza brachydactyla	Pale Sparrow	LC	L	Breeding	4,380,000		43,800	No	-

Scientific name	Common name	Global IUCN Status	Lit./ Obs.	Status in the AoI (according to IUCN)	Extent of Occurrence (km2)	Ecologically appropriate area of analysis (km2)	1% of EOO	EAAA is ≥ 1 % of EOO	Critical Habitat
Cecropis daurica	Red-rumped Swallow	LC	L	Breeding	99,900,000		999,000	No	-
Cercotrichas galactotes	Rufous-tailed Scrub-robin	LC	L	Breeding	32,900,000		329,000	No	-
Cettia cetti	Cetti's Warbler	LC	L	Breeding	19,900,000		199,000	No	-
Charadrius dubius	Little Ringed Plover	LC	L	Breeding	87,600,000		876,000	No	-
Circaetus gallicus	Short-toed Snake-eagle	LC	L	Breeding	58,000,000		580,000	No	-
Circus cyaneus	Hen Harrier	LC	L	Non-Breeding	52,200,000		522,000	No	-
Circus pygargus	Montagu's Harrier	LC	L	Breeding	18,000,000		180,000	No	-
Columba oenas	Stock Dove	LC	L	Non-Breeding	15,100,000		151,000	No	-
Coracias garrulus	European Roller	LC	L	Breeding	19,900,000		199,000	No	-
Corvus corone	Carrion Crow	LC	L	Resident	85,700,000		857,000	No	-
Corvus frugilegus	Rook	LC	L	Non-Breeding	35,400,000		354,000	No	-
Corvus monedula	Eurasian Jackdaw	LC	L	Resident	26,000,000		260,000	No	-
Coturnix coturnix	Common Quail	LC	L	Breeding	87,900,000		879,000	No	-
Cuculus canorus	Common Cuckoo	LC	L	Breeding	61,200,000		612,000	No	-
Curruca communis	Common Whitethroat	LC	L	Breeding	25,100,000		251,000	No	-
Curruca mystacea	Menetries's Warbler	LC	L	Breeding	4,480,000		44,800	No	-

Scientific name	Common name	Global IUCN Status	Lit./ Obs.	Status in the AoI (according to IUCN)	Extent of Occurrence (km2)	Ecologically appropriate area of analysis (km2)	1% of EOO	EAAA is ≥ 1 % of EOO	Critical Habitat
Delichon urbicum	Northern House Martin	LC	L	Breeding	30,800,000		308,000	No	-
Emberiza calandra	Corn Bunting	LC	L	Resident	23,700,000		237,000	No	-
Emberiza cia	Rock Bunting	LC	L	Non-Breeding	16,700,000		167,000	No	-
Emberiza cineracea	Cinereous Bunting	NT	L	Breeding	489,000		4,890	No	-
Emberiza hortulana	Ortolan Bunting	LC	L	Breeding	20,200,000		202,000	No	-
Emberiza melanocephala	Black-headed Bunting	LC	L	Breeding	6,120,000		61,200	No	-
Eremophila alpestris	Horned Lark	LC	L	Resident	64,100,000		641,000	No	-
Erithacus rubecula	European Robin	LC	L	Non-Breeding	25,200,000		252,000	No	-
Falco columbarius	Merlin	LC	L	Non-Breeding	146,000,000		1,460,000	No	-
Falco naumanni	Lesser Kestrel	LC	L	Breeding	24,800,000		248,000	No	-
Falco peregrinus	Peregrine Falcon	LC	L	Non-Breeding	455,000,000		4,550,000	No	-
Falco subbuteo	Eurasian Hobby	LC	L	Breeding	52,600,000		526,000	No	-
Falco tinnunculus	Common Kestrel	LC	L	Resident	116,000,000		1,160,000	No	-
Fringilla montifringilla	Brambling	LC	L	Non-Breeding	54,500,000		545,000	No	-
Galerida cristata	Crested Lark	LC	L	Resident	57,700,000		577,000	No	-
Gyps fulvus	Griffon Vulture	LC	L	Non-Breeding	44,500,000		445,000	No	-
Hippolais languida	Upcher's Warbler	LC	L	Breeding	5,370,000		53,700	No	-

Scientific name	Common name	Global IUCN Status	Lit./ Obs.	Status in the AoI (according to IUCN)	Extent of Occurrence (km2)	Ecologically appropriate area of analysis (km2)	1% of EOO	EAAA is ≥ 1 % of EOO	Critical Habitat
Hirundo rustica	Barn Swallow	LC	L	Breeding	251,000,000		2,510,000	No	-
Iduna pallida	Olivaceous Warbler	LC	L	Breeding	18,700,000		187,000	No	-
Irania gutturalis	White-throated Robin	LC	L	Breeding	4,560,000		45,600	No	-
Lanius minor	Lesser Grey Shrike	LC	L	Breeding	13,600,000		136,000	No	-
Lanius senator	Woodchat Shrike	NT	L	Breeding	12,000,000		120,000	No	-
Linaria cannabina	Common Linnet	LC	L	Non-Breeding	31,000,000		310,000	No	-
Lullula arborea	Woodlark	LC	L	Breeding	16,100,000		161,000	No	-
Luscinia megarhynchos	Common Nightingale	LC	L	Breeding	19,300,000		193,000	No	-
Melanocorypha bimaculata	Bimaculated Lark	LC	L	Breeding	5,520,000		55,200	No	-
Melanocorypha calandra	Calandra Lark	LC	L	Resident	17,100,000		171,000	No	-
Merops apiaster	European Bee-eater	LC	L	Breeding	55,700,000		557,000	No	-
Milvus migrans	Black Kite	LC	L	Non-Breeding	135,760,673		1,357,607	No	-
Monticola saxatilis	Rufous-tailed Rock-thrush	LC	L	Breeding	23,600,000		236,000	No	-
Monticola solitarius	Blue Rock-thrush	LC	L	Breeding	66,600,000		666,000	No	-
Motacilla alba	White Wagtail	LC	L	Non-Breeding	101,000,000		1,010,000	No	-

Scientific name	Common name	Global IUCN Status	Lit./ Obs.	Status in the AoI (according to IUCN)	Extent of Occurrence (km2)	Ecologically appropriate area of analysis (km2)	1% of EOO	EAAA is ≥ 1 % of EOO	Critical Habitat
Motacilla cinerea	Grey Wagtail	LC	L	Non-Breeding	103,000,000		1,030,000	No	-
Motacilla flava	Western Yellow Wagtail	LC	L	Breeding	40,900,000		409,000	No	-
Neophron percnopterus	Egyptian Vulture	EN	L	Breeding	58,000,000		580,000	No	-
Oenanthe finschii	Finsch's Wheatear	LC	L	Resident	4,450,000		44,500	No	-
Oenanthe hispanica	Black-eared Wheatear	LC	L	Breeding	11,600,000		116,000	No	-
Oenanthe isabellina	Isabelline Wheatear	LC	L	Breeding	16,000,000		160,000	No	-
Oriolus oriolus	Eurasian Golden Oriole	LC	L	Breeding	26,600,000		266,000	No	-
Otis tarda	Great Bustard	VU	L	Resident	21,700,000		217,000	No	-
Otus brucei	Pallid Scops-owl	LC	L	Breeding	6,190,000		61,900	No	-
Otus scops	Eurasian Scops-owl	LC	L	Breeding	33,900,000		339,000	No	-
Passer hispaniolensis	Spanish Sparrow	LC	L	Breeding	16,600,000		166,000	No	-
Pastor roseus	Rosy Starling	LC	L	Breeding	8,190,000		81,900	No	-
Pterocles alchata	Pin-tailed Sandgrouse	LC	L	Resident	13,000,000		130,000	No	-
Pterocles orientalis	Black-bellied Sandgrouse	LC	L	Resident	17,400,000		174,000	No	-

Scientific name	Common name	Global IUCN Status	Lit./ Obs.	Status in the AoI (according to IUCN)	Extent of Occurrence (km2)	Ecologically appropriate area of analysis (km2)	1% of EOO	EAAA is ≥ 1 % of EOO	Critical Habitat
Ptyonoprogne rupestris	Eurasian Crag Martin	LC	L	Resident	29,300,000		293,000	No	-
Riparia riparia	Collared Sand Martin	LC	L	Breeding	101,000,000		1,010,000	No	-
Saxicola torquatus	Common Stonechat	LC	L	Resident	113,000,000		1,130,000	No	-
Spilopelia senegalensis	Laughing Dove	LC	L	Resident	64,400,000		644,000	No	-
Spinus spinus	Eurasian Siskin	LC	L	Non-Breeding	11,700,000		117,000	No	-
Streptopelia turtur	European Turtle-dove	VU	L	Breeding	35,700,000		357,000	No	-
Sturnus vulgaris	Common Starling	LC	L	Resident	38,400,000		384,000	No	-
Tachymarptis melba	Alpine Swift	LC	L	Breeding	61,100,000		611,000	No	-
Tetrax tetrax	Little Bustard	NT	L	Non-Breeding	12,600,000		126,000	No	-
Turdus merula	Eurasian Blackbird	LC	L	Non-Breeding	33,400,000		334,000	No	-
Turdus pilaris	Fieldfare	LC	L	Non-Breeding	21,700,000		217,000	No	-
Upupa epops	Common Hoopoe	LC	L	Breeding	104,000,000		1,040,000	No	-

6.3.4.4 Criterion 4: Highly threatened and/or unique ecosystems

Ecosystems that are at risk of significantly decreasing in area or quality, have a small spatial extent, and/or contain concentrations of biome-restricted species were considered for this criterion.

The Criterion 4 application (GN79, IFC 2019) foresees the use the "Red List of Ecosystems (RLE)" where formal IUCN assessments have been conducted. However, no evaluation was performed in Turkey as shown in the IUCN RLE Database[26]. Therefore, this system cannot be used at present. Instead, the "European Red List of Habitats" (Janssen *et al.*, 2016[27]) was used to identify threatened Ecosystems.

The "European Red List of Habitats" (European Union, 2016) is the result of an extensive and thorough assessment carried out by Alterra and IUCN with the support of a wide range of experts across Europe. Criteria and categories applied in the European Red List of Habitats to the EUNIS habitat types are based on a protocol proposed in a feasibility study (Rodwell *et al*. 2013)[28], combined with elements of the IUCN Red List of Ecosystems approach for ecosystem risk assessment (Keith *et al*. 2013[29], IUCN 2016). The categories applied to the EUNIS habitat types are analogous to those of the IUCN Red List of Threatened Species. In particular, the CR or EN categories include habitats that are at risk of significantly decreasing in quantity (area or distribution) and/or biotic/abiotic quality, and/or have a small spatial extent, and/or contain concentrations of biome-restricted species and are therefore considered to be at very high risk of collapse.

Three Natural Habitats were identified within the AoI based on desktop study: "Continental inland salt steppe" (E6.2), classified as Vulnerable (VU) according to the European Red List of Habitats (Janssen *et al.*, 2016[15]), "Temporary running waters" (C2.5), classified as Data Deficient (DD), and "Permanent non-tidal, smooth-flowing watercourses" (C2.3), classified as Least Concern (LC).

Therefore, no habitats classified as Endangered (EN) or Critically Endangered (CR) were identified, and no Critical Habitat is expected to be present in the AoI according to this criterion.

6.3.4.5 Criterion 5: Areas associated with key evolutionary processes

This criterion includes presence of areas with landscape features that might be associated with evolutionary processes or species populations that are especially distinct and may be of special conservation concern given their distinct evolutionary history was considered.

The study area is not known to contain landscape features that may influence evolutionary processes, giving rise to regional configurations of species and ecological properties. In fact, no species and/or subpopulations of species is characterized by a particular level of isolation, spatial heterogeneity, and wealth of environmental gradients or edaphic interfaces. Moreover, the area is not considered to be of demonstrated importance as to climate change adaptation or as biological corridor. These considerations suggest that the study area does not support any key evolutionary process.

---

[26] http://assessments.iucnrle.org/

[27] Janssen J., Rodwell J., García C. M., Gubbay S., Haynes T., Nieto A., Sanders N., Landucci F., Loidi J., Ssymank A., Tahvanainen T., Valderrabano M., Acosta A., Aronsson M., Arts G., Attorre F., Bergmeier E., Bijlsma, R. J., Bioret F., Gubbay S. (2016). European Red List of Habitats Part 2. Terrestrial and freshwater habitats. 10.2779/091372.

[28] Rodwell, J.S., Janssen, J.A.M., Gubbay, S. and Schaminée, J.H.J. (2013). Red List Assessment of European Habitat Types. A feasibility study. Report for the European Commission, DG Environment, Brussels.

[29] Keith, D.A., Rodríguez, J.P., Rodríguez-Clark, K.M., Nicholson, E., Aapala, K., Alonso, A., Asmussen, M., Bachman, S., Bassett, A., Barrow, E.G., Benson, J.S., Bishop, M.J., Bonifacio, R., Brooks, T.M., Burgman, M.A., Comer, P., Comín, F.A., Essl, F., Faber-Langendoen, D., Fairweather, P.G., Holdaway, R.J., Jennings, M., Kingsford, R.T., Lester, R.E., Mac Nally, R., McCarthy, M.A., Moat, J., Nicholson, E., Oliveira-Miranda, M.A., Pisanu, P., Poulin, B., Riecken, U., Spalding, M.D. and Zambrano-Martínez, S. (2013). Scientific Foundations for an IUCN Red List of Ecosystems. PLoS ONE 8(5): e62111. http://dx.doi.org/10.1371/journal.pone.0062111

Therefore, no Critical Habitat is expected to be present in the AoI according to this criterion.

6.3.5 Ecology of species potentially triggering CH

The table below summarizes the species of fauna identified as triggering "Potential Critical Habitats" (PCHs) and the IFC criteria for which they were considered. Since no field studies were conducted and all the information contained in the present Critical Habitat Assessment were obtained from literature, the fauna species assessed were all considered only as potentially present and only "Potential Critical Habitat" can be assumed as present within the AoI. Therefore, a field survey will be necessary also to confirm the actual presence of Critical Habitat triggered by the identified species reported in Table 6-75 and to identify Critical Habitats triggered by other species.

The ecology of fauna species identified as potentially triggering CH is described in detail below.

Table 6-75: Fauna species identified as potentially triggering Critical Habitats within the AoI.

Taxon	Species	Common name	Global IUCN Status	Local IUCN Status	End./ RR	Lit./ Obs.	IFC criteria
Fish	*Luciobarbus subquincunciatus*	Leopard Barbel	CR	-	-	L	Criterion 1a
Bird	*Rafetus euphraticus*	Euphrates Softshell Turtle	EN	-	-	L	Criterion 1a

***Luciobarbus subquincunciatus* (CR)**

Leopard Barbel (*Luciobarbus subquincunciatus*) is a benthopelagic, subtropical and freshwater fish species, belonging to the Cyprinidae family and characterized by a medium-sized body (largest known specimen is 60.0 cm SL). It is distinguished by the following unique characters: quincunx-like pattern of spots, dorsal fin with 8 branched rays, anal fin with 5 branched rays, lateral lines scaling 75-88, and inner pharyngeal teeth molariform, with formula 2,3,3-3, 3,2.

It is endemic to the Tigris-Euphrates Basin and present in Turkey, Syria, Iraq, and Iran (Figure 6-51). It inhabits large, free flowing lowland rivers, and migrates short distances to breed. It prefers lentic, high oxygen habitats, and it rarely recorded from lakes and reservoirs, which seems to represent largely unsuitable habitats. It feeds on molluscs based on teeth but also takes algae and detritus. It is reported to spawn in shallow gravel beds (Coad, 2009[30]).

This species has declined massively, but the reasons for this decline are unknown. The species is restricted to large rivers and seems to be very sensitive to pollution. It was never reported to build up large populations in reservoirs and it may be strongly impacted by dams. Furthermore, this large growing fish is an attractive commercial species, and it could be speculated that a high fishing pressure might be a threat. For these reasons, this species seems to be in an urgent need of conservation action. To build up ex-situ populations may be needed to guarantee its survival. Furthermore, there is the urgent need to understand better where populations are still surviving, and which are the threats leading to the fast collapse of the populations of this species occurred during the last 30 years. Furthermore, harvesting of this species needs managing (Coad, 2009).

[30] Coad B.W. (2009). Threatened fishes of the world: Luciobarbus subquincunciatus (Günther, 1868) (Cyprinidae). Environ. Biol. Fishes 86:323.

Since no terrestrial or freshwater fauna field studies were conducted, this species was assumed only as potentially present within the AoI. The performance of a field survey will be necessary to confirm the presence of the species and, therefore, the presence of Critical Habitat triggered by the species.

Figure 6-51: *Luciobarbus subquincunciatus* (Leonard Barbel) distribution range (source: https://www.iucnredlist.org/species/19383549/19849734) – red point indicates the location of the Project site.

***Rafetus euphraticus* (EN)**

Euphrates Softshell Turtle (*Rafetus euphraticus*) is a softshell turtle belonging to the Trionychidae family. This freshwater turtle can weigh up to 20 kg, and it has a smooth leathery shell that can reach up to 68 cm in length. The sexes are apparently alike in size and in general appearance. The upperparts are typically dull olive in colour, sometimes with an indistinct spotted pattern, especially on the head. There are some minor variations in the colour pattern, and rarely individuals may be dark brown or even black above (Taskavak *et al.* 2016[31]).

The geographic range of this species (Figure 6-52) is limited to the Euphrates and Tigris basins in Turkey, Syria, Iraq, and Iran (Ghaffari et al., 2008[32]). It occurs at an elevation ranging between the sea level and about 1000 m a.s.l. (Baran & Atatur, 1998[33]). It is almost exclusively riverine, inhabiting various freshwater habitats,

[31] Taskavak E., Atatür M.K., Ghaffari H., Meylan P.A. (2016). *Rafetus euphraticus* (Daudin 1801) – Euphrates Softshell Turtle. In: A.G.J. Rhodin, J.B. Iverson, P.P. van Dijk, R.A. Saumure, K.A. Buhlmann, P.C.H. Pritchard and R.A. Mittermeier (eds.). Conservation Biology of Freshwater Turtles and Tortoises: A Compilation Project of the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group. Chelonian Research Monographs 5(9): 098.1–11.

[32] Ghaffari H., Taşkavak E., Karami M. (2008): Conservation status of the Euphrates Softshell Turtle, Rafetus euphraticus, in Iran. – Chelonian Conservation and Biology, 7: 223–229.

[33] Baran I. & Atatur M. K. (1998). Turkish Herpetofauna. Republic of Turkey Ministry of Environment, Ankara.

preferably permanent and temporary tributaries and oxbow lakes, as well as slow-flowing sections of the main river channel (Taskavak et al., 2016). The species is particularly thermophilic (Taskavak & Atatur, 1998[34]). It feeds mainly on crabs, insects, and fishes, but also scavenges and takes some vegetable material (Taskavak & Atatur, 1998; Taskavak *et al.*, 2016).

Nests are placed in sandy riverbanks close to the waterline. The nesting season usually occurs between late April and early June, with mating observed in March; hatchlings emerge from their nest in early July (Taskavak *et al.*, 2016). Reported clutch sizes average 30–40 eggs (Baran & Atatur, 1998, Taskavak *et al.*, 2016). There is no information available from literature on clutch frequency, age or size at maturity, or generation time.

The species is severely threatened by anthropogenic fragmentation, alteration and destruction of suitable habitat throughout its distributional range (Taskavak *et al.*, 2016). Major dams cause fundamental changes to water quality and the flow regime downstream, making it impossible for the species to survive in long downstream riverine stretches. The loss of sandbank nesting habitat through flooding and sand mining is also a serious threat. Also, the use of pesticides in agricultural fields next to riverbanks causes pollution along the tributaries.

Throughout its distribution in Iran, the killing or capture of the species is legally prohibited. In Turkey, the species is under protection of national law, and in 2016 the Ministry of Environment announced a Conservation Action Plan for the species for the 2016-2021 term (Ayaz & Bayrakçı, 2015[35]). *Rafetus euphraticus* was also listed on CITES II in October 2016, in conjunction with the CITES II listing of all African softshells, that are being increasingly impacted by unsustainable consumption and unregulated domestic (in Africa) and growing international trade.

Since no terrestrial or freshwater fauna field studies were conducted, this species was assumed only as potentially present within the AoI. The performance of a field survey will be necessary to confirm the presence of the species and, therefore, the presence of Critical Habitat triggered by the species.

[34] Taskavak E. & Reimann M. J. (1998). A Giant Project and a miserable turtle. Reptilia 3: 64-67.

[35] Ayaz D. & Bayrakçı Y. (2015). Gaziantep ili Fırat Kaplumbağası (*Rafetus euphraticus*) tür eylem planı (Species Action Plan of Euphrates turtle in Gaziantep). The Ministry of Water and Forestry, Gaziantep Authority for the Conservation of Nature and National Parks. 34 pp. [In Turkish].

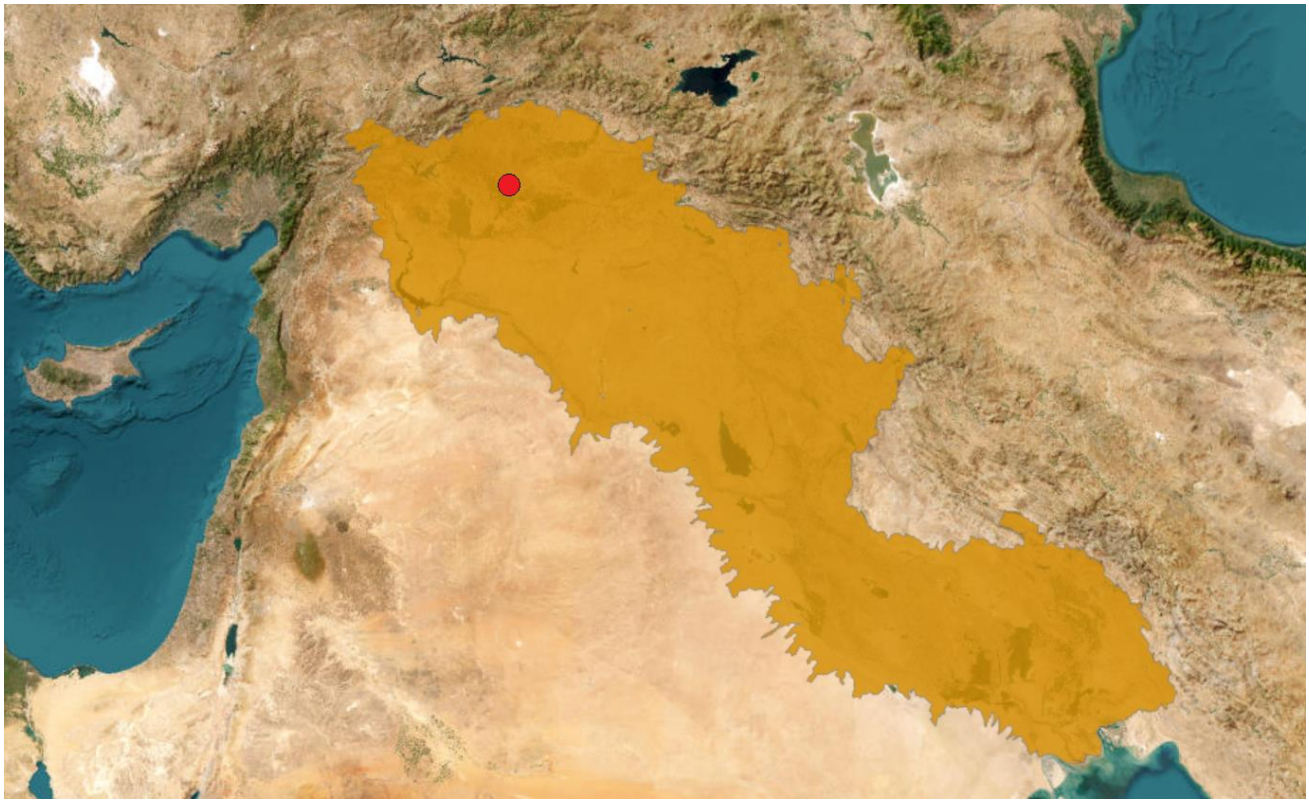


Figure 6-52: *Rafetus euphraticus* (Euphrates Softshell Turtle) distribution range (source: https://www.iucnredlist.org/species/19070/1956551) – red point indicates the location of the Project site.

Table of Contents

TABLES

FIGURES

7.0 ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

7.1 Physical Components

7.1.1 Air Quality

Based on the information collected for the definition of the baseline air quality (see Chapter 6/ section6.2.1.2), the physical component *Air Quality* was assigned a **Medium-high** value of sensitivity. The AoI is considered to be sensitive for the following reasons:

- The close presence of communities, vulnerable targets, and sensitive ecological receptors potentially exposed to air emissions.
- Other ongoing projects (under construction and planning stage) around the Project area.

7.1.1.1 Construction phase

7.1.1.1.1 Impact factors

Heavy construction is a source of dust emissions that may have substantial temporary impact on local air quality. Emissions during the construction activities are associated with land clearing, ground excavation, cut and fill operations as well as camp site operations. Dust emissions often vary substantially over different phases of the construction process. The impact factors originated from the Project activities potentially affecting air quality during construction phase are listed in Table 7-1.

Table 7-1: Project actions and related impact factors potentially affecting air quality during construction phase

Project actions	Impact factors
General engineering/construction works (i.e., land clearing, ground excavation, cut and fill operations, camp site operations)	Emissions of particulate matter Gaseous emissions from vehicles and construction equipment Gaseous emission from the boilers
Material transportation	Emissions of particulate matter Gaseous emissions from vehicles and construction equipment

Impacts potentially affecting this component are assessed here below for the construction phase.

- **Emissions of particulate matter**

Dust emissions from land preparation activities (including land clearing, ground excavation, cut and fill operations) are estimated using the emissions factors given in the Annex 12 of the Regulation on Control of Industrial Air Pollution (see below in Table 7-2). Uncontrolled emission factors represent the situations where activities are carried out without taking any mitigation measures. On the other hand, the controlled factors stand for the cases where activities are carried out with measures in place such sprinkling, keeping materials moist, loading and unloading without skidding, etc.

Table 7-2: Emission Factors used in Dust Emission Estimation

Source of emission	Emission factors		Emission Factor Unit
	Uncontrolled Conditions	Controlled Conditions	
Excavation	0.025	0.0125	kg/ton
Loading	0.010	0.005	kg/ton
Unloading	0.010	0.005	kg/ton
Storage	5.8	2.9	kg/ha.day
Transportation (total distance)	0.7	0.35	kg/km-vehicle

Land preparation activities and corresponding dust emissions are calculated based on the following assumptions on excavation amounts, bulk density of soil, duration of earth works, size of the area on which activities will take place, working hours per day, capacity of each truck, etc. The calculation of dust emissions is presented in the following table. Considering that the Project activities will follow the proposed mitigation measures, dust emissions are calculated based on the controlled condition emission factors.

Dust emission due to excavation, loading and unloading are calculated based on the following formula:

$$\text{Dust Emission}\left(\frac{\text{kg}}{\text{h}}\right) = \text{Emission Factor}\left(\frac{\text{kg}}{\text{ton}}\right) \text{x Production Amount}\left(\frac{\text{m}^3}{\text{h}}\right) \text{x Bulk Density of Soil}\left(\frac{\text{ton}}{\text{m}^3}\right)$$

where:

$$\textit{Production Amount}\ (\text{m}^3) = \frac{\text{Excavation/Loading/Unloading Amount}\ (\text{m}^3)}{\text{Duration of works (days)} * \text{Working hours per day (h/day)}}$$

Dust emission due to transportation are calculated based on the following formula:

$$\text{Dust Emission}\left(\frac{\text{kg}}{\text{h}}\right) = \text{Emission Factor}\left(\frac{\text{kg}}{\text{km} - \text{vehicle}}\right) \text{x Distance}\left(\frac{\text{km}}{\text{vehicle}}\right) \text{x Number of vehicles}\left(\frac{\text{vehicle}}{\text{h}}\right)$$

Table 7-3: Dust Emission Estimation – Cable Trench Excavation

Dust Emission due to excavation works:	
Excavation amount	38,300 m^3
Bulk density of soil	1.80 ton/m^3
Mass of excavated soil	38,300 m^3 x 1.80 ton/m^3 = 68,940 ton
Duration of earth works	300 days
Daily working time (2 shifts)	16 h/day

Hourly excavation amount	68,940 ton / (300 days x 16 h/day) = 14.36 ton/h
Dust emission due to excavation (under controlled conditions)	14.36 ton/h x 0.0125 kg/ton = **0.18 kg/h**
Dust Emission due to unloading of backfill material:	
Backfilling amount	38,300 m^3
Bulk density of soil	1.80 ton/m^3
Mass of backfilling material	38,300 m^3 x 1.80 ton/m^3 = 68,940 ton
Duration of earth works	300 days
Daily working time (2 shifts)	16 h/day
Hourly backfilling amount	68,940 ton / (300 days x 16 h/day) = 14.36 ton/h
Dust emission due to unloading of backfill (under controlled conditions)	14.36 ton/h x 0.005 kg/ton = **0.07 kg/h**

Table 7-4: Dust Emission Estimation – Access Road Construction

Dust Emission due to excavation works:	
Excavation amount	31,000 m^3
Bulk density of soil	1.80 ton/m^3
Mass of excavated soil	31,000 m^3 x 1.80 ton/m^3 = 55,800 ton
Duration of earth works	300 days
Daily working time (2 shifts)	16 h/day
Hourly excavation amount	55,800 ton / (300 days x 16 h/day) = 11.63 ton/h
Dust emission due to excavation (under controlled conditions)	11.63 ton/h x 0.0125 kg/ton = **0.15 kg/h**
Dust Emission due to unloading of backfill material:	
Backfilling amount	9,000 m^3
Bulk density of soil	1.80 ton/m^3
Mass of backfilling material	9,000 m^3 x 1.80 ton/m^3 = 16,200 ton
Duration of earth works	300 days

Daily working time (2 shifts)	16 h/day
Hourly backfilling amount	16,200 ton / (300 days x 16 h/day) = 3.37 ton/h
Dust emission due to unloading of backfill (under controlled conditions)	3.37 ton/h x 0.005 kg/ton = **0.02 kg/h**
Dust Emission due to loading of excess excavated soil to trucks:	
Excess Excavation amount	22,000 m^3
Bulk density of soil	1.80 ton/m^3
Mass of Excess Excavation material	22,000 m^3 x 1.80 ton/m^3 = 39,600 ton
Duration of earth works	300 days
Daily working time (2 shifts)	16 h/day
Hourly amount	39,600 ton / (300 days x 16 h/day) = 8.25 ton/h
Dust emission due to loading of material (under controlled conditions)	8.25 ton/h x 0.005 kg/ton = **0.04 kg/h**
Dust Emission due to transportation of excess excavated material:	
Average transport distance within the project area	500 m (one way)
Truck carrying capacity	30 tons/vehicle
Frequency of transports	(8.25 ton/h) / (30 ton/vehicle) = 0.27 vehicle / h
Dust emission due to transportation (under controlled conditions)	0.27 vehicle/h x 0.35 kg/km-vehicle x (1 km (round trip)) = **0.09 kg/h**

Table 7-5: Dust Emission Estimation – Inverter, switchyard and administration building construction

Dust Emission due to excavation works:	
Excavation amount	1,600 m^3
Bulk density of soil	1.80 ton/m^3
Mass of excavated soil	1,600 m^3 x 1.80 ton/m^3 = 2,880 ton
Duration of earth works	300 days
Daily working time (2 shifts)	16 h/day
Hourly excavation amount	2,880 ton / (300 days x 16 h/day) = 0.6 ton/h

Dust emission due to excavation (under controlled conditions)	0.6 ton/h x 0.0125 kg/ton = **0.007 kg/h**
Dust Emission due to unloading of backfill material:	
Backfilling amount	800 m^3
Bulk density of soil	1.80 ton/m^3
Mass of backfilling material	800 m^3 x 1.80 ton/m^3 = 1,440 ton
Duration of earth works	300 days
Daily working time (2 shifts)	16 h/day
Hourly backfilling amount	1,440 ton / (300 days x 16 h/day) = 0.3 ton/h
Dust emission due to unloading of backfill (under controlled conditions)	0.3 ton/h x 0.005 kg/ton = **0.002 kg/h**
Dust Emission due to loading of excess excavated soil to trucks:	
Excess Excavation amount	800 m^3
Bulk density of soil	1.80 ton/m^3
Mass of Excess Excavation material	800 m^3 x 1.80 ton/m^3 = 1,440 ton
Duration of earth works	300 days
Daily working time (2 shifts)	16 h/day
Hourly amount	1,440 ton / (300 days x 16 h/day) = 0.3 ton/h
Dust emission due to loading of material (under controlled conditions)	0.3 ton/h x 0.005 kg/ton = **0.002 kg/h**
Dust Emission due to transportation of excess excavated material:	
Average transport distance within the project area	500 m (one way)
Truck carrying capacity	30 tons/vehicle
Frequency of transports	(0.3 ton/h) / (30 ton/vehicle) = 0.01 vehicle / h
Dust emission due to transportation (under controlled conditions)	0.01 vehicle/h x 0.35 kg/km-vehicle x (1 km (round trip)) = **0.04 kg/h**

The total amount of dust to be emerged from the construction activities is calculated as 0.601 kg/h which is below the threshold value for the air emission dispersion modelling requirement defined by the Turkish Regulation (i.e., 1 kg/h threshold value for area source defined in Table 2.1 in Annex-2 of the SKHKKY). Therefore, possible impacts on air quality have been assessed without using software models.

On the other hand, seven other SPP projects are adjacent to the Project area, namely;

- G4-Viranşehir-1 Solar Power Plant Project to be realized by Egesa Elektrik İnşaat Enerji Üretim A.Ş.,
- G4-Viranşehir-2 Solar Power Plant Project to be realized by, EKSİM Enerji A.Ş.,
- G4-Viranşehir-3 Solar Power Plant Project to be realized by Reşitoğlu Enerji Elektrik Üretim A.Ş,
- G4-Viranşehir-4 Solar Power Plant Project to be realized by Ral Enerji A.Ş.,
- G4-Viranşehir-6 Solar Power Plant Project to be realized by EKSİM Enerji A.Ş.,
- G4-Viranşehir-9 Solar Power Plant Project to be realized by Ral Enerji A.Ş.,
- G4-Viranşehir-10 Solar Power Plant Project to be realized by EKSİM Enerji A.Ş.,

The construction schedule of these projects, as of the date of this ESIA, is given in Table 7-6.

Table 7-6: Construction Schedules of the projects nearby

Name of the Project	Aug. 23	Sep 23	Oct. 23	Nov. 23	Dec. 23	Jan. 24	Feb. 24	Mar. 24	Apr. 24	May 24	Jun. 24	Jul. 24	Aug. 24	Sep 24	Oct. 24	Nov. 24	Dec. 24
G4-Viranşehir-1 SPP																	
G4-Viranşehir-2 SPP																	
G4-Viranşehir-3 SPP																	
G4-Viranşehir-4 SPP																	
G4-Viranşehir-5 SPP																	
G4-Viranşehir-6 SPP																	
G4-Viranşehir-7 SPP																	
G4-Viranşehir-8 SPP																	
G4-Viranşehir-9 SPP																	
G4-Viranşehir-10 SPP																	

As it can be seen from the Table 7-6,

- Construction of the G4-Viranşehir-1 SPP will be started in December 2023.
- Construction of the G4-Viranşehir-2 SPP, G4-Viranşehir-6 SPP and G4-Viranşehir-10 SPP will be started in February 2024.
- Construction of the G4-Viranşehir-3 SPP, G4-Viranşehir-4 SPP and G4-Viranşehir-9 SPP will be started in January 2024.
- The Construction Schedule of these ten projects will overlap from February 2023 to June 2024.

Gaseous emissions from vehicles and construction equipment

Gaseous emissions originated from the exhaust emissions due to fuel combustion in operation of the heavy-duty vehicles are calculated by using the Emission Standards Reference Guide published by USEPA. According to this guide, the major gaseous pollutants emitted from these types of vehicles are nitrogen oxides (NO_x), carbon monoxide (CO) and non-methane hydrocarbons (NMHC) (see Table 7-7).

Table 7-7: USEPA Emission Standards for Nonroad Compression-Ignition Engines [1]

Rated Power (kW)	NMHC (g/kW-hour)	NOx (g/kW-hour)	PM (g/kW-hour)	CO (g/kW-hour)
kW < 8	-	-	0.4	8.0
8 ≤ kW < 19	-	-	0.4	6.6
19 ≤ kW < 37	-	-	0.03	5.5
37 ≤ kW < 56	-	-	0.03	5.0
56 ≤ kW < 75	0.19	0.4	0.02	5.0
75 ≤ kW < 130	0.19	0.4	0.02	5.0
130 ≤ kW < 225	0.19	0.4	0.02	3.5
225 ≤ kW < 450	0.19	0.4	0.02	3.5
450 ≤ kW < 560	0.19	0.4	0.02	3.5
560 ≤ kW < 900	0.19	3.5	0.04	3.5
kW > 900	0.19	3.5	0.04	3.5

Kalyon will carry out the construction works simultaneously in different locations of the project area. During calculation of the gaseous emissions caused by the construction machinery, maximum number of the machine and equipment that will work simultaneously are taken into consideration.

[1] https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100OA05.pdf

The amount of gaseous pollutants calculated by using emission factors are presented in Table 7-8 and Table 7-9.

Table 7-8: Pollutant Emissions Originated from the Each Construction Equipment

Construction Equipment	Number of Equipment	Rated Power* (kW)	Parameter	Emission (kg/hour)
Generator	7	50	NMHC	0.067
			NO_X	0.140
			PM	0.007
			CO	1.225
Pile Driver	10	35	NMHC	0.067
			NO_X	0.140
			PM	0.007
			CO	1.225
Loader	2	153	NMHC	0.057
			NO_X	0.120
			PM	0.006
			CO	1.050
Excavator	7	161	NMHC	0.214
			NO_X	0.451
			PM	0.023
			CO	3.945
Dozer	2	172	NMHC	0.065
			NO_X	0.138
			PM	0.007
			CO	1.204
Grader	1	135	NMHC	0.026
			NO_X	0.054
			PM	0.003
			CO	0.473
Earthmoving Trucks	22	210	NMHC	0.878
			NO_X	1.848
			PM	0.092
			CO	16.170
JCB	7	81	NMHC	0.146
			NO_X	0.308

Construction Equipment	Number of Equipment	Rated Power* (kW)	Parameter	Emission (kg/hour)
			PM	0.015
			CO	3.850
Cylinder	2	110	NMHC	0.042
			NO_X	0.088
			PM	0.004
			CO	1.100
Telehandler	11	55	NMHC	0.115
			NO_X	0.242
			PM	0.012
			CO	2.118
Lowbed	1	172	NMHC	0.033
			NO_X	0.069
			PM	0.003
			CO	0.602
Crane	2	244	NMHC	0.093
			NO_X	0.195
			PM	0.010
			CO	1.708
SUV	2	110	NMHC	0.042
			NO_X	0.088
			PM	0.004
			CO	1.100

* *Values of similar projects were referenced.*

Table 7-9: Total Pollutant Emissions Originated from the Construction Equipment

Parameter	Total Calculated Emission (kg/hour)	Threshold Value Defining Modelling Study Requirement by the Turkish Regulation (kg/hour)
NMHC	1.843	3
NO_X	3.880	4
PM	0.194	1
CO	35.769	50

Since the amount of each pollutant emission originated from the construction equipment is below the threshold value for the air emission dispersion modelling requirement defined by the Turkish Regulation (Table 2.1 in Annex-2 of the SKHKKY), air quality modelling study was not conducted for these pollutants.

- **Gaseous emission from the boilers**

During construction period, heating and hot water needs will be provided by Liquefied Natural Gas (LNG) heating center composed of 1 boiler having 10,000 m^3 volume and 1500 kW capacity in camp sites. Accordingly,

Hourly energy output = 1500 kWh x 3.6 MJ/kWh = 5,400 MJ

The emissions from the boilers area calculated as per the emission factors defined by European Environment Agency, EMEP/EEA Air Pollutant Emission Inventory Guidebook 2019 for small combustion plants.

Table 7-10: Emission factors and emissions for the LNG boilers

Pollutant	Emission factor*	Calculation	Emissions (kg/h)	Threshold Value for the Air Emission Dispersion Modelling Requirement from the stacks(kg/h) **
NOx	42 g/GJ	=42 g/GJ x 5400 MJ x 1GJ/1000 MJ x 1 kg/1000 g	0.23	40
CO	22 g/GJ	=22 g/GJ x 5400 MJ x 1GJ/1000 MJ x 1 kg/1000 g	0.11	500
SOx	0.30 g/GJ	=0.30 g/GJ x 5400 MJ x 1GJ/1000 MJ x 1 kg/1000 g	0.0016	60
PM10	0.20 g/GJ	=0.20 g/GJ x 5400 MJ x 1GJ/1000 MJ x 1 kg/1000 g	0.0011	10

* EMEP/EEA Air Pollutant Emission Inventory Guidebook 2019, 1.A.4.a.i, 1.A.4.b.i, 1.A.4.c.i, 1.A.5.a Small Combustion, Table 3.16

** Table 2.1 in Annex-2 of the SKHKKY

The total amount of pollutants to emerge from the construction activities are calculated as below the threshold value for the air emission dispersion modelling requirement defined by the Turkish Regulation. Therefore, impacts on air quality have been assessed without using numerical models.

7.1.1.1.2 Mitigation measures

In order to reduce the air emissions from the construction machinery and equipment, the following actions will be implemented during the construction phase:

- Dust will be supressed by spraying water at construction sites and transportation routes, especially in hot-dry seasons and in windy conditions;
- Loads in all trucks transporting dust-generating materials will be sprayed with water to suppress dust (keeping the material moist) and trucks carrying fine material (excavation soil or fine material, etc.) will be covered with tarpaulin to prevent dust emissions;
- Skidding will be avoided during loading and unloading;
- Completed earthworks will be covered and sealed - as soon as reasonably practicable after completion;
- In case alternative roads are present, construction traffic will avoid passing through the settlements. If roads through settlements cannot be avoided, necessary measures (i.e., speed limits) will be taken to

prevent/minimise transportation related emissions and communities will be informed about the activities and schedule;

- Speed limits will be enforced, vehicle movements will be limited and idling will be prohibited;;
- Campfires or burning materials will be prohibited;
- Activities will be conducted trying to use the minimum required number of means at the same time;
- Transportation distances will be minimized where possible;
- Vehicle engines and other machinery will be idled for short periods during duty, to avoid unnecessary emissions by turning the vehicles off and on frequently;
- Machinery and equipment will be periodically checked and maintained to ensure their good working condition and for compliance with standards and technical regulations for the protection of the environment and have appropriate certifications;
- Emergency generator working hours will be recorded and necessary emission measurements will be conducted in case of exceeding 500 working hours in a year. Monthly operating hours of the previous year and the records regarding the amount of gas/fuel consumed in emergency situations and the frequency of the emergency (year/day) will be reported to Provincial Directorate of Environment, Urbanization and Climate Change (PDEUCC) until January 31st of each year;
- Exhaust gas emission arising from the engine land vehicles in traffic will comply with the Regulation on Control of Exhaust Gas Emissions. Vehicles will be subjected to appropriate routine maintenance programs and emission measurements as required by the regulation. The use of vehicles that do not comply with the emission limits will not be permitted until such vehicles will be serviced and re-tested. Emission measurements of heating centers in the construction camps (if any) will be conducted according to Regulation on Control of Air Pollution from Heating if the thermal power is below 1000 kW and Regulation on Control of Industrial Air Pollution if the thermal power is above 1000 kW;
- Stockpiles will be kept for the shortest possible time;
- Consider the prevailing wind direction when siting stockpiles to reduce the likelihood of affecting sensitive receptors;
- Slow down or cease the dust generating work under strong winds, such as reducing work activities or using water spray to reduce dust dispersion;
- Minimize material handling and avoid double handling;
- Electric small-scale mechanization and technical tools will be used when available and feasible;
- Provide dust masks to workers on site where dust levels are likely to be excessive;
- During the second half of the August 2023,
  - additional dust water suppression methods will be applied, such as increasing the water spraying;
  - the number of the vehicles in this period will be kept at a minimum, as much as possible.

7.1.1.1.3 Residual impacts

Based on the baseline conditions of the assessed component, the project characteristics and actions, as well as the proper implementation of the mitigation measures proposed above, a potential **negligible to low negative impact** is expected on the air quality due to construction activities.

Table 7-11: Residual impact assessment matrix for the air quality during construction phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Emissions of particulate matter	Duration:	Short	Medium-high	Short-term	**Low**	Medium	**Negligible**
	Frequency:	Frequent					
	Geo. Extent:	Local					
	Intensity:	Low					
Gaseous emissions from vehicles and construction equipment	Duration:	Short	Medium-high	Short-term	**Low**	Low	**Low**
	Frequency:	Frequent					
	Geo. Extent:	Local					
	Intensity:	Low					
Gaseous emission from the boilers	Duration:	Short	Medium-high	Short-term	**Low**	Low	**Low**
	Frequency:	Frequent					
	Geo. Extent:	Local					
	Intensity:	Low					

7.1.1.1.4 Monitoring measures

The following monitoring measures shall be implemented to assess the real impacts of the Project on the air quality during the construction and verify the effectiveness of the mitigation measures.

- Monitoring PM10 levels by quarterly measurements;
- Regular (daily) visual monitoring to ensure that the dust mitigation measures are in place;
- Routine maintenance program will be set-up and maintenance records will be kept for all vehicles, machinery/equipment;
- Periodic inspection of subcontractors to ensure that all vehicles, construction machinery used on site evidence regular maintenance schedule in line with regulatory requirements;
- Maintaining a logbook by recording any incidents that cause extra dust or gas emissions, either on- or offsite, and the action taken to resolve the situation in the log book; and
- Air quality monitoring of PM_{10} at the closest sensitive receptors in case of grievance.

7.1.1.2 Operation Phase

7.1.1.2.1 Impact factors

The impact factor of the Project activities potentially affecting air quality during operation phase is listed in Table 7-18.

Table 7-12: Project Actions and Related Impact Factors During Operation Phase

Project actions	Impact factors
Plant/infrastructure operation	Emission of gaseous pollutants from the vehicles

The impact factor identified above is described below and assessed in the matrix that follows.

- **Emission of gaseous pollutants from the vehicles**

During the operation phase of the Project, only emission to be caused by the Project related activities are the exhaust emissions from the cars used by the operation personnel. During operation phase, total of 23 personnel will be employed, and the vehicle traffic will be mainly from the maintenance works and staff shuttles/cars entering and leaving the Project Area.

7.1.1.2.2 Mitigation measures

In order to reduce the air emissions from the operation machinery and equipment, the following actions will be implemented during the operation phase:

- vehicle engines and other machinery will be kept turned on only if necessary, avoiding any unnecessary emission;
- vehicles will be periodically checked and maintained to ensure their good working condition;
- number of vehicles operating simultaneously will be kept at a minimum.

7.1.1.2.3 Residual impacts

Based on the baseline conditions of the assessed component, the project characteristics, and actions, as well as the proper implementation of the mitigation measures proposed above, a potential **negligible negative impact** is expected on the air quality due to operation activities.

Table 7-13: Residual impact assessment matrix for the air quality during operation phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Emission of gaseous pollutants from the vehicles	Duration:	Very long	Medium-high	Short-term	**Low**	Medium	**Negligible**
	Frequency:	Frequent					
	Geo. Extent:	Local					
	Intensity:	Negligible					

7.1.1.2.4 Monitoring measures

The following monitoring measures shall be implemented to assess the true effects of the Project on the air quality during the operation period.

- Routine maintenance program will be set-up and maintenance records will be kept for all vehicles, machinery/equipment;
- A logbook will be maintained by recording any exceptional incidents that cause extra dust or gas emissions, either on- or offsite, and the action taken to resolve the situation in the logbook.

7.1.1.3 Decommissioning Phase

The activities during the decommissioning phase are likely to be similar to the construction phase hence the impacts will be similar to impacts of construction activities. Based on that, a new impact is not expected during the decommissioning phase of the Project, other than those listed in the construction phase.

7.1.2 Noise and Vibration

Based on the information collected for the definition of the baseline (see Chapter 6.1.4), the physical component *Noise* was assigned a **Medium** value of sensitivity for the following reasons:

- High noise levels in the AoI;

- Close presence of communities, vulnerable receptors and sensitive ecological receptors potentially exposed to noise and vibration emissions; and
- Other ongoing projects (under construction and planning stage) around the Project site.

7.1.2.1 Noise Baseline Summary

In order to determine the baseline noise levels around the Project area, 11 noise receptor locations have been determined. Between April 05th – 15th, 2023, ambient noise levels were measured during a 48-hours period at each location in line with TS 9798 (ISO 1996–2) and TS 9315 (ISO 1996–1) standards.

The baseline noise measurement results are presented in the noise baseline section of this ESIA (see Chapter 6 / section 6.1.4). The noise measurement results are compared with both IFC noise standards and Turkish Regulatory noise limit values. In this respect, it is observed that baseline noise levels are below the IFC and Turkish Regulatory noise limits.

7.1.2.2 Noise Modelling Methodology

A noise modelling software "SoundPLAN Essential 5.0"[1] was used to determine the predicted noise levels that would potentially occur during the construction phase of the Project. Information about the noise levels of vehicles and equipment, identified as noise sources to be used by the Project, was obtained from the noise modelling software program's library.

During the modelling studies for the construction phase of the Project, below steps were followed:

1) The elevation model that directly affects the noise distribution of the natural terrain is created. In the meantime, elevation contours with 10 m intervals on the topographic map were digitized and loaded into the program. Interpolation of elevation contours was performed in the program and natural elevation data of the Project area and its surroundings were obtained to be used in the model. After the elevations are digitalized, Temporary DGM (Digitalized Ground Model) is generated.

2) The humidity, temperature, and air pressure data of the Project area were introduced to the model.

3) The noise sources identified for the study area were introduced to the model together with their noise levels (dBA).

4) The receptors have also been digitized in the model.

5) Ground effect, which is another important parameter for the noise distribution, was also digitalized in the model. Ground effect varies between 0 to 1, where 0 corresponds to hard, reflective surfaces and 1 corresponds to soft, absorptive surfaces.

6) Upon completion of the above, the modelling process has been initiated by determining a calculation area that will include all the noise sources and sensitive receptors in the study area. For the worst-case scenario simulation, all the noise sources are assumed to work at the same time and at the distances identified before. As a result of the model runs, noise levels in the defined receptors and grid noise maps for the study area are obtained.

The Noise Model assumptions and approaches are listed below:

- Noise model was developed by using equipment type and amount, and noise levels which is defined in the below sections;

[1] https://www.soundplan.eu/en/software/soundplanessential/

- The Project area humidity is taken as 50.4%, temperature as 18.6°C and air pressure as 948.9 hPa by assuming a general average for region as described in Section 6.1.2;
- The ground effect was taken as 0.8 according to the rurality & urbanity intensity of the Project area; and
- The model is set considering the worst-case scenario, which represents the situation where all of the noise sources are operating at the same time with maximum capacity.

For the worst-case scenario simulation, modelled noise levels were cumulatively assessed by considering the highest baseline noise levels measured, and the cumulative noise values were compared with the Project standards.

7.1.2.3 Construction Phase

7.1.2.3.1 Impact factors

The impact factor from the Project activities potentially affecting ambient noise during construction phase is listed in Table 7-14.

Table 7-14: Project Actions and Related Impact Factors During Construction Phase

Project actions	Impact factors
General engineering/construction works	Emission of noise
Material transportation	Emission of noise

The impact factor identified above is described below and assessed in the matrix that follows.

- **Emission of noise**

Increase in ambient noise levels are expected due to operation of generators, heavy machinery, equipment etc. during:

- General engineering/construction works; and
- Material transportation.

In this section, the environmental noise generated by the machinery and equipment to be used in the infrastructure and superstructure construction, is evaluated cumulatively and conservatively for the purpose of displaying the worst-case scenario during the construction phase of the Project. However, it should be noted that no construction activity will take place during night-time.

The list of equipment and machinery that will be used during the construction of the whole Project are presented in Table 7-15. The noise levels of these equipment/machine were obtained from the library of SoundPlan Essential 5.0 and were introduced to the model. The given equipment/machine list represents all the equipment that will be used in the construction works which will be carried out simultaneously in different parts of the Project area.

Kalyon will carry out the construction works simultaneously in different locations of the project area. During noise modelling , maximum number of the machine and equipment that will work simultaneously are taken into consideration.

Table 7-15: Construction Machine/Equipment List

Equipment / Vehicle	Number	Sound Power (Lw)*
Generator	7	102
Pile Driver	10	132
Loader	2	116
Excavator	7	112
Dozer	2	117
JCB	7	116
SUVs	2	99
Grader	1	119
Earthmoving Trucks	22	123
Cylinder	2	118
Telehandler	11	104
Lowbed	1	123
Mobile Crane	2	105

*Noise levels of the machine/equipment are obtained from the library of Sound Plan Essential 5.0.

The calculated noise levels at the chosen receptors, where baseline noise measurements were conducted, the cumulative results and the comparison of the results with the IFC standards and Turkish limit values are presented in Table 7-16. Detailed breakdown of the cumulative results of the assessed receptors are given below:

- IFC day-time noise standard is exceeded at locations N-1, N-3, N-6, N-7, N-10 and N-11;
- Turkish day-time noise regulatory limit value is exceeded at location N-11;
- Turkish evening-time noise regulatory limit value is exceeded at locations N-6, N-7, N-10 and N-11.

The daytime grid noise map obtained for the construction phase is presented in the Figure 7-1 below.

Table 7-16: Modelled Construction Noise Levels and Baseline Noise Levels at the Receptors during the Construction Phase of the Project

Measurement Point	Measurement Location					Modelled Noise Levels (originated from Project activities) (dBA)					The Baseline Noise Levels (dBA)*					Modelled Noise Level + The Ambient Noise Level (dBA)					Difference Between Ambient and Modelled Noise Levels (dBA)				
	Province	District	Village / Neighborhood	Receptor Type	Distance to the Project Area (m)	IFC		Turkish			IFC		Turkish			IFC		Turkish			IFC		Turkish		
						Day (07-22)	Night (22-07)	Day (07-19)	Evening (19-23)	Night (23-07)	Day (07-22)	Night (22-07)	Day (07-19)	Evening (19-23)	Night (23-07)	Day (07-22)	Night (22-07)	Day (07-19)	Evening (19-23)	Night (23-07)	Day (07-22)	Night (22-07)	Day (07-19)	Evening (19-23)	Night (23-07)
N-1	Mardin	Derik	Demirli	Residential	1,420	57.0	-	57.0	57.0	-	44.3	38.7	44.6	42.6	38.6	57.2	38.7	57.2	57.2	38.6	12.9	0.0	12.6	14.6	0.0
N-2	Mardin	Derik	Demirli	Residential	1,780	54.0	-	54.0	54.0	-	44.2	40.5	44.3	43.2	40.3	54.4	40.5	54.4	54.3	40.3	10.2	0.0	10.1	11.1	0.0
N-3	Mardin	Derik	Demirli	Residential	1,660	56.3	-	56.3	56.3	-	44.8	39.0	45.2	43.2	38.0	56.6	39.0	56.6	56.5	38.0	11.8	0.0	11.4	13.3	0.0
N-4	Şanlıurfa	Viranşehir	Gölcük	Residential	1,400	54.2	-	54.2	54.2	-	44.0	40.9	44.2	44.2	38.8	54.6	40.9	54.6	54.6	38.8	10.6	0.0	10.4	10.4	0.0
N-5	Şanlıurfa	Viranşehir	Gölcük	Residential	1,600	53.0	-	53.0	53.0	-	44.8	37.9	44.8	44.3	37.4	53.6	37.9	53.6	53.5	37.4	8.8	0.0	8.8	9.2	0.0
N-6	Şanlıurfa	Viranşehir	Gölcük	Residential	280	64.7	-	64.7	64.7	-	43.8	38.1	43.7	43.0	37.7	64.7	38.1	64.7	64.7	37.7	20.9	0.0	21.0	21.7	0.0
N-7	Şanlıurfa	Viranşehir	Gölcük	Residential	580	62.8	-	62.8	62.8	-	44.4	38.9	44.6	42.7	38.6	62.9	38.9	62.9	62.8	38.6	18.5	0.0	18.3	20.1	0.0
N-8	Şanlıurfa	Viranşehir	Gölcük	Residential	2,740	50.0	-	50.0	50.0	-	44.2	38.9	43.7	42.3	38.2	51.0	38.9	50.9	50.7	38.2	6.8	0.0	7.2	8.4	0.0
N-9	Şanlıurfa	Viranşehir	Gölcük	Residential	2,950	46.5	-	46.5	46.5	-	42.4	39.8	42.1	42.5	39.2	47.9	39.8	47.8	48.0	39.2	5.5	0.0	5.7	5.5	0.0
N-10	Şanlıurfa	Viranşehir	Gölcük	Residential	550	60.3	-	60.3	60.3	-	44.1	39.7	44.1	42.9	39.9	60.4	39.7	60.4	60.4	39.9	16.3	0.0	16.3	17.5	0.0
N-11	Mardin	Derik	Demirli	Residential	260	65.2	-	65.2	65.2	-	45.6	37.9	46.4	40.2	37.7	65.2	37.9	65.3	65.2	37.7	19.6	0.0	18.9	25.0	0.0
IFC Noise Standards[1,2]	Residential; institutional; educational areas					**55**	**45**	-	-	-	**55**	**45**	-	-	-	**55**	**45**	-	-	-	**3**	**3**	-	-	-
Turkish Noise Limit Values[3,4]	Industrial facilities, transportation sources					-	-	**65**	**60**	**55**	-	-	**65**	**60**	**55**	-	-	**65**	**60**	**55**	-	-	-	-	-

Notes:

* For the worst-case scenario simulation, modelled noise levels were cumulatively assessed and compared with the highest baseline value.
[1] IFC Environmental, Health, and Safety (EHS) Guidelines General EHS Guidelines: Environmental - Noise Management;
[2] IFC Guidelines provide noise standards for two-time intervals in 24 hours: day (07:00 to 22:00), and night (22:00 to 07:00).
[3] Regulation on Control of Environmental Noise;
[4] Regulation on Control of Environmental Noise provides noise standards for three-time intervals in 24 hours: day (07:00 to 19:00), evening (19:00 to 23:00) and night (23:00 to 07:00).

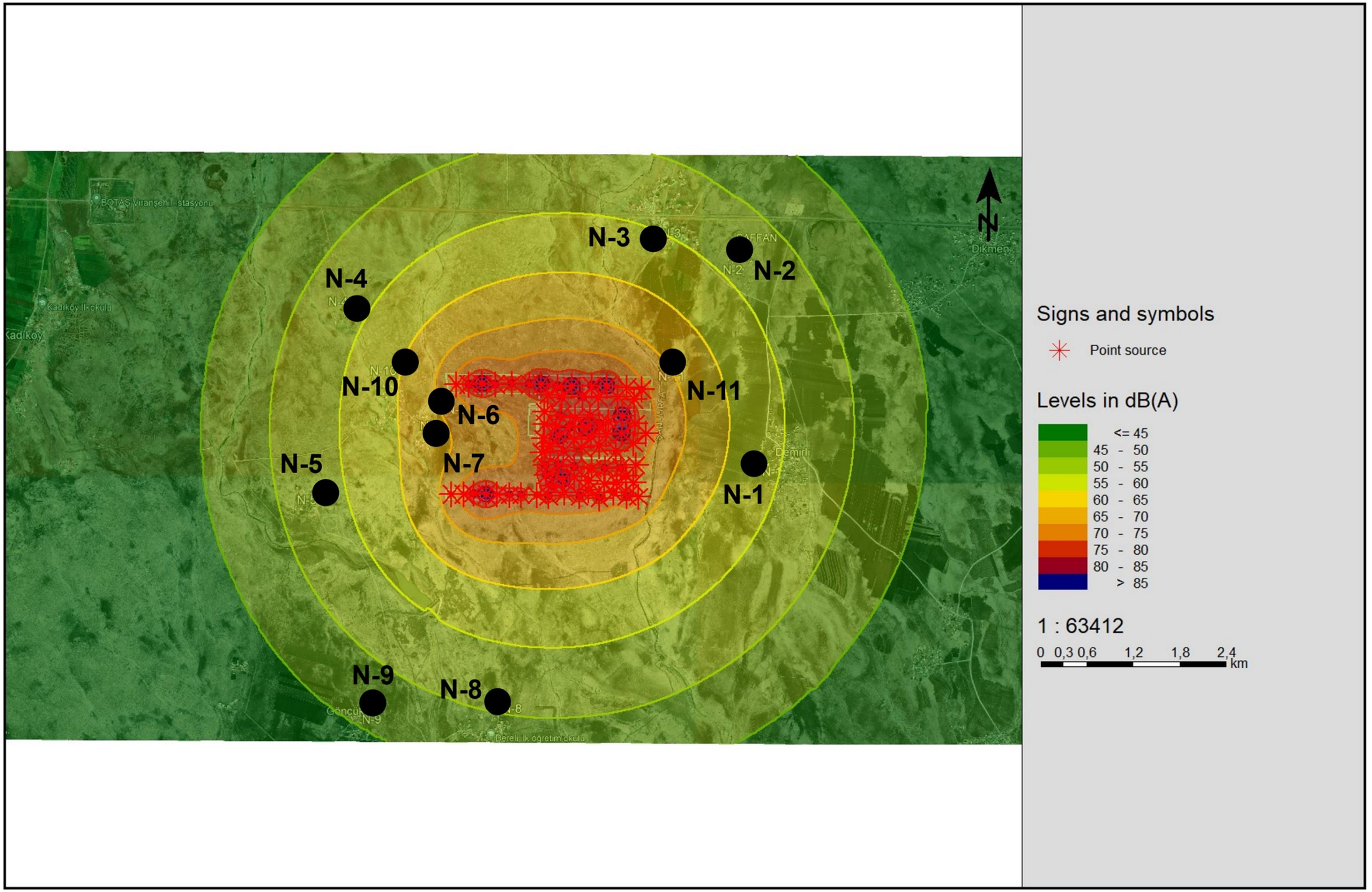


Figure 7-1: Daytime Grid Noise Map for the Construction Phase of the Project

7.1.2.3.2 Mitigation Measures

The mitigation measures listed below follow the mitigation hierarchy (avoidance, minimization, rehabilitation/restoration) and will be implemented during the construction phase of the Project. It should be noted that the noise modelling studies and relevant assessments are based on the worst-case scenario assuming that all machines and equipment used in the construction activities are working simultaneously, and at maximum sound power levels; therefore, the real increase in baseline noise levels would be much lower than the predicted values above in most of the time due to the homogeneous distribution of equipment on site.

During the construction phase, provisions of the “Regulation on Control of Environmental Noise” and “Regulation on Protection of Workers from Noise-Related Risks” will be followed with the purpose of protecting both environment and health of employees with respect to noise impacts. Accordingly, appropriate personal protective equipment and materials such as ear protector or ear plug will be provided to protect workers from noise impacts.

The following control measures will be applied where possible:

- Selection of equipment with lower sound power levels;
- Installing silencers for fans;
- Installing suitable mufflers on engine exhausts and compressor components;
- Installing acoustic enclosures for equipment casting radiating noise;
- Limiting the hours of operation for specific pieces of equipment or operations, especially mobile sources operating through community areas;
- Speed limits applied throughout site for the Project vehicles that will transport construction materials / equipment;
- Properly refurbished and/or new machinery, equipment and vehicles will be used to the extent possible;
- Any component of machinery or equipment, which is thought to generate excessive noise (e.g., a defective muffler, broken or loosely placed engine hood) will be discarded if said components cannot be maintained/repaired and they will be replaced as appropriate;
- Engine covers will be kept closed when the equipment is in operation to minimize noise;
- Workers will be trained in noise abatement best practices, including avoiding unnecessary operation of engines and switching off equipment when it is not required;
- Idling of construction vehicles will be avoided;
- Best management practices (e.g., selection of equipment and work methods) will be used to limit vibration impacts, particularly nuisance vibration. Heightened attention to vibration control will occur when working within 50 meters of residences and other sensitive receptors with high vibration creating equipment. Significant changes to the vibration levels can occur based on the soil conditions and the driving energy of the hammer;
- Re-locating noise sources to less sensitive areas to take advantage of distance and shielding;
- Reducing the Project traffic routing through community areas wherever possible;
- Developing a grievance mechanism to record and respond to complaints;

- Carrying out the regular maintenance of the construction equipment in order to minimize the possible high noise levels generated by the equipment; and
- Performing quarterly monitoring campaigns at the baseline noise measurement locations during the construction phase.

In case of any Project related noise grievance, noise measurement campaign will be carried out immediately at the area where noise related grievance is received. If monitoring results indicate that noise levels are above the defined limits, at the first stage construction schedule in order to limit the hours of operation or to limit the number of equipment to be operated simultaneously will be reviewed and revised accordingly, if possible. Secondly, if it is not possible to revise the construction schedule, noise barriers without any gaps and with a continuous minimum surface density of 10 kg/m^2 could be installed as a second option, in order to minimize the transmission of sound through the barrier. Barriers should be located close to the source or to the receptor location to be effective. The exact specifications, location and number of the noise barriers will be determined, if deemed necessary.

In case of any noise related grievances about the cumulative impact of projects, Kalyon Enerji will inform the other project owners and joint actions will be taken.

7.1.2.3.3 Residual impacts

The table below summarizes the impacts caused by the identified impact factor on the component assessed.

Based on the baseline conditions of the assessed component, the project characteristics, and actions, as well as the proper implementation of the mitigation measures proposed above, a potential **low** impact is expected on the ambient noise during the construction phase.

Table 7-17: Residual Impact Assessment Matrix for the Noise During Construction Phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation Effectiveness	Residual Impact Value
Emission of Noise	Duration:	Short	Very high	Short-term	**Low**	Medium	**Low**
	Frequency:	Continuous					
	Geo. Extent:	Local					
	Intensity:	Very high					

7.1.2.3.4 Monitoring measures

During the construction phase of the Project, a monitoring program of noise at the baseline noise measurement locations and at the receptors where the defined noise limit values are exceeded, will be in place. The monitoring campaign will be conducted by measuring the noise continuously for 48 hours (quarterly) at the identified locations.

7.1.2.4 Operation Phase

7.1.2.4.1 Impact factors

The impact factor from the Project activities potentially affecting ambient noise during construction phase is listed in Table 7-18.

Table 7-18: Project Actions and Related Impact Factors During Operation Phase

Project actions	Impact factors
Plant/infrastructure operation	Emission of noise

The impact factor identified above is described below and assessed in the matrix that follows.

- **Emission of noise**

During the operation phase of the Project, inverter stations will be enclosed in prefabricated units which include inverters, step-up transformers and MV Ring Main Units. Sound pressure levels of the inverter stations are known to be around 85/75 dBA at 1m/10m in front of the enclosure and 1m above ground. Therefore, noise level generated by the inverter stations is not expected to cause any increase in the background noise levels at the closest sensitive receptors.

7.1.2.4.2 Mitigation measures

During the operation phase of the Project, provisions of the "Regulation on Control of Environmental Noise" and "Regulation on Protection of Workers from Noise-Related Risks" will be followed with the purpose of protecting health of employees with respect to noise impacts. Accordingly, appropriate personal protective equipment and materials such as ear protector or ear plug will be provided to protect workers from noise impacts, if required. In addition, maintenance of the equipment will be made regularly to ensure high noise levels are minimized.

Although no significant impact is expected in terms of noise emissions, following measures will be implemented during the operation phase of the Project:

- In case of any noise related grievance, noise measurement campaign will be carried out immediately at the area where noise related grievance is received;
- Noise levels will be monitored at the receptors where the defined noise limit values are exceeded, at least for a year on monthly basis; and
- In cases when monitoring results indicate that noise levels are above the defined limits, then noise abatement measures will be implemented (e.g. noise barriers at the source, soundproofing, etc.).

7.1.2.4.3 Monitoring measures

During the operation phase of the Project, a monitoring program of noise at the baseline noise measurement locations and at the receptors where the defined noise limit values are exceeded, will be in place. The monitoring campaign will be conducted by 48 hours of continuous noise measurements (quarterly) at the locations. In case the measurements are below the limit values, annual noise measurements will be carried out - to stay on the safe side. If the measurements results are under the regulatory limits, further noise measurements will only be carried out in case of any complaints from the community.

7.1.2.5 Decommissioning Phase

The activities during the decommissioning phase are likely to be similar to the construction phase hence the impacts will be similar to construction activities. Based on that, a new impact is not expected during the decommissioning phase of the Project, other than those listed in the construction phase

7.1.3 Soil and Subsoil

Based on the information collected for the definition of the baseline (see Chapter 6.2.1.5), the physical component *Soil and Subsoil* was assigned a **Medium-Low** value of sensitivity for the following reasons:

- Limited presence of soil with agricultural potential;
- Limited potential for soil contamination.

7.1.3.1 Construction phase

7.1.3.1.1 Impact factors

The impact factors from the Project activities potentially affecting soil and subsoil during construction phase are listed in Table 7-19.

Table 7-19: Project actions and related impact factors potentially affecting soil and subsoil during construction phase

Project actions	Impact factors
General engineering/construction works;	Removal of topsoil/soil Minor leakage of contaminants into soil Occupation of land
Material Storage	Minor leakage of contaminants into soil
Accommodation and management of the workforce	Discharge of wastewater Occupation of land

Impacts potentially affecting this component are assessed here below for the construction phase.

- **Removal of Topsoil/Soil**

Prior to commencing the excavation and topsoil removal process to raise the ground to the desired levels, the field will be cleared of significant obstacles using heavy machinery such as rock pickers, excavators, and dozers. Once the field is free from obstructions, the grubbing phase will commence as planned. Rock removal will be carried out by the Viranşehir Municipality. Together with the rock removal process, the topsoil will be taken to municipality storage area. During rock removal, stone and topsoil will be separated from each other and if necessary, they will be used in restoration works. Once the site is cleared from rock and topsoil, it will be handed over to Kalyon Enerji to start construction and installation.

Soil will be removed during; earthworks (excavation, filling) to create the surface over which the Project will be constructed, trenching activities for cable laying and excavation works for the foundations of buildings (e.g., control building). No excavation waste is expected as the resulting material will be used for filling. The material needed for the construction activities, including bedding, padding, backfilling, and aggregate will be provided from third party companies which have permits/licenses in accordance with national regulations.

Removal of soil will eventually generate disturbances that will make the soil surface more vulnerable to wind and/or rain erosion. There are no natural water receptors in the Project AoI therefore no impact by surface drainage caused by soil erosion is expected.

- **Minor Leakage of Contaminants into Soil**

Minor leakage of contaminants into soil can be caused by;

- accidental spill of any hazardous materials that are used during the construction;
- oil and fuel leakage from vehicles and generators;
- runoff from area where chemical, oil and fuel are temporarily stored (i.e., areas where paving and secondary containments are not present);
- pollution caused by temporary storage of hazardous materials and/or wastes;
- disposal of wastes, wastewater, and liquid wastes;
- accidental spill of untreated wastewater (e.g., domestic) to soil.
- flooding secondary containments caused by heavy precipitation;

- **Discharge of Wastewater**

During construction phase, domestic wastewater generation due to personnel working per day is calculated as 72.28 m^3/day including offsite accommodation and construction camp. Domestic wastewater generated by personnel at the camp site will be collected by sewage infrastructure and treated in package wastewater treatment plant. The effluent of the wastewater treatment plant will be used in dust suppression/irrigation in line with the environmental permit to be secured from the Provincial Directorate of Environment, Urbanization and Climate Change as per the Regulation on Environmental Permits and Licenses.

No wastewater generation is expected as a result from dust suppression activities, since the water to be used for dust suppression activities is expected to evaporate.

- **Occupation of land**

Occupation of land mainly related to presence of the new facilities (such as PV panels, administrative buildings, campsite, and switchyard) and this will increase the artificial surfaces.

7.1.3.1.2 Mitigation measures

The following mitigation measures shall be implemented to mitigate the effects of the impact factors.

- **Removal of Topsoil/Soil**
  - Project Soil Management and Erosion Control Plan will be developed and implemented.
  - Land preparation and construction activities will be re-scheduled during extreme weather conditions, when possible, to avoid erosion risk.
  - Erosion control measures, including installation of drainage channels will be implemented as necessary, to prevent movement of sediment off-site, prior to the start of construction operations.
  - Drainage channels and dikes will be installed to prevent runoff to adjacent lands and loss of soil around the temporary excavated material storage areas and bedding, padding, back filling, and aggregate materials.
  - Topsoil management will be prioritized and in case vegetated/uncontaminated land is expected to be permanently removed, the topsoil will be properly stored in accordance with the Regulation on Excavation, Construction and Demolition Wastes issued on March 18, 2004, at Official Gazette no.25406 and re-used for reclamation as necessary. In addition, Kalyon Enerji will ensure that topsoil management will be carried out in line with international standard as well as national standards.
  - Subsoil removal will be completed in compliance with the Regulation on Control of Excavated Soil, Construction and Demolition Wastes issued on March 18, 2004, at Official Gazette no: 25406.
  - Loss of subsoil will be minimized through use of suitable equipment, planning, development of procedures and schedules.
  - Soil stripping will not be carried out during construction activities, unless necessary, to minimize disturbance to vegetation, ground species and soils.
  - Licensed quarries will be used to purchase bedding, padding, backfilling, and aggregate materials.
  - Any excess excavated material will be disposed at licensed storage/recycling facilities as required by the Regulation on Excavation, Construction and Demolition Wastes issued on March 18, 2004 at Official Gazette no.25406.

- In case a licensed disposal facility is not available, Kalyon Enerji will identify parcels, for which usage rights will be obtained from the respective right holders as per the requirements of the applicable legislation. Environmental and social assessment studies as per Management of Change Procedure will be implemented during selection and entry to the off-site excavated material storage sites. Criteria such as selecting brownfields, that are not used for agricultural or grazing purposes and having a sufficient distance to settlement areas and will be considered in the selection of excavated material storage sites.

- **Minor Leakage of Contaminants into Soil**
  - The Project will comply with relevant legal and project safety requirements to avoid leakages from hazardous materials (chemicals, liquids etc.) storage facilities on-site;
  - The areas, where the hazardous materials (chemicals, liquids etc.) storage tanks are located (i.e., hazardous material storage areas), will be designed and constructed to avoid potential contamination into the soil (paved areas with sufficient secondary containment, proper drainage systems, storage as per Safety Data Sheet (SDS) requirements etc.).
  - Project Pollution Prevention Plan and Waste Management Plan will be developed and implemented to ensure that the amount of release and spills are avoided or managed in a timely manner before reaching substantial amounts that may potentially affect the soil quality.
  - The temporary waste storage areas will be constructed in accordance with the Regulation on Waste Management issued on April 02, 2015, Official Gazette no: 29314 and GIIP.
    - The area will away from any traffic, the facilities, or the buildings.
    - There will be a designated area for the licensed vehicles to receive the wastes.
    - Hazardous wastes and non-hazardous wastes will be stored separately, with separate access.
    - Precautions against possible fires and spills (fire extinguisher, spill kit, etc.) will be available at the storage area.
    - The waste storage areas will be covered at the top and on four sides, shielded from precipitation and the elements. Adequate containment and drainage systems will be installed.
    - Storage area will be closed and locked at all times.
    - The contact information of the personnel in charge of the waste storage area and warning signs will be posted at the temporary storage areas.
    - The floor will be concrete, the edges of the floor will be raised with concrete walls/parapets for hazardous waste containment.
    - To ensure impermeability; cured concrete with a minimum thickness of 25 cm will be applied, where the concrete meets C30 (STS) standard. If this condition is not met, impermeability will be ensured by laying a of impermeable layer at least 1 mm between the concrete and the soil floor.
    - All wastes will be stored separately from each other, in tanks and containers. Labels indicating the type of waste will be placed for each type of waste.
    - Disposal of wastes at sufficient frequencies will be scheduled in order not to exceed the storage capacities at the temporary waste storage areas/storage compartments.
    - Hazardous wastes (except for the medical waste) will be temporarily stored at the waste storage areas for a maximum of 6 months and non-hazardous waste for a maximum of one year.
  - Industrial Waste Management Plans for all temporary waste storage areas established by contractors (including hazardous and non-hazardous waste) will be submitted to the relevant Provincial Directorate of MoEUCC as per the format defined by the MoEUCC and will be renewed prior to expiry of the approvals.

- Temporary Waste Storage Permit will be obtained from the related Provincial Directorate of MoEUCC for temporary waste storage sites at the site generating hazardous waste of more than 1,000 kg per month.
- Waste reuse/recycling/recovery/disposal agreements with the Municipality and licensed recovery/disposal -companies will be executed for the management of hazardous and non-hazardous waste.
- Hazardous Materials and Hazardous Waste Compulsory Liability Insurance will be available as per the relevant provisions of the Regulation on Waste Management for the hazardous waste temporary storage areas/containers regardless of the amount of hazardous waste stored;
- Official waste declarations for all waste generated will be submitted to the online system of MoEUCC, starting from January each year until the March of each year at the latest.
- Waste storage outside the designated storage areas will be prohibited. Wastes stored in the interim storage areas will be transferred to the temporary storage area daily;
- Regular maintenance of vehicles and machinery/equipment will be undertaken to ensure that leakages of oil/fuel or any other hazardous material is prevented;
- Impervious (concrete etc.) surfaces will be designated for the refuelling and maintenance of the machinery/vehicles. If it is not possible according to the nature of the Project, all refuelling tankers and all heavy machinery used at the site will have drip trays, and these trays will be placed under the pipe connection points to prevent accidental leakage to the soil during refuelling operations;
- Secondary containments, ponds and drip trays will be checked regularly, especially during extreme weather conditions;
- Generators will be equipped with drip trays and will be checked regularly to prevent spills;
- Portable spill containment and clean-up materials (spill kits) with instructions will be made available and easily accessible at the construction site;
- Training on spill response, use of containment and clean-up material (spill kits) will be provided to all workers;
- Accidental spills and leakages will be managed through implementation of the Emergency Preparedness and Response Plan. Procedure for management of contamination will be prepared and in case of any spill/leakage, sampling and analyses will be conducted by accredited laboratories. Provisions of the Soil Pollution Control and Point Source Contaminated Sites Regulation will be implemented for investigation, management and reporting of any contamination.;
- Any equipment, machinery, pumps and trans mixers will be washed only at designated concrete plants, concrete slurry will not be discharged into environment;

- **Discharge of Wastewater**
  - Project-specific Pollution Prevention Plan will be implemented for the management of sewage wastewater and implemented during the construction and operation phases of the Project.
  - Leakproof report of the septic tanks will be ensured and necessary measures will be taken to prevent them from deforming in extreme weather conditions;

- No untreated wastewater discharges of any type to land will be allowed. Polluted water (if any generated as a result of accidental leakages) will be properly collected or managed to prevent the soil pollution;
- Discharge of wastewater will be in compliance with the applicable regulatory requirements given in Appendix B.

7.1.3.1.3 Residual impacts

The table below summarizes the impacts caused by the identified impact factors on the component assessed.

Based on the baseline conditions of the assessed component, the project characteristics, and actions, as well as the proper implementation of the mitigation measures proposed above, a potential **negligible** is expected on the soil and subsoil during the construction phase.

Table 7-20: Residual impact assessment matrix for the soil and subsoil during construction phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Removal of Soil	Duration:	Short	Medium-low	Short-mid-term	**Low**	Medium high	**Negligible**
	Frequency:	Frequent					
	Geo. Extent:	Project Site					
	Intensity:	Low					
Minor Leakage of Contaminants into Soil	Duration:	Short	Medium-low	Mid term	**Low**	Medium	**Negligible**
	Frequency:	Infrequent					
	Geo. Extent:	Project Site					
	Intensity:	Medium					
Discharge of Wastewater	Duration:	Short	Medium-low	Mid term	**Low**	Medium high	**Negligible**
	Frequency:	Frequent					
	Geo. Extent:	Project Site					
	Intensity:	Medium					
Occupation of Land	Duration:	Short	Medium-low	Long term	**Low**	Medium	**Low**
	Frequency:	Recurrent					
	Geo. Extent:	Project Site					
	Intensity:	Medium					

7.1.3.1.4 Monitoring measures

The following monitoring measures will be implemented to evaluate the actual impacts of the Project on the soil and subsoil during construction and to confirm the effectiveness of mitigation measures:

- Regular site inspections will be conducted to ensure that the designated construction boundaries are not extended and that erosion control measures are properly in place.
- Periodic inspections of subcontractors will be carried out to prevent unregulated disposal of excavated materials.
- Visual inspections of stormwater and wastewater drainage networks (if present) and septic tanks will be conducted at regular intervals to confirm their integrity and functionality.
- Site inspections will be performed and documented periodically to detect any potential leaks.

- Regular site inspections will be conducted to identify and report any potential damage in areas designated for hazardous materials storage and waste storage.
- Records of worker training on spill response and the proper use of containment and cleanup materials, including subcontractor employees, will be maintained.
- Site inspections will be periodically conducted to ensure an adequate supply of spill-response materials, such as spill kits and metal trays, on-site and within each heavy machinery, with records kept.
- A routine maintenance program will be established, and maintenance records will be maintained for all vehicles and machinery/equipment.
- Licenses and permits for quarries and excavation material storage/recycling facilities will be documented.
- Subcontractor waste management practices will be monitored through document reviews (e.g., permits, waste recycling/disposal agreements) and visual inspections at their work sites.

7.1.3.2 Operation phase

7.1.3.2.1 Impact factors

The impact factors from the Project activities potentially affecting soil and subsoil during operation phase are listed in Table 7-21.

Table 7-21: Project actions and related impact factors potentially affecting soil and subsoil during operation phase

Project actions	Impact factors
Plant/infrastructure operation	Minor Leakage of Contaminants into Soil Discharge of wastewater Occupation of land

- **Minor Leakage of Contaminants into Soil**

Minor leakage of contaminants into soil can be caused by;

- oil and fuel leakage from vehicles, generators and transformer;
- accidental spill of any hazardous materials that are used during the operation;
- runoff from area where chemical, oil and fuel are temporarily stored (i.e. areas where paving and secondary containments are not present);
- pollution caused by temporary storage of hazardous materials and/or wastes;
- disposal of wastes, wastewater and liquid wastes;
- flooding of secondary containments caused by heavy precipitation;
- accidental spill of untreated wastewater (e.g., domestic, industrial) to soil.

- **Discharge of Wastewater**

During operation phase, domestic wastewater generation due to personnel working per day is calculated as 5.24 m^3/day. Domestic wastewater generated by personnel will be collected by sewage infrastructure and stored in septic tanks and periodically transported to a licensed wastewater treatment plant. -

There are two alternative cleaning methods for cleaning PV panels: dry cleaning, where no water is required, and wet cleaning, where water is required for cyclical cleaning during certain months of the year. According to the experience gained from other projects operated by Kalyon Enerji, there has been no need for panel cleaning in the first three years. If panel cleaning with wet cleaning method is required, no chemical or hazardous material will be used during cleaning.

Therefore, no impact in terms of wastewater discharge is anticipated since there will not be any wastewater discharges or impacts to the environment during the operation phase.

- **Occupation of land**

Occupation of land mainly related to presence of the new facilities (such as PV panels, administrative buildings, and switchyard) and this will increase the artificial surfaces.

7.1.3.2.2 Mitigation measures

The mitigation measures will be implemented to mitigate the effects of the impact factors.

- **Minor Leakage of Contaminants into Soil**
  - Project Pollution Prevention Plan and Waste Management Plan will be developed and implemented to ensure that the amount of release and spills are avoided or managed in a timely manner before reaching substantial amounts that may potentially affect the soil quality.
  - The areas, where the hazardous materials (chemicals, liquids etc.) storage tanks are located (i.e., hazardous material storage areas), will be designed and constructed to avoid potential contamination into the soil (paved areas with sufficient secondary containment, proper drainage systems, storage as per Safety Data Sheet (SDS) requirements etc.).
  - The temporary waste storage areas will be constructed in accordance with the Regulation on Waste Management issued on April 02, 2015, Official Gazette no: 29314 and GIIP.
    - The area will away from any traffic, the facilities or the buildings.
    - There will be a designated area for the licensed vehicles to receive the wastes.
    - Hazardous wastes and non-hazardous wastes will be stored separately, with separate access.
    - Precautions against possible fires and spills (fire extinguisher, spill kit, etc.) will be available at the storage area.
    - The waste storage areas will be covered at the top and on four sides, shielded from precipitation and the elements. Adequate containment and drainage systems will be installed.
    - Storage area will be closed and locked at all times.
    - The contact information of the personnel in charge of the waste storage area and warning signs will be posted at the temporary storage areas.
    - The floor will be concrete, the edges of the floor will be raised with concrete walls/parapets for hazardous waste containment.
    - To ensure impermeability; cured concrete with a minimum thickness of 25 cm will be applied, where the concrete meets C30 (STS) standard. If this condition is not met, impermeability will be ensured by laying a of impermeable layer at least 1 mm between the concrete and the soil floor.
    - All wastes will be stored separately from each other, in tanks and containers. Labels indicating the type of waste will be placed for each type of waste.
    - Disposal of wastes at sufficient frequencies will be scheduled in order not to exceed the storage capacities at the temporary waste storage areas/storage compartments.
    - Hazardous wastes (except for the medical waste) will be temporarily stored at the waste storage areas for a maximum of 6 months and non-hazardous waste for a maximum of one year.

- Industrial Waste Management Plans for all temporary waste storage areas established by contractors (including hazardous and non-hazardous waste) will be submitted to the relevant Provincial Directorate of MoEUCC as per the format defined by the MoEUCC and will be renewed prior to expiry of the approvals.
- Temporary Waste Storage Permit will be obtained from the related Provincial Directorate of MoEUCC for temporary waste storage sites at the site generating hazardous waste of more than 1,000 kg per month.
- Hazardous Materials and Hazardous Waste Compulsory Liability Insurance will be available as per the relevant provisions of the Regulation on Waste Management for the hazardous waste temporary storage areas/containers regardless of the amount of hazardous waste stored.
- Waste reuse/recycling/recovery/disposal agreements with the Municipality and licensed recovery/disposal firms will be executed for the management of hazardous and non-hazardous waste.
- Official waste declarations for all waste generated will be submitted to the online system of MoEUCC, starting from January each year until the March at least.
- Waste storage out of the designated storage areas will be prohibited. Wastes generated in the interim storage areas will be transferred to the temporary storage area;
- Regular maintenance of vehicles and machinery/equipment will be undertaken to ensure that leakages of oil/fuel or any other hazardous material is prevented;
- Impervious (concrete etc.) surfaces will be designated for the refueling and maintenance of the machinery/vehicles. If it is not possible according to the nature of the Project, all refueling tankers and all heavy machinery used at the facility will have drip trays, and these trays will be placed under the pipe connection points to prevent accidental leakage to the soil during refueling operations;
- Generators and any equipment containing chemicals will be placed in localised bunded & kerbed areas for containment of drainage, spillages and leaks in order to minimise contaminated water routed to the drains;
- Secondary containments, ponds and drip trays will be checked regularly, especially during extreme weather conditions;
- Portable spill containment and clean-up materials (spill kits) will be made available and easily accessible at the facility, instructions on how to use spill containment and clean-up materials will be included in the kits;
- Training on spill response, use of containment and clean-up material (spill kits) will be provided to works;
- In case of a spill/leakage incident on-site, contamination levels will be identified by means of sampling and analyses studies to be conducted by accredited laboratories and the results will be compared with baseline concentrations of the related parameters to plan corrective actions where necessary;
- Accidental spills and leakages will be managed through implementation of the Emergency Preparedness and Response Plan.

- **Discharge of Wastewater**
  - Project-specific Pollution Prevention Plan will be implemented for the management of sewage wastewater and backwash wastewater resulting from potable water treatment plant and implemented during the operation phase of the Project.
  - If deemed necessary, leakproof of the septic tanks will be ensured, and necessary measures will be taken to prevent them from deforming in extreme weather conditions;
  - No untreated wastewater discharges of any type to land will be allowed. Polluted water (if any generated as a result of accidental leakages) will be properly collected or managed to prevent the soil pollution;

7.1.3.2.3 Residual impacts

The table below summarizes the impacts caused by the identified impact factors on the component assessed.

Based on the baseline conditions of the assessed component, the project characteristics, and actions, as well as the proper implementation of the mitigation measures proposed above, a potential **negligible impact** is expected on the soil and subsoil during the operation phase.

Table 7-22: Residual impact assessment matrix for the soil and subsoil during operation phase.

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Minor Leakage of Contaminants into Soil	Duration:	Very long	Medium-low	Mid term	**Low**	Medium high	**Negligible**
	Frequency:	Infrequent					
	Geo. Extent:	Project Site					
	Intensity:	Medium					
Discharge of Wastewater	Duration:	Short	Medium-low	Mid term	**Low**	Medium	**Negligible**
	Frequency:	Infrequent					
	Geo. Extent:	Local					
	Intensity:	Medium					
Occupation of Land	Duration:	Very long	Medium-low	Long term	**Medium**	Medium	**Low**
	Frequency:	Frequent					
	Geo. Extent:	Project Site					
	Intensity:	Medium					

7.1.3.2.4 Monitoring measures

The following monitoring measure shall be implemented to assess the true effects of the Project on the soil and subsoil during the construction and verify the effectiveness of the mitigation measures.

- Periodic site inspections will be carried out to ensure that the drains are free of sediments and accumulation of sediments at the sediment traps does not prevent the run-off flow;
- Periodic visual site inspection of stormwater and wastewater drainage networks and septic tanks, in order to verify their integrity and functionality;
- Periodic site inspections will be carried out and reported to identify any possible leakages;
- Periodic site inspections will be carried out in order to identify any possible damage in the hazardous materials storage areas and waste storage areas;

- Trainings on spill response, use of containment and clean-up material for the workers (including the subcontractors' workers) will be recorded;
- Periodic site inspections will be carried out to ensure adequate amount of spill-response material such as spill-kits and metal trays will be present at the site and in each heavy machinery and records will be kept;
- Routine maintenance programme will be set-up and maintenance records will be kept for all vehicles and machinery/equipment.

7.1.3.3 Decommissioning phase

The activities during the decommissioning phase are likely to be similar to the construction phase hence the impacts will be similar to construction activities. The same considerations described for soil and subsoil during the construction phase would be applicable to the decommissioning phase for the pollutant emissions to the soil and waste generation. Wastewater will be kept in septic tanks and transferred to licensed facilities therefore, no wastewater discharge is anticipated during decommissioning phase, hence there will be no impact due to decommissioning activities.

7.1.4 Geology and Geomorphology

Based on the information collected in the baseline (see Chapter 6.1.7), the physical component Geology and Geomorphology was assigned as **negligible** value of sensitivity due to the negligible change on topography and morphology.

7.1.4.1.1 Construction Phase

During the construction phase, impacts will be mainly associated to the following ***impact factor*:**

- Changes in the local morphology

The ***project actions*** related to the abovementioned impact factor are the following: surface levelling and grading (including dismantling of existing structures), temporary stockpiling of material, construction of the motorway and service facilities and associated facilities (herein after referred as "construction of the facilities").

There will be no blasting performed for the Project.

Additional impacts on geology and geomorphology also related to soil, hydrology, and hydrogeology and these are discussed in the relevant sections of this ESIA.

The impact is mainly related to the changes inflicted on the current morphology of the area due to the earthworks and excavations, and for the site preparation (excavated, filled with proper material, and flattened) and the construction of the structures' foundations.

7.1.4.1.2 Operation Phase

As a result of the impact screening, no impacts on the geology and the geomorphological components are expected during the operation phase.

7.1.4.1.3 Decommissioning and Closure Phase

The decommissioning activities would comprise the removal of the Project Components and the associated facilities. Also, the foundations of the structures would be removed. The site is expected to be restored for its future use.

As a result of the impact screening, no impacts on the geology and the geomorphological components are expected during the decommissioning and closure phase. Decommissioning of infrastructures could have a positive impact if the natural state of the land is recovered.

7.1.4.2 Mitigation Measures

The mitigation measures, for the impacts of the geology and geomorphology on the Project are listed below for the construction phase:

- Detailed studies on geological and geotechnical components (including seismicity) have already been completed for the Project before the construction phase within the scope of the local EIA. Recommendations in these studies should be implemented.
- Worksite will be minimized to the smallest extent possible in order to meet Project's works and activities.
- Construction site will be minimized to the smallest extent possible in order to meet Project's works and activities.
- The foundations' footprints and depths have been properly dimensioned; hence the excavations and the consequent physical-mechanical disturbances will be minimized.
- The flattening and excavation operation will be minimized to the extent possible in order to limit the morphological disturbances.
- Part of the removed material will be re-used as a fill material at the Project Area, if it presents the suitable geotechnical characteristics, in order to limit the use of raw material.

7.1.4.3 Residual Impacts

7.1.4.3.1 Construction Phase

The residual impact on the geology and geomorphology component after the application of the above-mentioned mitigation measures during construction phase is presented in the following table (Table 7-23).

Table 7-23: Impact Assessment Matrix for Geology and Geomorphology During Construction Phase After Mitigation

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation Effectiveness	Residual Impact Value
Morphological changes	Duration:	Short	Low	Long-term	**Negligible**	Medium-Low	**Negligible**
	Frequency:	Single Event					
	Geo. Extent:	Project Site					
	Intensity:	Negligible					

7.1.4.3.2 Operation Phase

As stated before, as a result of the impact screening, no impacts are expected on the geology and geomorphology component during the commissioning and operation phase.

7.1.4.3.3 Decommissioning and Closure Phase

As stated before, as a result of the impact screening, no impacts on the geology and the geomorphological components are expected during the decommissioning and closure phase.

7.1.4.4 Monitoring

No specific monitoring activities are required for this component.

7.1.5 Seismicity

7.1.5.1 Impact Analysis

The major natural hazard expected during all phases of the Project would be an earthquake.

In the event of earthquakes, during all phases of the Project, significant impact on the community and the workers' health and safety, such as accidents, fire etc., may arise. Additionally, an earthquake may cause adverse impacts on the environment, such as spills, leakage, and erosion.

According to AFAD, the peak ground acceleration (PGA) values for the Project Area with 475 years return period is defined as approximately 0.094 g.

On the other hand, landslides, rockfalls, etc., which are evaluated within the scope of Law No. 7269, have not been detected in the Project Area and its vicinity, and there is no "Disaster Exposure Zone" decision taken before regarding these disaster events.

7.1.5.2 Mitigation Measures

The mitigation measures of the impacts caused by the natural hazard and seismology component on the Project are listed below:

- Before and during the construction activities in the study area, the provisions of "Türkiye Building Earthquake Regulation" (OG Number: 30364 Date: 18.03.2018) will be complied with.
- Detailed investigations will be conducted for assessing the stability conditions for the structural elements for both normal operation loads and under seismic loads. Türkiye Building Earthquake Regulation requires certain parameters to be determined prior to the construction. These parameters were determined by the geological and geotechnical investigations for the Project Area.
- Several structures will be developed as part of the Project and these will all be designed according to Turkish and international design standards requiring specific structural characteristics related to slopes of cuts and fills, footing sizes and many other considerations.
- Related studies (geological, geotechnical and hydrological studies, flood risk assessments etc.) will completed for the Project before the construction phase.

7.1.5.3 Monitoring

No specific monitoring activities are required for this component.

7.1.6 Hydrology and Surface Water

Based on the information collected in the baseline (see Chapter 6.1.7), the physical component Hydrology and Surface Water Quality was assigned as **negligible** value of sensitivity due to the absence of surface water bodies in the AoI, water/sediment pollution and presence of hydrological changes in sub-catchments of creeks in the AoI.

7.1.6.1 Construction Phase

7.1.6.1.1 Impact factors

The impact factors from the Project activities potentially affecting hydrology and surface water during construction phase are listed in Table 7-24.

Table 7-24: Project actions and related impact factors potentially affecting hydrology and surface water during construction phase

Project actions	Impact factors
General engineering/construction works;	Surface water pollution
Accommodation and management of the workforce	Discharge of wastewater

Impacts potentially affecting this component are assessed here below for the construction phase.

Surface water pollution

If not properly managed, the temporary storage of waste and/or hazardous materials from construction activities could result in the release of contaminants to the surface/ground. Leakages of contaminants into the water would be mainly expected to occur due to runoff from areas in the proximity of freshwater bodies that have experienced:

- Oil and fuel leakage from vehicles and generators;
- Accidental spills of any hazardous materials that are used during the construction;
- Runoff from areas where chemicals, oil and fuel are temporarily stored (i.e. areas where paving and secondary containments are not present);
- Pollution caused by temporary storage of hazardous materials and/or wastes;
- Disposal of wastes and wastewater;
- Accidental spill of wastewater.

Chemical contamination of freshwater could have a variety of adverse effects on the quality of surface water, depending on the contaminant and its concentration. The accidental spillage of cement and fuel, oils, and lubricants can have significant water quality consequences for watercourses, aquatic ecology, and downstream users. Also, if the surface water is contaminated, the groundwater can quickly become polluted.

Despite the potential for even severe impacts, this factor is predicted to be infrequent at best, and of a low intensity, and therefore spills, leakages, and accidental discharges would have to originate from the Project Footprint or the associated facilities which are generally located at a certain distance from the nearby water bodies.

Discharge of wastewater/water

As water demand per capita is estimated as 228 L/person day based on 2020 data of TUIK (Turkish Statistical Institute) Municipal Water Statistics, total water demand during the construction phase was estimated as 72.28 m^3 per day, considering that all the domestic water to be used by the Project personnel will be converted to domestic wastewater.

Domestic wastewater generated by personnel at the camp site will be collected by sewage infrastructure and treated in package wastewater treatment plant. The effluent of the wastewater treatment plant will be used in dust suppression/irrigation in line with the permit to be secured from the Ministry (and/or Provincial Directorate).

No wastewater generation is expected from dust suppression activities, since the water to be used for dust suppression activities is expected to evaporate.

7.1.6.1.2 Mitigation Measures

The mitigation measures related to hydrology and surface water quality for the construction phase are as follows:

- The Project will comply with safety requirements to avoid leakages from hazardous chemicals/materials and liquids (diesel fuel, oil etc.) stored on-site.
- The areas where the diesel/fuel storage tanks are located (can be named hazardous material storage areas), will be designed and constructed to avoid potential contamination of the soil (paved areas with sufficient secondary containment, proper drainage systems, collection ponds etc.).
- The temporary waste storage areas will be constructed based on the requirements listed in “Regulation on Regular Storage of Wastes” issued on *Official Gazette* No:27533, Dated: 26/03/2010 (Amended: OG-24/06/2022-31876) and “Regulation on Waste Management” issued on *Official Gazette*, Dated: 02/04/2015, No: 29314 (Amended: OG-23/03/2017-30016).
- Considering the flooding risk, the following engineering studies were taken into account during the Project design phase.
  - By adding the reinforced concrete structure under the fences, the safety of the work site improved by increasing the height of the security fence, and the site was protected from flood and surface water.
  - The foundation of the inverter station was raised 60 cm from the ground level against the risk of water rising.
  - The infrastructure of the inverter station is designed in such a way that the surface and storm water infiltration will be prevented, and water is collected in the water collection -pit -constructed -on the ground level of the station and discharged with the help of a pump.
  - The manhole cover located at the entrance of the foundation of the inverter station is manufactured as leakproof.
  - Waterproofing is provided with XPS Board and Membrane insulation materials inside the concrete foundation.
- The General Directorate of State Hydraulic Works (abbreviated as DSI in Turkish), and General Directorate of Water Management (abbreviated as SYGM in Turkish) will be consulted regarding hydrological studies and surface water quality and any additional studies will be conducted upon their opinions prior to the construction phase based on the opinions of these institutions.
- Safe Fueling and Gasoline Handling Guidelines will be developed in the construction areas. No fueling of vehicles or equipment will take place within excavated areas. If heavy equipment cannot be moved to appropriate fuelling points, an impervious surface (such as a drip-tray) will be used for refuelling this equipment to prevent accidental releases to groundwater aquifers.
- Hazardous materials will not be stored in excavated areas and all handling of all hazardous materials will be in accordance with the Control of Substances Hazardous to Health Procedure. These procedures will be in line with Environmental, Health, and Safety (EHS) Guidelines: Environmental Hazardous Material Management (IFC, 2007).
- Procedure for management of the construction site during periods of heavy rainfall will be developed. Exposed surfaces and stored materials will be covered if necessary to reduce the erosion of sediments into surface waters.

- Treated domestic wastewater would be reused for local watering of vegetation, dust control or as a fire-fighting reserve in accordance with the standards defined in the Wastewater Treatment Plants Technical Procedures Communique if it is deemed feasible. In case it is decided to reuse wastewater, a Wastewater Reuse Plan will be prepared during the construction phase describing which types of wastewater are suitable for each reuse application and effective control measures will be implemented to prevent misuse of reused water.
- The specific items in the management plans will address the measures below related to surface water and protection:
  - Design and management of spoil and soil storage areas and opening stores of construction materials to control sediment loss into runoff by minimizing the length and angle of slopes.
  - Schemes to prevent new ground surface eruptions from rainfall erosion or to avoid construction activities during periods of heavy rainfall.
  - Diversion of external ‘clean’ runoff around the construction area to prevent mixing of ‘clean’ and ‘dirty’ runoff and reduce the size of the required sediment basins.
  - Conveyance of all 'dirty' runoff to the proposed sediment basins.
  - Establishment of barrier fences and/or markings to determine the extent of the structure/work area that may be damaged.
  - Limitation of exposure to the soil and the minimum amount of deterioration required for the construction.
  - Covering and protection of degraded fertile ground with soil, vegetation, mulch or erosion-resistant material.
  - Collection and management of polluted water (if any generated by accidental leakages) in order to prevent mixing with any water body.
  - Protection of existing drainage and irrigation channels, sediment barriers, green areas, protection strips, such as drains, and drainage and erosion control pits by taking appropriate measures.
  - Collection and settlement of drainage from excavations to remove suspended materials prior to discharge in accordance with required permits. Construction of local perimeter drains around working areas to collect suspended runoff and direct it to a system of settlement basins before discharge following required permits, where practicable.
  - Regular inspection and maintenance of all structures and facilities to ensure proper and efficient operation, especially after heavy rainfall. Removing sediment deposits and disposing of them either by spreading them on site (if uncontaminated) or at a suitably licensed facility.
  - Training workers (including subcontractor workers) on spill response, use of containment and clean-up materials (spill kits).

7.1.6.1.3 Residual Impacts

The residual impact following the above-mentioned mitigation measures during the construction phase is presented in the following table (Table 7-25). Based on the baseline conditions of the assessed components, the Project characteristics, and actions, as well as the proper implementation of the mitigation measures proposed above, **negligible negative impact** is expected on hydrology and surface water quality during the construction phase.

Table 7-25: Impact Assessment Matrix for Hydrology and Surface Water Quality During Construction Phase After Mitigation

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Surface Water Pollution	Duration:	Very long	Low	Mid term	**Negligible**	High	**Negligible**
	Frequency:	Infrequent					
	Geo. Extent:	Local					
	Intensity:	Low					
Discharge of Water/Wastewater	Duration:	Short	Low	Mid term	**Negligible**	Medium high	**Negligible**
	Frequency:	Frequent					
	Geo. Extent:	Local					
	Intensity:	Medium					

7.1.6.1.4 Monitoring

The monitoring program to be used for surface water quality will be based on site-specific risk assessments as well as specific guidelines for surface water quality standards. The monitoring program framework will be as follows:

- Drainage outfalls will routinely be tested as well as during repair activities at ecologically vulnerable locations as well as the upgradient of surface water resources. Test frequency will be determined based on the flow discharge characteristics and the downgradient receptor sensitivity (e.g., ecological and/or water resources).
- Assessment of surface water runoff and flooding conditions after heavy rainfall events for efficiency of water conveyance systems will be implemented.
- To ensure the measures listed above are in place (like concrete pavement in storage areas, collection pond underneath, gravel spread to unpaved areas etc.), design checks will be undertaken.
- Routine site inspections will be carried out for dust suppression activities as well as any possible leakages, and these inspections should be recorded.
- Periodic site inspections will be carried out to identify any possible damage in the hazardous materials storage areas and waste storage areas.
- Routine site inspections will be carried out to ensure an adequate amount of spill-response material such as spill-kits and metal trays will be present at the site and in each heavy machinery and records will be kept.
- Trainings on spill response, use of containment and clean-up materials for the workers (including the subcontractors' workers) will be recorded.

7.1.6.2 Operation Phase

7.1.6.2.1 Impact factors

Impacts during the operation phase are likely to be the same as during the construction phase, therefore the activities will be similar to construction activities related to the following ***impact factors***:

- Surface water pollution,
- Discharge of wastewater/water, and
- Wash water for PV panels

Project actions in the operation phase are similar to those in the construction phase, including:

- Wastewater generation, disposal of waste derived from operation (domestic wastes, hazardous wastes from maintenance works), and accidental spills, which are detailed in the previous section (construction phase),
- Disposal of wastewater
- Presence of the facilities

The impact factors from the Project activities potentially affecting hydrology and surface water during operation phase are listed in Table 7-26.

Table 7-26: Project actions and related impact factors potentially affecting hydrology and surface water during operation phase

Project actions	Impact factors
Plant/infrastructure operation	Surface water pollution Discharge of wastewater/water Wash water for PV panels

All the impact factors identified above are assessed below for the operation phase.

Surface water pollution

The details related to this Project impact are detailed in the previous section (construction phase).

Discharge of Wastewater/Water

As water demand per capita is estimated as 228 L/person day based on 2020 data of TUIK (Turkish Statistical Institute) Municipal Water Statistics, total water demand during the construction phase was estimated as 5.70 m^3 per day, considering that all the domestic water to be used by the Project personnel will be converted to domestic wastewater.

Domestic wastewater generated by personnel will be collected by sewage infrastructure and stored in septic tanks and periodically transported to a licensed wastewater treatment plant.

The details related to this Project impact are detailed in the previous section (construction phase).

Wash Water

Any wash water utilized for the internal cleaning of vessels and equipment will be disposed to appropriate locations depending on contamination i.e., open drains or other appropriate drains with removal facilities using a vacuum tanker or other portable vacuum collection system.

There are two alternative cleaning methods for cleaning PV panels: dry cleaning, where no water is required, and wet cleaning, where water is required for cyclical cleaning during certain months of the year. According to the experience gained from other projects operated by Kalyon Enerji, there has been no need for panel cleaning in the region. However, if panel cleaning with wet cleaning method is required in the following years of operation, the amount of water required per wet cleaning is calculated as 390 m^3 according to the assumption that 2 tons per MWp will be required. The deionized water will be supplied by getting services from a related supplier for wet cleaning.

No wastewater generation is expected as a result of panel cleaning activities since the water to be used is expected to evaporate.

7.1.6.2.2 Mitigation Measures

The mitigation measures related to hydrology and surface water quality for the operation phase are as follows:

- The project will comply with safety requirements to avoid leakages from hazardous chemicals/materials and liquids stored on-site.
- The temporary waste storage areas will be constructed based on the requirements listed in “Regulation on Regular Storage of Wastes” issued on *Official Gazette* No:27533, Dated: 26/03/2010 (Amended: OG-24/06/2022-31876) and “Regulation on Waste Management” issued on *Official Gazette*, Dated: 02/04/2015, No: 29314 (Amended: OG-23/03/2017-30016).
- Leak-proof quality septic tanks will be provided for the collection of the generated domestic wastewater. Collected wastewater will either be collected by vacuum trucks and disposed of at the nearest licensed WWTP as per the agreements/protocols to be executed with the related municipalities/licensed companies or to the main campsite package WWTPs.

7.1.6.2.3 Residual Impacts

The residual impact after the application of the above-mentioned mitigation measures during the commissioning and operation phase is presented in the following table (Table 7-27).

Table 7-27: Impact Assessment Matrix for Hydrology and Surface Water Quality During Operation Phase After Mitigation

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Surface Water Pollution	Duration:	Very long	Low	Mid term	**Negligible**	High	**Negligible**
	Frequency:	Infrequent					
	Geo. Extent:	Local					
	Intensity:	Negligible					
Discharge of Water/Wastewater	Duration:	Very long	Low	Mid term	**Low**	High	**Negligible**
	Frequency:	Continuous					
	Geo. Extent:	Local					
	Intensity:	Negligible					
Wash Water	Duration:	Short	Low	Short-term	**Negligible**	High	**Negligible**
	Frequency:	Infrequent					
	Geo. Extent:	Project Site					
	Intensity:	Negligible					

7.1.6.2.4 Monitoring

The monitoring program to be used for surface water quality will be based on site-specific risk assessments as well as specific guidelines for surface water quality standards. The monitoring program framework will be as follows:

- Drainage outfalls will routinely be tested as well as during repair activities at ecologically vulnerable locations as well as the upgradient of surface water resources. Test frequency will be determined based on the flow discharge characteristics and the downgradient receptor sensitivity (e.g., ecological and/or water resources).
- Assessment of surface water runoff and flooding conditions after heavy rainfall events for efficiency of water conveyance systems will be implemented.
- Periodic site inspections will be carried out to identify any possible damage in the hazardous materials storage areas and waste storage areas.
- Routine site inspections will be carried out to ensure an adequate amount of spill-response material such as spill-kits and metal trays will be present at the site and in each heavy machinery and records will be kept.
- Trainings on spill response, use of containment and clean-up materials for the workers (including the subcontractors' workers) will be recorded.

7.1.6.3 Decommissioning Phase

The decommissioning phase will have similar impacts to the construction and operation phases, so the activities will be the same. The same considerations described for this component during the construction phase would be applicable to the decommissioning phase.

In general, decommissioning activities would comprise the removal of the plants and the associated facilities. Also, the structures' foundations would be removed. The site is expected to be restored for future use. Decommissioning of infrastructure could have a **positive impact** if the natural state of the land is recovered.

7.1.7 Hydrogeology and Groundwater

Based on the information collected in the baseline (see Chapter 6.1.8), the physical component Hydrogeology and Groundwater was assigned as **low** value of sensitivity due to the relatively low pressures in terms of both quantity and quality in AoI.

7.1.7.1 Construction Phase

7.1.7.1.1 Impact factors

The impact factor from Project activities potentially affecting the groundwater quality and quantity during the construction phase of the Project will mainly be originated from operations that have the potential to pollute groundwater water, either intentionally or accidentally.

Impacts on this component during the commissioning and operation phase will be the same as during the construction phase and are related to the following ***impact factors:***

- Changes in the local hydrogeology, and
- Groundwater pollution.

The **Project actions** related to the abovementioned impact factor are the following:

- Groundwater exploitation (demand for freshwater)
- Temporary stockpiling of material
- Construction of the associated facilities
- Operation of associated facilities during construction
- Disposal of waste deriving from construction (including excavated soil)

All the impact factors identified above are assessed below for the construction phase.

The impact factors from the Project activities potentially affecting hydrogeology and groundwater during construction phase are listed in Table 7-28.

Table 7-28: Project actions and related impact factors potentially affecting hydrogeology and groundwater during construction phase

Project actions	Impact factors
Groundwater Usage	Changes in the Local Hydrogeology
General engineering/construction works;	Minor leakage to groundwater
Material Storage	Minor leakage to groundwater
Accommodation and management of the workforce	Minor leakage to groundwater

Impacts potentially affecting this component are assessed here below for the construction phase.

Changes in the Local Hydrogeology

During the construction phase, water will be needed not only for workers as potable water but also for constructional activities such as dust suppression. Although drinking water of the personnel will be bottled water, the potable water needed for personnel needs at the construction camps will be supplied from Municipality by water tankers, and the potable water needed for the personnel residing in off-site accommodation will be supplied through the municipality potable network. The water need for dust suppression during dry periods is estimated to be 50 m^3/day and it will be supplied through the effluent of the wastewater treatment plant having advanced treatment. It is planned that additional water needs will be supplied from a well which is planned to be drilled and constructed by a patrolling office near the Project Area. Until the well is drilled, water will be supplied from Viranşehir Municipality by water tankers.

Even though the well and the water pipeline is not considered as an associated facility, as the continuous discharge of groundwater from the well will be a new boundary condition in the groundwater flow system, it is expected that the groundwater flow regime will change, water supply and groundwater usage from this well is considered for the Impact Assessment.

Minor leakage to groundwater

The possibility of contamination of aquifers in the event of intentional or accidental discharges of hazardous materials to the ground during construction, particularly in shallow overburdened areas, may increase. Aquifers may be affected by various activities involving site clearance/earthworks, and spillages/leakages from the construction plant and at refuelling and storage depots located on site.

Waste derived from construction can lead to groundwater pollution if it is not properly managed. The temporary storage of waste and/or hazardous substances deriving from the construction operations, if not properly managed, could result in a release of pollutants onto the soil surface/ground. Accidental leakages from hazardous substances or machine refuelling or maintenance are also potential hazards. During construction, pollution may reach groundwater through the soil if the effectiveness of the taken mitigation measures cannot be ensured. No particularly hazardous material is predicted to be used during construction; accidental spills of pollutants from machinery/vehicles would reach groundwater only if the spilt material is in large quantities and the material is spilt over a period of time.

The temporary storage of waste and/or hazardous materials from construction activities could, if not properly managed, result in the release of contaminants to the surface/ground. Accidental spills from the use of hazardous substances, refuelling or maintenance of machinery are also potential hazards. Contaminants may infiltrate through the soil to the groundwater if the effectiveness of mitigation measures cannot be ensured. No particularly hazardous materials are expected to be used during construction; accidental spills of pollutants from machinery/vehicles will only reach groundwater if the spill is large and occurs over a period.

7.1.7.1.2 Mitigation Measures

The mitigation measures related to hydrogeology and groundwater quality for the construction are as follows:

General mitigation measures:

- Safe Fuelling and Gasoline Handling Guidelines will be developed in the construction areas. No fuelling of vehicles or equipment will take place within excavated areas. If heavy equipment cannot be moved to appropriate fuelling points, an impervious surface (such as a drip-tray) will be used for refuelling this equipment to prevent accidental releases to groundwater aquifers.
- Hazardous materials will not be stored in excavated areas and all handling of all hazardous materials will be in accordance with the Control of Substances Hazardous to Health Procedure. These procedures will be in line with Environmental, Health, and Safety (EHS) Guidelines: Environmental Hazardous Material

Management (IFC, 2007). As an example, secondary containment structures will consist of berms, dikes, or walls capable of containing the larger 110 percent of the largest tank or 25 percent of the combined tank volumes in areas where hazardous materials are handled (e.g., fuel stores and loading areas, concrete mixing, hazardous material stores) to prevent hazardous materials entering the site drainage.

- An Emergency Response Plan (ERP) will be developed in line with Environmental, Health, and Safety (EHS) Guidelines: General EHS guidelines (IFC, 2007) for handling spills of hazardous materials including fuels that will be handled during construction works.
- The specific items in the management plans will address the measures below related to groundwater and protection:
  - Preventing the discharge of untreated wastewater, residues or other waste into groundwater or surface water.
  - Controlling and avoiding wastewater flows from any field activities (i.e., excavations, and vehicle/equipment washing).
  - Collecting and managing contaminated water (if any generated as a result of accidental leakages) in order to prevent mixing with any water body and topsoil/soil pollution.
  - Assuring the maintenance of vehicles and equipment (if necessary) in designated areas with impermeable surfaces (concrete floors, etc.) and if necessary, secondary containment systems.
  - Making portable spill containment and clean-up materials (spill kits) available and easily accessible at the construction site, including instructions on how to use spill containment and clean-up materials.
  - Training workers (including subcontractor workers) on spill response, use of containment and clean-up materials (spill kits).
  - Providing adequate and properly maintained tanks, paved ground, spill containment materials and proper secondary containment systems with sufficient volume for fuel/oil storage and for the storage of other fluids and hazardous substances to prevent loss to the soil.

7.1.7.1.3 Residual Impacts

The residual impact on the hydrogeology and groundwater component after the application of the abovementioned mitigation measures during the construction phase is presented in the following table (Table 7-29).

Table 7-29: Impact Evaluation Matrix for Hydrogeology and Groundwater Component During Construction Phase After Mitigation

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Changes in the Local Hydrogeology	Duration:	Medium	Low	Long term	**Low**	High	**Negligible**
	Frequency:	Infrequent					
	Geo. Extent:	Local					
	Intensity:	Low					
Minor leakage to groundwater	Duration:	Very long	Low	Long term	**Low**	Medium high	**Negligible**
	Frequency:	Continuous					
	Geo. Extent:	Local					
	Intensity:	Low					

7.1.7.1.4 Monitoring

Construction period monitoring measures are as follows:

- Design checks, to ensure the measures listed above are in place (like concrete pavement in storage areas, collection pond underneath etc.) and, will be undertaken.
- Groundwater usage will be kept on record and Kalyon Enerji will be ensure that well operation will be carried out according to national and international requirements. If non-compliance operational application was realized, Kalyon Enerji should ensure that corrective measures was taken to resolve non-compliance.
- The provided training on spill response, use of containment and clean-up material for the workers (including the subcontractors' workers) will be recorded.
- Routine site inspections will be carried out to ensure an adequate amount of spill-response material such as spill-kits and metal trays will be present at the site and in each heavy machinery and records will be kept.
- A routine maintenance programme will be set up and maintenance records will be kept for all vehicles and machinery/equipment.
- By using appropriate sealing mechanisms (enclosed conveyance of the exploited groundwater to settlement structures), potential chemicals will not come into contact with the exploited groundwater. Discharges will be periodically tested to meet Turkish and international standards (e.g. IFC General EHS Guidelines, EU standards).

7.1.7.2 Operation Phase

7.1.7.2.1 Impact factors

Impacts on this component during the commissioning and operation phase will be the same as during the construction phase and are related to the following ***impact factors:***

- Changes in the local hydrogeology, and
- Groundwater pollution.

Impacts could be due to the following ***project actions***:

- Groundwater exploitation (demand for freshwater)
- Presence of facilities

The impact factors from the Project activities potentially affecting hydrogeology and groundwater during operation phase are listed in Table 7-30.

Table 7-30: Project actions and related impact factors potentially affecting hydrogeology and groundwater during operation phase

Project actions	Impact factors
Plant/infrastructure operation	Changes in the Local Hydrogeology Minor leakage to groundwater

Impacts potentially affecting this component are assessed here below for the construction phase.

All the impact factors identified above are assessed below for the operation phase.

Changes in the Local Hydrogeology

During the operation phase, water will be needed not only for workers as potable water but also for operational activities such as panel cleaning. Despite the fact that the drinking water of the personnel will be bottled water, it is planned to use the groundwater from well drilled and constructed by a patrolling office for the supply of potable water. On the other hand, potable water for the Project will be supplied from the same well which is planned to be drilled and constructed near the Project Area. Even though the well and the water pipeline is not considered as an associated facility, as the continuous discharge of groundwater from the well will be a new boundary condition in the groundwater flow system, it is expected that the groundwater flow regime will change, water supply and groundwater usage from this well is considered for the Impact Assessment. The total volume of the water demand of personnel per day is 5.70 m^3, which includes bottled drinking water as well as potable water supplied from the planned water well.

In addition, if the wet cleaning method is required in the following years of operation for the panel cleaning, the amount of water required per cleaning will be 390 m^3 according to the assumption that 2 tons per MWp will be required. According to the experience gained from other projects operated by Kalyon Enerji, there has been no need for panel cleaning in the region. However, if panel cleaning with wet cleaning method is required in the following years of operation, the amount of water required per wet cleaning is calculated as 390 m^3 according to the assumption that 2 tons per MWp will be required. The deionized water will be supplied by getting services from a related supplier for wet cleaning. Therefore, any kind of groundwater usage for panel cleaning is not planned.

Minor leakage to groundwater

The details related to this impact factor are also detailed in the previous section (construction phase).

7.1.7.2.2 Mitigation Measures

The mitigation measures related to hydrogeology and groundwater quality for the operation are as follows:

- The Project will comply with safety requirements to avoid leakages from hazardous chemicals/materials and liquids stored on-site.
- The temporary waste storage areas will be constructed based on the requirements listed in “Regulation on Regular Storage of Wastes” issued on *Official Gazette* No:27533, Dated: 26/03/2010 (Amended: OG-24/06/2022-31876) and “Regulation on Waste Management” issued on *Official Gazette*, Dated: 02/04/2015, No: 29314 (Amended: OG-23/03/2017-30016).
- Leak-proof quality septic tanks will be provided for the collection of the generated domestic wastewater. Collected wastewater will either be collected by vacuum trucks and disposed of at the nearest licensed WWTP as per the agreements/protocols to be executed with the related municipalities/licensed companies or to the main campsite package WWTPs.

7.1.7.2.3 Residual Impacts

The residual impact on the hydrogeology and groundwater quality component after the application of the abovementioned mitigation measures during the operation phase is presented in the following table (Table 7-31).

Table 7-31: Impact Evaluation Matrix for Hydrogeology and Groundwater Quality Component During Operation Phase After Mitigation

Impact Factor	Impact Factor Features	Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
	Duration: Medium	Low	Long term	**Low**	High	**Negligible**

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Changes in the Local Hydrogeology	Frequency:	Infrequent					
	Geo. Extent:	Local					
	Intensity:	Low					
Minor leakage to groundwater	Duration:	Very long	Low	Long term	**Low**	Medium high	**Negligible**
	Frequency:	Continuous					
	Geo. Extent:	Local					
	Intensity:	Low					

7.1.7.2.4 Monitoring

Operation period monitoring measures are as follows:

- Design checks, to ensure the measures listed above are in place (like concrete pavement in storage areas, collection pond underneath etc.) and, will be undertaken.
- Groundwater usage will be kept on record and Kalyon Enerji will be ensure that well operation will be carried out according to national and international requirements. If non-compliance operational application was realized, Kalyon Enerji should ensure that corrective measures was taken to resolve non-compliance.
- The provided training on spill response, use of containment and clean-up material for the workers (including the subcontractors' workers) will be recorded.
- Routine site inspections will be carried out to ensure an adequate amount of spill-response material such as spill-kits and metal trays will be present at the site and in each heavy machinery and records will be kept.
- A routine maintenance programme will be set up and maintenance records will be kept for all vehicles and machinery/equipment.
- By using appropriate sealing mechanisms (enclosed conveyance of the exploited groundwater to settlement structures), potential chemicals will not come into contact with the exploited groundwater. Discharges will be periodically tested to meet Turkish and international standards (e.g., IFC General EHS Guidelines, EU standards).

7.1.7.3 Decommissioning and Closure Phase

The impacts during the decommissioning phase are likely to be similar to the construction phase hence the activities will be similar to construction activities. The same considerations described for this component during the construction phase would be applicable to the decommissioning phase for the groundwater pollution impact factor.

7.1.8 Traffic

Based on the information collected for the definition of the baseline (see Chapter 6.1.9), the physical component *Traffic* was assigned a **Medium-High** value of sensitivity for the following reasons

- Schools and residential areas in the vicinity
- The existing roads will be used for access to the site
- Other ongoing projects (under construction and planning stage) around the Project site

7.1.8.1 Construction phase

7.1.8.1.1 Impact factors

The impact factors from the Project activities potentially affecting traffic during construction phase are listed in Table 7-32.

Table 7-32: Project actions and related impact factors potentially affecting traffic during construction phase

Project actions	Impact factors
General engineering/construction works;	Increase of traffic
Material Storage	Increase of traffic

Impacts potentially affecting this component are assessed here below for the construction phase.

- **Increase of traffic**

The activities related to the site preparation and construction works will require the movement of trucks entering and leaving the Project Area for the transportation of machinery, equipment, construction material and staff.

The number of vehicles on the Şanlıurfa-Mardin Road-D400/E90 highway and increase in vehicles during site preparation and construction works are given in the Table 7-33.

Table 7-33: Traffic Load Increase on Şanlıurfa-Mardin Road-D400/E90 Highway during Construction Phase

Vehicle Type	The Annual Average Daily Traffic Data of Şanlıurfa-Mardin Road-D400/E90 highway	Number of Vehicle Increase with the Project's Construction	Traffic Load Increase (%) at State Road
Car	6,594	50	0.76
Medium- Duty Commercial Vehicle	527	5	0.95
Bus	87	-	
Truck	404	4	0.99
Truck+Trailer +Tow Truck + Side Trailer	3,986		-
Total	11,598	59	0.51

Source:https://www.kgm.gov.tr/SiteCollectionDocuments/KGMdocuments/Istatistikler/TrafikveUlasimBilgileri/21TrafikUlasimBilgileri.pdf

During the construction phase, the Project's vehicles will not be on the road at the same time. However, in the worst-case scenario, it is assumed that the vehicles will all be on the road at the same time. Based on that, approximately 0.51 % increase in Highway traffic could be expected in terms of total vehicle flowrate per hour. It should be noted that since the assessment is based on the maximum traffic load increases at worst-case scenario during rush-hour, the increase in road traffic will be much lower than the values given in the table above in most of the time during a daily period.

Within this regard, expected impacts of the traffic load during the construction phase can be listed as below:

- Increase in traffic load will cause an increase in the environmental noise along the access road to the Project Site.

- Increase in traffic load, interruption of roads and limitation to traffic where existing village roads will be used, during construction activities and road closures.
- High speed of heavy vehicles and increased road traffic is a concern for local communities.
- Increased road traffic could lead to accidental wildlife losses.
- Usage of existing roads can cause damage on the roads due to heavy vehicles.

7.1.8.1.2 Mitigation measures

A Traffic Management Plan will be prepared within the scope of the Project to maintain traffic safety on the roads to be used and to prevent the risks which may outcome due to Project activities ensuring “safe site, safe vehicle and safe driver” at all times.

Following points will be considered as a minimum regarding traffic management:

- Referring to Stakeholder Engagement section of this ESIA Report, a continuous stakeholder engagement process and grievance mechanism will be in place:
  - to exchange information on the Project with the local community and other stakeholders; and
  - to record and respond any complaints and concerns raised by the local community members and other stakeholders.
- Considerations will be given to traffic volumes at the rush hours of the day and transportation of equipment and materials will be utilized at quieter periods to avoid increased congestion on the roads used by the local communities.
- It will be ensured that the roads will be made suitable for the heavy vehicle use by taking necessary permits and making necessary arrangements. In case of any damage on the roads, necessary maintenance works will be undertaken.
- Project site will be equipped with suitable and sufficient lighting to ensure sufficient visibility.
- At all times vehicles will be kept on designated site roads where established. Off-road driving will not be permitted other than emergency situations, or if no roads have been established yet.
- If reversing cannot be avoided at the work areas, necessary reversing procedures will be identified including installing reversing aids on vehicles, reversing sensors etc. Trained banksman will be used when reversing cannot be avoided.
- Parking areas will be designated with signs and reverse parking will be implemented for emergency situations.
- The routes to be used by pedestrians will be segregated from heavy vehicle routes where possible.
- The speed limits will be implemented.
- Seatbelts will be worn in vehicles and machinery when being operated.
- No vehicle/equipment/material will be allowed to enter work areas before obtaining approval from the security.
- Loading areas will be designed appropriately to prevent/minimize vehicle/pedestrian contact and property damages.
- All operators will be licensed/certified for the type of vehicle being driven and will undergo medical surveillance.

- Repair and maintenance of vehicles will be done by the authorized bodies.
- Fatigue and distraction procedures will be established considering the local legal requirements and the nature of the work.
- Project disclosure activities will include informing communities about the project traffic management controls, planned road closures, blasting activities and grievance mechanism. Collaboration with local communities and responsible authorities will be ensured to improve signage, visibility, road safety conditions especially near the roads and other locations where children may be present.
- Appropriate traffic signs, signals, lights and markings will be placed at the required areas to prevent potential accidents/incidents. Barriers will be placed at the required areas to protect both human health and assets.

7.1.8.1.3 Residual impacts

The table below summarizes the impacts caused by the identified impact factors on the component assessed.

Based on the baseline conditions of the assessed component, the project characteristics and actions, as well as the proper implementation of the mitigation measures proposed above, a potential **negligible** is expected on the traffic during the construction phase.

Table 7-34: Residual impact assessment matrix for the traffic during construction phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Increase of traffic	Duration:	Short	Medium-high	Short-term	**Low**	Medium high	**Negligible**
	Frequency:	Frequent					
	Geo. Extent:	Local					
	Intensity:	Low					

Monitoring measures

The following monitoring measure shall be implemented to assess the true effects of the Project on the traffic during the construction and verify the effectiveness of the mitigation measures.

- Investigation of the incidents and accidents and use of lesson's learned to improve traffic mitigations.
- Following of the licenses and medical surveillance of the operators to ensure that they are up to date.
- Monitoring condition of the roads to ensure safe driving.
- Controlling maintenance records of the vehicles to ensure regular maintenance activities take place.
- Weather forecast monitoring to ensure safety of the operators.
- Closely monitoring the compliance with speed limits to protect the health and safety of both public and employees.
- Comments and/or complaints received via grievance mechanism to improve traffic mitigations and to prevent air quality and noise impacts, if any.

Monitoring should in particular be designed to identify failure or ineffectiveness of mitigation measures in terms of road safety.

7.1.8.2 Operation phase

7.1.8.2.1 Impact factors

The impact factors from the Project activities potentially affecting traffic during operation phase are listed in Table 7-35.

Table 7-35: Project actions and related impact factors potentially affecting traffic during construction phase

Project actions	Impact factors
Plant/infrastructure operation	Increase of traffic

Impacts potentially affecting this component are assessed here below for the operation phase.

- **Increase of traffic**

During operation phase of the project, the vehicle traffic will be mainly from the maintenance works and staff shuttles/cars entering and leaving the Project Area. In this regard, expected impacts of the traffic load during the operation phase can be listed as below:

- High speed of vehicles is a concern for local communities.
- Transportation of personnel can make an effect on the load of traffic in local level
- Occupational safety risks with respect to vehicles/worker accidents

7.1.8.2.2 Mitigation measures

A Traffic Management Plan will be prepared within the scope of the Project to maintain traffic safety on the roads to be used and to prevent the risks which may outcome due to Project activities ensuring “safe site, safe vehicle and safe driver” at all times.

Following points will be considered as a minimum regarding traffic management:

- Referring to Stakeholder Engagement section of this ESIA Report, a continuous stakeholder engagement process and grievance mechanism will be in place:
  - to exchange information on the Project with the local community and other stakeholders; and
  - to record and respond any complaints and concerns raised by the local community members and other stakeholders.
- Project site will be equipped with suitable and sufficient lighting to ensure sufficient visibility.
- At all times vehicles will be kept on designated site roads where established. Off-road driving will not be permitted other than emergency situations, or if no roads have been established yet.
- Parking areas will be designated with signs and reverse parking will be implemented for emergency situations.
- The routes to be used by pedestrians will be segregated from vehicle routes where possible.
- The speed limits will be implemented.
- Seatbelts will be worn in vehicles and machinery when being operated.
- No vehicle/equipment/material will be allowed to enter work areas before obtaining approval from the security.

- All operators will be licensed/certified for the type of vehicle being driven and will undergo medical surveillance.
- Repair and maintenance of vehicles will be done by the authorized bodies.
- Project disclosure activities will include informing communities about the project traffic management controls, planned road closures, blasting activities and grievance mechanism. Collaboration with local communities and responsible authorities will be ensured to improve signage, visibility, road safety conditions especially near the roads and other locations where children may be present.
- Appropriate traffic signs, signals, lights and markings will be placed at the required areas to prevent potential accidents/incidents. Barriers will be placed at the required areas to protect both human health and assets.

7.1.8.2.3 Residual impacts

The table below summarizes the impacts caused by the identified impact factors on the component assessed.

Based on the baseline conditions of the assessed component, the project characteristics and actions, as well as the proper implementation of the mitigation measures proposed above, a potential **negligible** is expected on the traffic during the operation phase.

Table 7-36: Residual impact assessment matrix for the traffic during operation phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Increase of traffic	Duration:	Very long	Medium-high	Short-term	**Low**	Medium high	**Negligible**
	Frequency:	Infrequent					
	Geo. Extent:	Local					
	Intensity:	Negligible					

7.1.8.2.4 Monitoring measures

The following monitoring measure shall be implemented to assess the true effects of the Project on the traffic during the construction and verify the effectiveness of the mitigation measures.

- Investigation of the incidents and accidents and use of lesson's learned to improve traffic mitigations.
- Following of the licenses and medical surveillance of the operators to ensure that they are up to date.
- Monitoring condition of the roads to ensure safe driving.
- Controlling maintenance records of the vehicles to ensure regular maintenance activities take place.
- Weather forecast monitoring to ensure safety of the operators.
- Closely monitoring the compliance with speed limits to protect the health and safety of both public and employees.
- Comments and/or complaints received via grievance mechanism to improve traffic mitigations and to prevent air quality and noise impacts, if any.

Monitoring should in particular be designed to identify failure or ineffectiveness of mitigation measures in terms of road safety.

7.1.8.3 Decommissioning Phase

A new impact is not expected during the decommissioning and closure phase of the Project, other than those listed in the construction and operation phases.

7.1.9 Greenhouse Gas (GHG) Emissions

This section presents calculation and assessments of the greenhouse gas (GHG) emissions to be originated from the activities of the Project and Project's contribution to climate change.

The GHG emissions estimation methods used in this assessment generally follow internationally accepted practices for conducting Environmental Assessments. Where applicable, the Greenhouse Gas Protocol/A Corporate Accounting and Reporting Standard prepared by the World Business Council for Sustainable Development/World Resources (April 2004; hereafter referred to as the GHG Protocol) is applied. The GHG Protocol provides guidance for preparing corporate GHG inventories, as well as sector-specific and general calculation tools that can be used for estimating GHG emissions. The GHG protocol has been adopted by the Global Reporting Initiative. The GHG Protocol introduces the concept of direct and indirect emissions and scopes for GHG emission inventory under three broad categories, as follows:

Scope 1 – Direct GHG emissions:

Carbon emissions occurring from sources that are owned or controlled by the Project (e.g., emissions from combustion in owned or controlled boilers, and vehicles, process, and fugitive emissions).

Scope 2 – Indirect GHG emissions:

Carbon emissions from the generation of purchased electricity, heat or steam consumed by the Project.

Scope 3 – Other indirect GHG emissions:

Carbon emissions which are a consequence of a company's activities but occur from sources not financially or operationally controlled by the company (e.g., emissions from waste, the extraction and production of purchased materials; and employee travel to and from work).

The GHG Protocol requires reporting of Scope 1 (direct emissions from site) and Scope 2 (emissions from on-site energy consumption) emissions only. Scope 1 and Scope 2 emissions are typically the focus of most corporate inventories, although many organizations choose to account for other activities such as employee travel and downstream emissions from waste. These sources are classified as Scope 3 (indirect) emissions and are reported optionally. Given the nature of Project operations, Scope 1 emissions will be the most significant. Accordingly, Scope 1 have been the primary focus of the GHG inventory. Additionally, Scope 2 emissions have been estimated considering the electricity consumption expected during Project life. Scope 3 emissions are not expected in significant amounts, therefore are not included in these estimations.

7.1.9.1 Legislative Framework

Climate change is a global phenomenon, which is the result of anthropogenic activities, mainly energy use, industrial processes, and land use changes. Due to its multidimensional nature, fighting climate change requires actions at different scales, e.g., international, regional, and local. This section summarizes the legislative framework regarding climate change accordingly.

7.1.9.1.1 International Standards

The main international body dealing with climate change is the United Nations Framework Convention on Climate Change (UNFCCC), adopted in 1992 Rio Earth Summit and ratified by 195 countries. UNFCCC guides countries on cooperation to fight climate change and to cope with its impacts. Currently, Ratification of Doha amendment to the Kyoto Protocol, covering 2013 – 2020 is under the focus of Türkiye, while the Paris Agreement is ratified by Türkiye and the Law on the Approval of the Paris Agreement by the Turkish Grand National Assembly entered into force after being published in the Official Gazette dated October 7th, 2021 and numbered 31621.

According to the IFC PS3, the client will consider alternatives and implement technically and financially feasible and cost-effective options to reduce project related GHG emissions during the design and operation of the Project. These options may include, but are not limited to, alternative project locations, adoption of renewable or low carbon energy sources, sustainable agricultural, forestry and livestock management practices, the reduction of fugitive emissions and the reduction of gas flaring.

For projects that are expected to or currently produce more than 25,000 tonnes of CO_2-equivalent annually,[2] the client will quantify direct emissions from the facilities owned or controlled within the physical project boundary,[3] as well as indirect emissions associated with the off-site production of energy[4] used by the project. Quantification of GHG emissions will be conducted by the client annually in accordance with internationally recognized methodologies and good practice.[5]

According to the EP2, GHG emissions should be calculated in line with the GHG Protocol[6] to allow for aggregation and comparability across Projects, organisations and jurisdictions. Clients may use national reporting methodologies if they are consistent with the GHG Protocol. The client will quantify Scope 1 and Scope 2 Emissions.

The EPFI will require the client to report publicly on an annual basis on GHG emission levels (combined Scope 1 and Scope 2 Emissions) and GHG efficiency ratio, as appropriate, during the operational phase for Projects emitting over 100,000 tonnes of CO_2 equivalent annually. Clients will be encouraged to report publicly on Projects emitting over 25,000 tonnes. Public reporting requirements can be satisfied via host country regulatory requirements for reporting or environmental impact assessments, or voluntary reporting mechanisms such as the Carbon Disclosure Project, where such reporting includes emissions at Project level.

7.1.9.1.2 European Directives

The EU is a global leader in the fight against climate change. Since 1990 the EU has been enacting laws on GHG emissions, renewable energies, and energy efficiency. An EU-wide climate policy framework has been established, applied, and reviewed over decades. Therefore, EU legislation on climate change and GHG emissions are considered in the Project.

7.1.9.1.3 Turkish Legislation

Türkiye's climate policy is shaped by National Climate Change Strategy (2010 – 2023) and National Climate Change Action Plan (2011 – 2023). Also 11th National Development Plan for 2019 – 2023 emphasizes sustainable development and fighting against climate change in sectors generating GHG emissions. It also emphasizes emission controls in buildings and sectors such as energy, industry, agriculture, forestry and waste.

The table below lists Turkish legislation related to climate change and GHG emissions.

[2] The quantification of emissions should consider all significant sources of greenhouse gas emissions, including non-energy related sources such as methane and nitrous oxide, among others.

[3] Project-induced changes in soil carbon content or above ground biomass, and project-induced decay of organic matter may contribute to direct emissions sources and shall be included in this emissions quantification where such emissions are expected to be significant.

[4] Refers to the off-site generation by others of electricity, and heating and cooling energy used in the project.

[5] Estimation methodologies are provided by the Intergovernmental Panel on Climate Change, various international organizations, and relevant host country agencies.

[6] The GHG Protocol is based on a comprehensive globally standardised framework to measure and manage GHG emissions from operations. Available from ghgprotocol.org.

Table 7-37: Turkish Legislation on Climate Change and GHG Emissions

Date	Number	Title
28.12.2003	25330	Regulation on Availability of Customer Information regarding Fuel Economy and CO_2 Emissions of New Automobiles
09.10.2013	28790	Notice on Voluntary Carbon Market Project Registration
17.05.2014	29003	Regulation on Monitoring of Greenhouse Gas Emissions
22.07.2014	29068	Notice on Monitoring and Reporting Greenhouse Gas Emissions
02.12.2017	30258	Notice on Validation of Greenhouse Gas Reports and Accreditation of Validator Institutions
04.01.2018	30291	Regulation on Fluorinated Greenhouse Gases

Regulation on Monitoring of Greenhouse Gas Emissions aims to define the procedures and principles on monitoring, calculating, verifying, and reporting the greenhouse gases emissions. Annex 1 of the Regulation includes the Projects that subject to this Regulation, and which should monitor, report, and verify the GHG emissions in the GHG mechanism established by MoEUCC.

Since solar power plant projects are not one of the listed Projects specified in Annex 1, the Project is not subject to this Regulation.

7.1.9.2 GHG Emission Calculation Methodology

The following sections summarize the emission calculation methods, input parameters and assumptions that are used to estimate the annual GHG emissions of the Project.

The GHG considered in the assessment include Carbon dioxide (CO_2), Methane (CH_4), and Nitrous Oxide (N_2O). There are no Project activities which are expected to emit Sulphur hexafluoride (SF_6), Perfluorocarbons (PFCs) or Hydrofluorocarbons (HFCs), therefore, these compounds are not included in the GHG assessment.

The Project is anticipated to include sources that produce GHGs during construction, operation, and closure phases. It is assumed that more GHG sources will be present during the construction phase than the closure phase. Therefore, the assessment for construction phase is used as a representative estimation for the closure phase.

The emissions estimation methods used to quantify annual GHGs follow internationally accepted practices for conducting EIAs and, where applicable, the Regulation on Monitoring Greenhouse Gas Emissions.

GHGs have the potential to affect future climate as they contribute to the greenhouse effect by absorbing longwave radiation, emitted by the Earth, in the atmosphere, increasing temperature and changing weather patterns. There is a potential for the Project activities to release GHG emissions that could contribute incrementally to climate change.

GHG emissions are expressed as tonnes of equivalent CO_2, calculated by multiplying the annual emissions of each indicator compound by its 100-year global warming potential (GWP). A single measure is used when evaluating effects, namely the maximum annual GHG emissions resulting from the Project activities in tonnes of carbon dioxide equivalent (CO_2e). The maximum annual GHG emissions from the Project activities will put in context of the annual GHGs at both a national and global level.

The GHG Protocol provided by the World Business Council for Sustainable Development/World Resources Institute (WBCSD/WRI, 2004) outlines guidance for preparing corporate GHG emission inventories and introduces the concept of direct and indirect emissions and scopes for the inventory. Given the nature of the

Project operations, the most significant emissions will be Scope 1, which are direct GHG emissions occurring from Stationary Sources (e.g., emissions from generators and boilers) and Mobile Sources that are owned or controlled by the Owner (e.g., emissions from combustion in vehicles, and fugitive emissions).

GHG emissions are assessed based on Project schedules and information provided by Client regarding to amounts of fuel, number of equipment/vehicles and other potential GHG sources. Scientifically accepted and well documented emission factors from the Türkiye's National Inventory Report (NIR) released in 2023 under UNFCCC[7] are used. Where local guidance is not available then emission factors from the Intergovernmental Panel on Climate Change (IPCC), are also used. A discussion of the global warming potentials is provided in Section 7.1.9.2.1 below. Table 7-38 provides a summary of the activities for which GHG emissions are calculated.

Table 7-38: GHG Emission Sources of the Project

Phase	Source	GHG Emissions
Construction	Generators - Combustion of Diesel	Emissions from the generator
	Vehicles - Combustion of Diesel	On-site vehicle emissions, due to diesel combustion
	Camp Site Heating – Combustion of LNG in boiler	Emissions due to LNG combustion
	Electricity Consumption	Indirect emissions due to used electricity
	Loss of Carbon Sink	Reduction of carbon sink due to loss of vegetation
Operation	Electricity Consumption (for lighting, heating and cooling, etc.)	Indirect emissions due to used electricity

7.1.9.2.1 Global Warming Potential

The GHG emissions are expressed as tonnes of CO_2e by multiplying the annual emissions of each GHG by its 100-GWP. The GWP of each gas represents the ability of the gas to trap heat in the atmosphere in comparison to CO_2. Emissions of CO_2, CH_4 and N_2O are converted to equivalent CO_2 (CO_2e) in the assessment of the GHG emissions.

The GWPs are taken from the United Nations Framework Convention on Climate Change reporting guidelines for the preparation of GHG inventory reports (UNFCCC, 2014), which represents the values used to prepare the national and global emissions inventories referenced in the main report. Table 7-39 provides the GWPs used in the GHG calculations.

Table 7-39: Global Warming Potentials from the Intergovernmental Panel on Climate Change

GHG Compound	GWP
CO_2	1
CH_4	25
N_2O	298

[7] Türkiye National Inventory Report (NIR) for UNFCCC, 2023, https://unfccc.int/documents/627786

7.1.9.2.2 Scope 1: Direct GHG Emissions

The GHG Protocol provided by the World Business Council for Sustainable Development/World Resources Institute (WBCSD/WRI, 2004) outlines guidance for preparing corporate GHG emission inventories and introduces the concept of direct and indirect emissions and scopes for the inventory. Scope 1 accounts for direct GHG emissions from sources that are owned or controlled by the Project Owner.

7.1.9.2.2.1 Stationary Combustion

Stationary combustion sources for the Project include diesel generators and boilers for heating. GHG emissions from Project is determined based on the fuel consumption as provided by Kalyon Enerji.

The emission factors on an energy basis are obtained from the IPCC 2006 Guidelines (Volume 2), Chapter 2 – Stationary Combustion Table 2.2. These emission factors are presented in Table 7-40 below.

Table 7-40: Stationary Combustion - Energy-based Emission Factors and Net Calorific Value

Phase	Source	Net Calorific Value (TJ/Gg)	Reference	Emission Factor (kg GHG/TJ)			Reference
				CO_2	CH_4	N_2O	
Construction	Use of Generators - Combustion of Diesel	40.4	Turkish Notification on Monitoring and Reporting of GHG Emissions (Official Gazette Date/Number: 22.07.2014/29068), Table 5.1	74,100	3.0	0.6	IPCC 2006 guidelines, Chapter 2 – Stationary Combustion Table 2.2
Construction	Campsite Heating -Combustion of LNG in boiler	48.0		64,200	3.0	0.6	IPCC 2006 guidelines, Chapter 2 – Stationary Combustion Table 2.3

* Density of diesel oil is specified as 820 - 845 kg/m³ (15 °C) in Safety Data Sheet of Turkish Petroleum Corporation. Average of the upper and lower limit values is calculated.

The equations for calculating the volume-based emission factors for CO_2, CH_4 and N_2O are the same as those presented in following section.

7.1.9.2.2.2 Mobile Fuel Consumption

The GHG emissions from mobile equipment to be used during the construction phase of the Project, are calculated based on fuel consumption and diesel-specific emission factors on an energy basis from the IPCC 2006 Guidelines (Volume 2), Chapter 3 – Mobile Combustion Table 3.3.1 and related 2019 Refinement. These emission factors are presented in Table 7-41 below.

Table 7-41: Mobile Combustion - Energy-based Emission Factors and Net Calorific Value

Phase	Source	Net Calorific Value (TJ/Gg)	Reference	Emission Factor (kg GHG/TJ)			Reference	Fuel Density (kg/m³)*
				CO_2	CH_4	N_2O		
Construction	Vehicles - Combustion of Diesel Oil	40.4	Turkish Notification on Monitoring and Reporting of GHG Emissions (Official Gazette	74,100	4.15	28.6	IPCC 2006 guidelines, Chapter 3 – Mobile	832

Phase	Source	Net Calorific Value (TJ/Gg)	Reference	Emission Factor (kg GHG/TJ)			Reference	Fuel Density (kg/m³)*
				CO_2	CH_4	N_2O		
			Date/Number: 22.07.2014/29068), Table 5.1				Combustion Table 3.3.1	

* Density of diesel oil is specified as 820 - 845 kg/m³ (15 °C) in Safety Data Sheet of Turkish Petroleum Corporation. Average of the upper and lower limit values is calculated.

A sample equation provided below presents the methods for calculating the volume-based emission factors (EF) for CO_2, CH_4 and N_2O:

CO_2 Emission Factor:

$$\mathrm{EF}_{\mathrm{CO_2}}\left(\frac{kg\ CO_2}{L}\right) = \text{Energy based EF}\left(\frac{\mathrm{t\ CO_2}}{\mathrm{TJ}}\right) \times \text{Net Calorific Value}\left(\frac{\mathrm{TJ}}{\mathrm{kT}}\right) \times \text{Density of Diesel}\left(\frac{\mathrm{kg}}{\mathrm{m^3}}\right) \times \frac{1{,}000\ \mathrm{kg\ CO_2}}{1\ \mathrm{t\ CO_2}} \times \frac{1\ \mathrm{kT}}{1{,}000{,}000\ \mathrm{kg}} \times \frac{1\ m^3}{1{,}000\ \mathrm{L}}$$

Total CO_2 Emissions from Mobile Equipment:

$$\mathrm{E_{CO_2}} = \text{Fuel Combustion}\left(\frac{\mathrm{L}}{\mathrm{yr}}\right) \times \text{Emission Factor}\left(\frac{\mathrm{kg\ CO_2}}{\mathrm{L}}\right) \times \frac{1\ \text{tonne}}{1{,}000\ \mathrm{kg}}$$

7.1.9.2.3 Scope 2: Indirect GHG Emissions

Scope 2 emissions are 'indirect' GHG emissions associated with the Project that are a consequence of the activities of the company but occur at sources owned or controlled by another company.

Scope 2 accounts indirect GHG emissions from the generation of purchased electricity, heat or steam consumed by the company.

7.1.9.2.3.1 Electricity Consumption

The Scope 2-indirect GHG emissions are expected due to electricity consumption. For the emission factor of electricity consumption, Turkish National Electricity Grid Emission Factors calculated by the Turkish Ministry of Energy and Natural Resources are used. The Ministry defines three types of emission factors[8] for electricity consumption:

- Emission factor for electricity consumption from grid: 0.7424 t CO_2/MWh
- Emission factor defined for a decrease in GHG emissions by utilizing solar and wind power: 0.6488 t CO_2/MWh
- Emission factor defined for a decrease in GHG emissions by utilizing other renewable sources: 0.5558 t CO_2/MWh

The equation for calculating the indirect GHG emissions due to the electricity purchased is given below.

$$E_{CO_2} = \sum_i E_i * EF$$

[8] https://enerji.gov.tr/evced-cevre-ve-iklim-turkiye-ulusal-elektrik-sebekesi-emisyon-faktoru

Where;

E_{CO2}: Total indirect CO_2 Emissions due to electricity consumption (t CO_2),

E_i: Use of electricity for each activity (MWh),

EF_i: National Electricity Grid Emission Factor (t CO_2/MWh),

i: Activity that consumes electricity.

7.1.9.2.4 Emissions Not Included in Scope 1 or Scope 2

7.1.9.2.4.1 Carbon Stock Change

Land use change and loss of carbon sink are the reason for indirect CO_2 emission. Due to the construction activities, the natural lands such as croplands, forestlands and grasslands are disturbed and occupied till the Project life end time. These activities result in change in carbon stock. The following formulation, referring to IPCC 2006 Guidelines Volume 4 Chapter 2, is used to calculate change in biomass stocks.

$$\Delta C_{CONVERSION} = \sum_i \{(B_{AFTER_i} - B_{BEFORE_i}) * \Delta A_{TO\_OTHERS}\} * CF$$

Where;

$\Delta C_{CONVERSION}$: initial change in biomass carbon stocks on land converted to another land category, tonnes C/year,

B_{AFTERi}: biomass stocks on land type i immediately after the conversion, tonnes d.m./ha,

$B_{BEFOREi}$: biomass stocks on land type i before the conversion, tonnes d.m./ha,

$\Delta A_{TO\_OTHERSi}$: area of land use i converted to another land use category in a certain year, ha/year,

C: carbon fraction of dry matter, tonne C/(tonnes d.m.),

i: type of land use converted to another land use category.

Table 7-42: Carbon Stock Change Values

Parameter	Values	Unit	Reference
	Grassland		
Annual area of Land Converted to Other Land	270	ha	IPCC 2006 IPCC Guidelines for National Greenhouse Gas Inventories V4 "Chapter 6 - Table 6.4.
Biomass stocks before the conversion	13.5	tonnes dm ha^{-1}	
Biomass stocks after the conversion	0	tonnes dm ha^{-1}	
Carbon fraction of dry matter	0.5	tonnes C (tonne dm)$^{-1}$	

7.1.9.3 Impact Analysis

7.1.9.3.1 Construction Phase

Stationary Combustion Emissions

During the construction phase of the Project, Stationary Combustion GHG emissions will be generated from:

- Combustion of diesel fuel due to use of generators during construction works.
- Combustion of LNG in boiler for the campsite heating.

During the construction phase of the Project, it is planned to meet the electricity demand for the activities to be carried out by means of diesel generators until connection to the local electricity grid is completed. Diesel fuel will be the main source for the generators. The total estimated diesel consumption due to use of generators during the construction period is provided by the Client as 12,500 liters.

Heating and hot water needs for the campsite will be provided by LNG heating center composed of one boiler having 10,000 m^3 volume and 1,500 kW capacity for 8 months within the construction period. The total LNG consumption is estimated as 1,702 m^3 for the construction period.[9]

Then the total Stationary Combustion GHG Emissions were calculated using the equations given in Section 7.1.7.2.2.1. The GHG emissions due to Stationary Combustion during construction phase were calculated as 83.29 tonnes CO_2.

Mobile Combustion Emissions

During the construction phase of the Project, GHG emissions will be expected to occur due to the use of on-road and off-road vehicles, machinery and equipment. The primary fuel that will be used for machinery, vehicles and equipment will be diesel. The total estimated diesel consumption due to use of mobile vehicles for all the construction activities is provided by the Client as 350,000 liters. Then the total GHG Emissions from Mobile Combustion were calculated using the equations given in Section 7.1.9.2.2.2. The GHG emissions due to Mobile Combustion during construction phase were calculated as 973.2 tonnes CO_2.

Electricity Consumption

During the construction phase, electricity will be utilized for construction activities. According to the information provided by the Client, electrical energy required when the connection to electricity grid is completed is estimated as 500,000 kWh. The GHG emissions resulting from the electricity consumption during the construction phase was calculated as 324.4 tonnes CO_2 using the emission factor and the formula given in Section 7.1.9.2.3.1.

Carbon Stock Change

Indirect GHG emissions are expected to arise from carbon stock change due to land use change during the construction phase of the Project. Emissions resulting from land use change have been estimated by making assumptions regarding the current use of the land and the quantity of carbon estimated to be stored within it. Since land clearing does not affect below ground carbon stocks, only above ground carbon stock is taken into consideration. The project area (270 ha) comprises of 100% grassland. Using the equation given in 7.1.9.2.4.1, the total indirect GHG emissions due to land use change is calculated as 1,822.5 tonnes CO_2.

Total GHG Emissions in Construction Phase

The emissions for construction phase of the Project are presented in Table 7-43. They are based on rough estimates and may significantly overestimate the actual emissions.

[9] It was assumed that the boiler has an efficiency of 85% and LNG has a heating value of 50 MJ/kg and a density of 430 kg/m^3.

Table 7-43: Annual Project GHG Emissions for Construction Phase

Source	Calculated GHG (as t CO_2e)			Total GHG amount	
	t CO_2	t CH_4	t N_2O	t CO_2e	Percentage (%)
Stationary Sources (Generators) - Combustion of Diesel	83.01	0.085	0.19	83.29	2.60
Stationary Sources (Campsite Heating) - Combustion of LNG	0.711	0.0008	0.0019	0.71	0.02
Vehicles - Combustion of Diesel	871.7	1.22	100.3	973.2	30.37
Electricity Consumption	324.4	-	-	324.4	10.13
Loss of Carbon Sink	829.9	-	-	1,822.5	56.88
TOTAL				3,204.10	100.00

The table above presents the emissions to be originated from the construction activities throughout the whole construction phase, with contribution of each source to the overall GHG emissions of the Project. Tonnes of CO_2e are calculated using the GWPs from Section 7.1.9.2.1 above.

Table 7-44: Comparison of Project GHG Emissions to National and Global Emissions

Source	Data
Project GHG Emissions (tonnes CO_2e) (during construction)	3,204.10
Comparison to Türkiye-wide Total (%)	0.0006%
Comparison to Global Total (%)	0.000013%
Türkiye-wide GHG Emissions (2020)[10] (tonnes CO_2e/year)	523,897,190
UNFCCC Annex-I 2020 GHG Emissions[11] (tonnes CO_2e/year)	22,948,516,020

Table 7-44 summarizes the overall emissions in tonnes of CO_2e for the Project construction phase. Data for Türkiye's GHG releases are obtained from Türkiye's latest National Inventory Report (NIR for the year 2020) for UNFCCC and total of Annex-I countries GHG releases are obtained from UNFCCC GHG database for the last inventory year 2020. For the construction phase, regarding the GHG emissions, the Project's contribution to the total emissions reported for the country level and global reporting programs is not significant.

It is accepted that increased anthropogenic GHG emissions are contributing to climate change. However, the GHG emissions due to the Project represent unmeasurable increase in global GHG emissions. Country scale and GHG emission levels are anticipated to be maintained.

[10] Obtained from TURKSTAT, Türkiye NIR for the year 2020

[11] Obtained from UNFCCC GHG database, https://di.unfccc.int/time_series

The combined GHG emissions from the construction phase of the Project are about **3,204.10 t CO_2e**. This value is below the 25,000 t CO2e threshold defined in IFC PS3 and Equator Principles IV. Therefore, no additional monitoring will be required.

7.1.9.3.2 Operation Phase

Electricity Consumption

During the operation phase, electricity will be utilized for operation activities. According to the information provided by the Client, the renewable electricity generated by the solar power plant (the Project) will be used for the energy demand of the operations during daytime and the electricity from the grid will be used during night-time. The electrical energy required for the operation phase of the Project is estimated as a total of 175 MWh consisting of 90 MWh/year internal consumption during daytime and 85 MWh/year external consumption (from grid) during night-time. The yearly GHG emissions resulting from the electricity consumption during the operation phase was calculated as 71.5 tonne CO_2/year using the emission factors defined by the Turkish Ministry as 0.6488 tCO_2/MWh[12] and 0.7424 tCO_2/MWh with the formula given in Section 7.1.9.2.3.1. The emission factor of 0.6488 tCO_2/MWh value means that for every 1 MWh of electricity generated by a new solar or wind power plant, 0.6488 tons of CO_2 emissions will be avoided.

Total GHG Emissions in Operation Phase

The annual GHG emissions for operation phase of Project are presented in Table 7-45. These annual emissions are calculated for the estimated operation scenario described above. They are based on rough estimates and may significantly overestimate or underestimate the actual emissions.

Table 7-45: Annual Project GHG Emissions for Operational Phase

Source	Calculated GHG			Total GHG amount	
	t CO_2/y	t CH_4/y	t N_2O/y	tCO_2e	Percentage
Internal Electricity Consumption (during day-time)	8.4	-	-	8.4	11.7%
External Electricity Consumption (during night-time)	63.1	-	-	63.1	88.3%
TOTAL				71.5	100.00%

The table above presents the emissions from the operational phase, with the contribution to the overall GHG emissions from the Project. Tonnes of CO_2e are calculated using the GWPs from Section 7.1.9.2.1 above.

Table 7-46 summarizes the annual overall emissions in tonnes of CO_2e for the Project operational phase. Data for GHG releases from Türkiye are obtained from Türkiye's latest National Inventory Report (NIR for the year 2020) for UNFCCC and total of Annex-I countries GHG releases are obtained from UNFCCC GHG database for the last inventory year 2020. For the operational phase, the GHG emissions from the Project are an insignificant contribution to the totals reported for the country level and global reporting programs.

[12] https://enerji.gov.tr/evced-cevre-ve-iklim-turkiye-ulusal-elektrik-sebekesi-emisyon-faktoru

Table 7-46: Comparison of Project GHG Emissions to National and Global Emissions

Source	Operational
Project GHG Emissions (tonnes CO_2eq/year)	71.5
Comparison to Türkiye-wide Total (%)	0.00001%
Comparison to Global Total (%)	0.0000003%
Türkiye-wide GHG Emissions (2020)[13] (tonnes CO_2eq/year)	523,897,190
UNFCCC Annex-I 2020 GHG Emissions[14] (tonnes CO_2eq/year)	22,948,516,020

The combined annual emissions from the operational phase of the Project which is considered as Scope 2 emissions arising from electricity consumption are about **71.5 t CO_2e per annum**. This annual value is below the threshold defined in IFC PS3 and Equator Principles IV. Therefore, no additional monitoring will be required.

7.1.9.3.3 Decommissioning and Closure Phase

A new impact is not expected other than those listed in the construction and operation phases in the decommissioning and closure phase of the Project.

7.1.9.4 Mitigation Measures

The annual GHG emissions calculations for the construction phase of the Project are presented above. These annual emissions are based on the approximate data and preliminary estimations provided by Client. Therefore, these calculations may be significantly underestimated or overestimated compared to the actual emissions. Considering these approximations, GHG emission calculations for construction and operation phases should be conducted again once the actual consumption amounts, and design parameters are known.

Section 7.1.9.2 describes methodology for estimation of GHG emissions originated from the Project and Section 7.1.9.3 evaluates potential contribution to global climate change. As stated above, the Project's contribution to national and global GHG emissions and climate change is not significant since both the annual and total emissions are very small in scale compared to Turkish and Global GHG emissions. Since the annual GHG emissions for the construction phase and the operation phase of the Project are below the threshold value defined in IFC PS3 and Equator Principles IV, no further monitoring is required.

In addition, the following measures will be applied to reduce GHG emissions and increase resource efficiency as much as possible:

- The Best Available Techniques should be taken into consideration in Project design as much as possible. The applicability of the Best Available Techniques (BATs) developed within the European regulatory framework [i.e., Integrated Pollution Prevention and Control, "IPPC", BAT Reference Documents (BREFs) according to the European Directive 2010/75/EU (IED)] should be evaluated and integrated into the Project design.

[13] Obtained from TURKSTAT, Türkiye NIR for UNFCCC for the year 2020

[14] Obtained from UNFCCC GHG database, https://di.unfccc.int/time_series

- All employees will be provided climate, resource and energy efficiency awareness training.
- The most efficient equipment in terms of fuel usage and effective operation will be chosen. Maintenance of all machinery and equipment will be periodically conducted to ensure efficient fuel use and effective operation as well.
- Efficient resource and material use will be promoted through the development and implementation of a management plans to reduce direct and indirect GHG emissions due to the Project. Other aspects of resource efficiency regarding water usage are covered in Project Description and related impact assessment section.
- No idling and out-of-scope operation of the machinery and equipment will be allowed.
- Vegetation cover will not be disturbed if not necessary
- In order to reduce the GHG emissions resulting from waste disposal processes, amount of wastes generated as a result of project actions will be minimized and generated wastes will be recycled accordingly.
- During the closure phase, rehabilitation of land will help to recover lost carbon sink by converting the disturbed land to its original state as much as possible, which will act as a long-term mitigation measure.

7.1.9.5 Residual Impacts

7.1.9.5.1 Construction Phase

According to the GHG calculations for the construction phase presented in the sections above, the estimated contribution of the Project is assessed as low when compared to national and international GHG emission levels. The table below summarizes the identified impact factor involved in the construction phase of the Project.

Table 7-47: GHG Emissions Impact Matrix for Construction Phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Construction Phase GHG Emissions	Duration:	Short	Medium-low	Long term	**Low**	Medium high	**Negligible**
	Frequency:	Continuous					
	Geo. Extent:	International					
	Intensity:	Low					

7.1.9.5.2 Operation Phase

According to the GHG calculations for the operation phase presented in the sections above, the estimated contribution of the Project is assessed as low when compared to national and international GHG emission levels. The table below summarizes the identified impact factor involved in the operation phase of the Project.

Table 7-48: GHG Emissions Impact Matrix for Operation Phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Operation Phase GHG Emissions	Duration:	Long	Medium-low	Long term	**Low**	Medium high	**Negligible**
	Frequency:	Continuous					
	Geo. Extent:	International					
	Intensity:	Low					

7.1.9.5.3 Decommissioning and Closure Phase

A new impact is not expected other than those listed in the construction and operation phases in the decommissioning and closure phase of the Project.

7.1.9.6 Monitoring

The following table details the monitoring activities identified for reporting and verifying of GHG emissions of the Project during the construction period.

For each monitoring activity and measure/action identified, the table shows:

- The reference (or source) documents (i.e., Turkish standard, permits, IFC Performance Standards and EHS Guidelines or other GIIP);
- Frequency/timing of the measurement,
- The Key Performance Indicator (KPI), and related quantitative target (if the target consists of a regulatory limit this will also be indicated); and,
- The related responsible party for implementing the related monitoring activity.

Table 7-49: Resource Efficiency and Energy Management Monitoring Actions

Source Document	Monitoring Action/Measure Description	Frequency/Timing	KPI	Target/Acceptance Criteria	Responsible Parties
• GHG Protocol • IPCC	• Quantify the resource consumption and specifications on a periodic (i.e., monthly) basis by appropriates methods; record and aggregate data on the consumption of the following resources: 1. Generators - Diesel Oil (construction); 2. Vehicles - Diesel Oil (construction); 3. Electricity (construction and operation). 4. Camp Site Heating – Combustion of LNG (construction) Records on the data resources (such as fuel invoices that include consumption amounts) must be kept.	Monthly	• Amounts consumed 1. [L] 2. [L] 3. [MWh] 4. [m3]	N.A.	Client / EPC
• IFC PS3	• GHG emission levels (combined Scope 1 and Scope 2 Emissions, and, if appropriate, the GHG efficiency ratio) from the facilities owned or controlled within the physical project boundary, as well as indirect emissions associated with the off-site production of energy used by the Project will be quantified and reported publicly on annual basis during the construction phase and operation phase.	Annual	• ESG Report	Compliance with international standards	Client/ EPC
• GIIP	• Number of employees that have completed the climate, resource and energy efficiency awareness trainings will be checked.	Semi-annually	• Training records	100%	Client / EPC

Source Document	Monitoring Action/Measure Description	Frequency/Timing	KPI	Target/Acceptance Criteria	Responsible Parties
• GIIP	• Maintenance records of machinery and equipment will be checked for regular maintenance periods.	Monthly	• Maintenance records	100%	Client / EPC
• GIIP	• Prior to any activity on site, final Project footprint will be determined.	Prior to any activity on site	• Project footprint	Decrease in land use/disruption	Client / EPC
• GIIP	• Records on waste types and corresponding amounts will be recorded.	Monthly	• Waste records	Decrease in amount of waste generated and continuous improvement	Client / EPC
• GIIP	• Number of non-compliances with GHG emissions management measures will be recorded	Continuously	• Visual • Records • Grievances	Minimization of non-compliances and continuous improvement	Client / EPC

7.2 Social Components

The Social Impact Assessment (SIA) presented in this chapter of the report represents both positive and adverse Project impacts that may be result by the Project actions. The development of the SIA mainly depends on the following steps,

- Gap Analysis site visit held in April 2023,
- Review of the Project national Environmental Impact Assessment Report and other relevant Project documents,
- Community Level Surveys conducted with the Mukhtars of Kadıköy, Subaşı, Gölcük and Demirli neighbourhoods.

As indicated in the social baseline study, due to the opposition of the local communities to the Project, household surveys could not be conducted in the villages. Therefore, the social impact assessment of this ESIA Report was prepared based on Community Level Surveys with the Mukhtars of the villages within the AoI, key institution interviews and expert judgement since the anticipated and experienced Project social impacts by the local communities cannot be collected through the household surveys.

Based on the outputs of the stakeholder engagement activities, review of the available Project documents and expert judgement, SIA was developed considering the construction, operation and decommissioning impacts by providing the mitigation measures for the adverse impacts and enhancement measures for the positive impacts.

Please refer to Chapter-5 for the impact assessment methodology developed by WSP Türkiye for the physical and social impacts.

7.2.1 Population and Demography

According to the baseline information of the population component, the sensitivity of the villages was assessed as **Medium High** considering the proximity to the camp site to the settlements and the possible population influx increase considering the other ongoing Projects. According to the Mukhtars, the total population of the neighbourhood of Subaşı is 700, Gölcük is 1500, Demirli is 1200, and Kadıköy is 1112. Considering the proximity of the workers' accommodation camp, Düzlük Hamlet of Kadıköy neighbourhood determined as the most vulnerable receptor for the population influx impact of the Project.

7.2.1.1 Construction phase

7.2.1.1.1 Impact factors

The main impact factor of the population increase will be the employment of workers for the Project.

Table 7-50: Project actions and related impact factors potentially affecting population during the construction phase

Project actions	Impact factors
General engineering/construction works;	Population Influx

- **Population Influx**

It is planned to employ 317 people during the construction phase of the Project and 25 people during the operation phase. It is projected that among 42 Kalyon Enerji employees to be worked during construction period, 32 of the employees will be skilled and 10 of the employees will be semiskilled. Where possible workforce is being sourced from local communities during the Project construction phase.

A large proportion (approximately 200 workers, mostly unskilled and semiskilled) of the workforce will be accommodated in the construction camp. The camp is located next to the Project site borders (see Figure 7-2). The rest (approximately 117 workers, skilled) will be accommodated in rental houses and hotels in in Viranşehir District and Şanlıurfa Province. The camp will be removed after the construction period. No lodging is planned during the operation phase. Employees will accommodate in houses in the vicinity of the Project area.

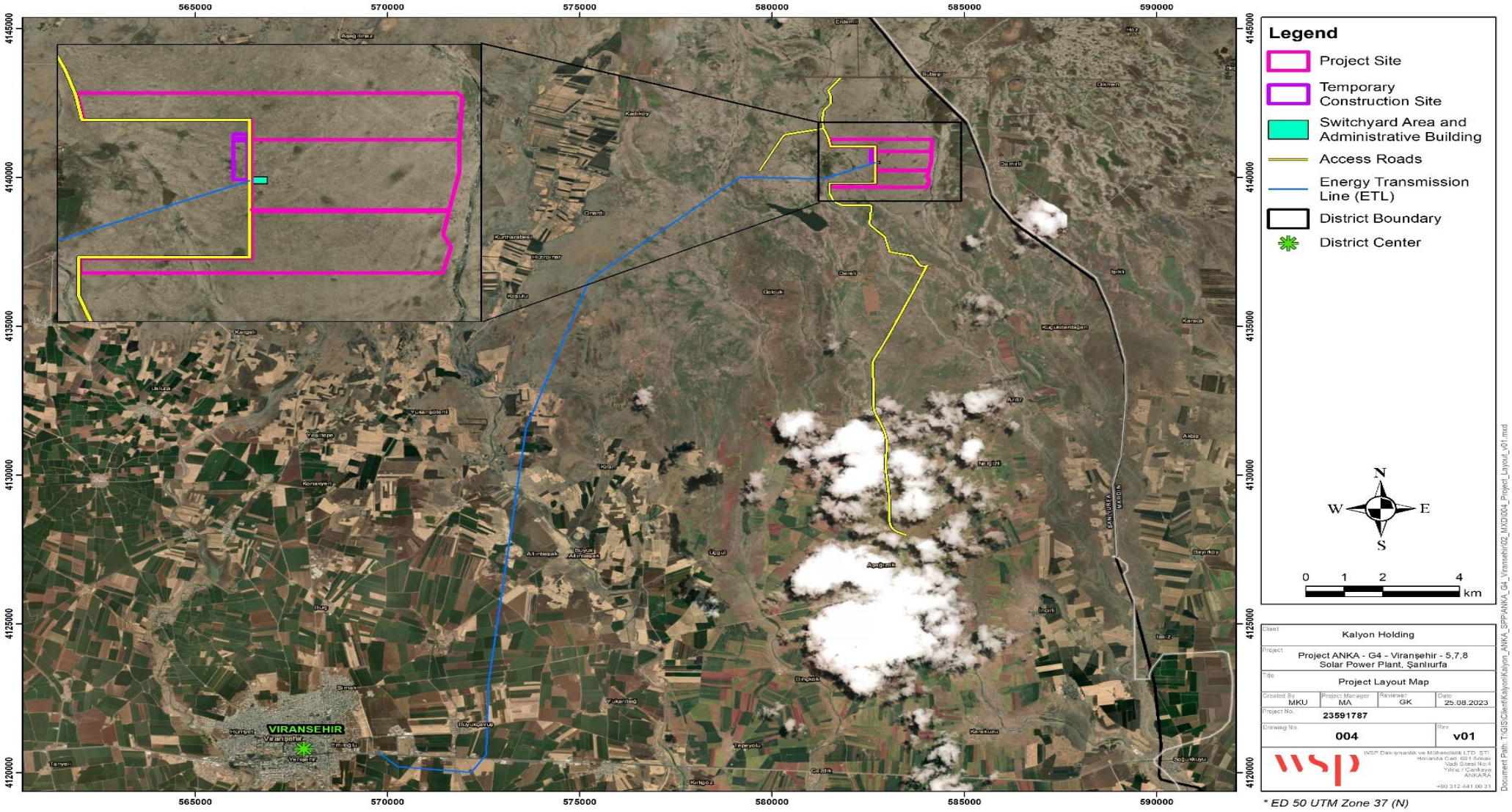


Figure 7-2: Project Layout

7.2.1.1.2 Mitigation measures

- Camp Site and Offsite Accommodation Management will be implemented.
- During the workers' accommodation design and planning process, IFC - EBRD Guiding Notes on Workers' Accommodation will be followed to ensure that the document's requirements are met.
- Accommodation will be fully contained with meals, entertainment, medical clinic. By this way interaction of the workers with local communities will be prevented as much as possible. The potential negative results of the interaction with the community residents will be explained to workers via social induction/trainings. Workers will not need to go into communities and if they pass through communities to get to the site at the beginning and end of their shift, they will be discouraged from interacting negatively with community residents.
- Priority for the employment opportunities will be given to local residents, where applicable.
- Workers' accommodations will be designed in compliance with the processes and standards of the IFC and the EBRD (2009), and the basic needs of the workers will be provided within the borders of the accommodation to limit the interaction of the workers with the local communities to prevent the pressure on the local utilities and the services.
- In case of the recruitment of workers outside the local area, cultural awareness training will be provided to workers to prevent any cultural conflicts with the local communities.
- Employee Code of Conduct will be prepared and applied.
- The mukhtars of the villages will be informed about the construction of the workers' accommodation, and the workers that will be accommodated in the camps will be registered in the village system.
- A grievance mechanism will be applied to record any gender-based complaints, and necessary measures will be taken accordingly.

7.2.1.1.3 Residual impacts

The impact of the Project in the construction phase on the population is assessed as negative and short term-term. Considering the closeness of the workers' accommodations to the Düzlük Hamlet, Kadıköy village, the frequency of the impact is assessed as frequent. The geographical extent of the population influx impact will be regional. The impact will occur at the local level, and the intensity of the impact is assessed as high. The receptor sensitivity is assessed as medium-high. The reversibility of the impact is short-mid-term since, after the construction phase, camps will be removed from the AoI. The impact value of the population increase is assessed as medium and after the implementation of the mitigation measures, the residual impact will remain at low.

The impact evaluation of the Project on the population in the construction phase is provided in the table below.

Table 7-51: Residual Impact Assessment Matrix for Population and Demography During Construction Phase.

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Population Influx	Duration:	Short	Medium-high	Short-mid-term	**Medium**	Medium high	**Low**
	Frequency:	Frequent					
	Geo. Extent:	Regional					

	Intensity:	High					

Monitoring measures

Monitoring activities will be performed on the following issues to ensure the implementation and effectiveness of the proposed mitigation measures,

- Community grievances registers by the grievance mechanism to be formed for the Project,
- Stakeholder Engagement and consultation registers and records by the Stakeholder Engagement Plan to be produced for the Project,
- Percentages of the local employees (which will be a performance indicator for ESMS to be prepared for the Project),
- Population figures of the settlements according to TURKSAT data.

7.2.1.2 Operation phase

7.2.1.2.1 Impact factors

The main impact factor of the population increase during the operation phase of the Project will be the employment of workers. It is planned to employ 25 people during the operation of the Project.

Table 7-52: Project actions and related impact factors potentially affecting population increase during operation phase

Project actions	Impact factors
SPP/infrastructure operation	Population Influx

- **Population Influx**

Operation phase of the Project will require small number of workers and they will use the administrative buildings of the Project located in the borders of the Project site. No lodging is planned during the operation phase. Employees will accommodate in houses in the vicinity of the Project area. The interaction of the operation phase workers will be limited with the local communities.

7.2.1.2.2 Mitigation measures

- Priority for the employment opportunities will be given to local residents where applicable,
- In case of the recruitment of workers outside the local area, cultural awareness training will be provided to workers to prevent any cultural conflicts,
- Employee Code of Conduct will be prepared and applied,
- A grievance mechanism will be applied to record any gender-based complaints, and necessary measures will be taken accordingly.

7.2.1.2.3 Residual impacts

The impact assessment of the Project on the population in the operation phase is provided in Table 7-53.

Table 7-53: Residual Impact Assessment Matrix for Population and Demography During Operation Phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Population Influx	Duration:	Very long	Medium-low	Short-mid-term	**Low**	Medium high	**Negligible**
	Frequency:	Frequent					
	Geo. Extent:	Local					
	Intensity:	Negligible					

Monitoring measures

Monitoring activities will be performed on the following issues to ensure the implementation and effectiveness of the proposed mitigation measures,

- Community grievances registers by the grievance mechanism to be formed for the Project,
- Stakeholder Engagement and consultation registers and records by the Stakeholder Engagement Plan to be produced for the Project,
- Percentages of the local employees (which will be a performance indicator for ESMS to be prepared for the Project),
- Population figures of the settlements according to TURKSAT data.

7.2.1.2.3.1 Decommissioning and Closure Phase

Decommissioning phase activities are mainly due to the moving out of the workers of the Project from the local area. Impacts on the local population for the decommissioning phase are difficult to predict at this stage of the Project, as these will depend on how well the local communities would adapt to the potential population influx.

7.2.1.3 Monitoring

Monitoring activities will be performed on the following issues to ensure the implementation and effectiveness of the proposed mitigation measures,

- Community grievances registers by the grievance mechanism to be formed for the Project,
- Stakeholder Engagement and consultation registers and records by the Stakeholder Engagement Plan to be produced for the Project,
- Percentages of the local employees (which will be a performance indicator for ESMS to be prepared for the Project),
- Population figures of the settlements according to TURKSAT data.

7.2.2 Economy and Employment

7.2.2.1 Construction Phase

7.2.2.1.1 Impact Factors

The construction phase of the Project is planned to be completed in 8 months and 317 personnel will be employed. Most settlements have security guards, construction workers, drivers and a few operators, technicians and engineers. The Contractor will hire staff locally and nationally according to the skills required and the availability of the workforce in the region. Especially the young population in the villages migrate from the village to the city due to the lack of job opportunities. The Project's provision of employment opportunities can support the reduction of migration from the village to the city and the strengthening of the local economy.

In addition to the direct and indirect employment opportunities, the Project will also create economic contributions to the local economy by purchasing goods and services such as fuel needs of mobile equipment, transportation, foods, passenger automobiles to be used in the Project, electrical energy needs of the Project, maintenance and repair materials, office supplies, vehicle, travel, logistics, food, accommodation, communication, security. Due to these features, the Project will benefit the strengthening of the local economy of the region.

Besides the positive impacts, it is known that the local communities had economic concerns due to the Project. The main sources of income in the neighborhoods are animal husbandry and agriculture. The fact that the Project will be constructed in the pastureland worries people. Loss of pasture area will lead to a decrease in the income obtained from animal husbandry. Therefore, the locals think that the Project will negatively affect the local economy.

7.2.2.1.2 Enhancement and Mitigation Measures

The Project will implement human resource policies and procedures and Labor Management Plan in compliance with the IFC PS-2 on Labour and Working Conditions. Job opportunities provided by the Project will be an essential source of income, especially for unemployed people, households living in poverty and the younger population in the AoI. The following enhancement actions will be implemented in order to improve the opportunities emerging from the Project and to enhance the positive impacts of the Project.

- The Project will implement human resource policies and procedures in compliance with the IFC PS-2 on Labour and Working Conditions. Such policies are expected to provide more predictable employment opportunities for direct and indirect employees,
- The Project will enhance local employment, and referential employment will be given to qualified local people. Hiring preference criteria will prioritize settlements directly affected by the current activities of the Project,
- Individuals whose livelihood sources are affected by the Project impacts will be given priority in the recruitment process of the Project,
- Formal and transparent recruitment process will be implemented to provide equal opportunity to the applicants,
- The mukhtars of the villages will be informed about the recruitment opportunities of the Project (announcements, banners) to reduce the requirement of the non-local labour force,
- Where applicable, vocational training will be provided to local people to maximize the local labour force,
- Before the procurement, local suppliers will be identified, and priority on purchases will be given to goods and services from local businesses,

- Capacity development will be applied, including the OHS and HR,
- Equal procurement opportunities will be provided to local small businesses through the Supplier Management Plan,
- EPC, subcontractors and suppliers will be monitored to prevent child and forced labour through Contractor Management Plan and Supplier Management Plan,
- An equal tender process will be applied,
- Equal pay for equal jobs will be provided to the local and non-local labour forces,
- Bank accounts will be provided to workers, and payments will be made via these bank accounts,
- The Worker Grievance mechanism will be implemented.

7.2.2.1.3 Residual Impacts

The employment opportunities emerging from the Project during the construction phase is a positive and short-term impact and will extend will be national in case of absence of required labour force in the local area. Job opportunities are likely to occur during the construction phase of the Project. Considering the implementation of the enhancement measures, the impact on job opportunities is depicted in the table below, and it is expected to be positive and medium.

Based on the baseline conditions of the assessed component, the Project characteristics and actions, as well as the proper implementation of the mitigation measures proposed above, a medium impact is expected on demand for goods, materials and services.

Table 7-54: Residual Impact Assessment Matrix for Economy and Employment During Construction Phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features		Impact Value	Enhancement effectiveness	Residual impact value
Demand for workforce	Duration:	Short	Medium-high	Reversibility:	Short-mid-term	**Medium**	Medium	**Medium**
	Frequency:	Reccurent						
	Geo. Extent:	National						
	Intensity:	Medium						
Demand for goods, materials and services	Duration:	Short	Medium	Reversibility:	Short-mid-term	**Medium**	Medium-low	**Medium**
	Frequency:	Frequent						
	Geo. Extent:	National						
	Intensity:	Medium						

7.2.2.1.4 Monitoring Measures

- Employment agreements made with contractors and subcontractors,
- Training Records (training materials, participant list, training planning, photos), which will be performance indicators for ESMS, to be prepared for the Project,
- Employment records (contracts, employee register), which will be performance indicators for ESMS, to be prepared for the Project,

- Grievance Records in accordance with the grievance mechanism to be produced for the Project.

7.2.2.2 Operation Phase

7.2.2.2.1 Impact Factors

Among renewable energy sources, solar energy is the energy type with the highest potential. Turkey, which has a high solar energy potential due to its location, has an average annual total sunshine duration of 2,640 hours (daily total 7.2 hours) and an average total radiation intensity of 1,311 kWh/m²-year (daily total 3.6 kWh/m²). When the Solar Power Plant is put into operation, it is planned to produce 150 MWe of electricity annually. Considering the possibility of providing uninterrupted energy with energy transmission, the Project is expected to have substantial contribution to national economy of Türkiye.

As for the employment opportunities, the Project will not be able to provide the same number of recruitments during the operation period and the number of people to be recruited will be much lower than during the construction phase.

7.2.2.2.2 Enhancement Measures

- To contribute to regional and global energy security,
- To be a regional trade center in energy,
- To consider social and environmental impacts in the context of sustainable development in every phase of the energy chain.

7.2.2.2.3 Residual Impacts

Increased energy production will be a benefit to the national economy. The impact of benefit to national economy positive impact with medium sensitivity. The impact is, very long term and national. Overall impact is assessed to be very high.

Table 7-55: Project Actions and Related Impact Factors Potentially Affecting Economy During Operation Phase.

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features		Impact Value	Enhancement effectiveness	Residual impact value
Benefit to national economy	Duration:	Very long	Medium	Reversibility:	Long term	**High**	Medium high	**Very High**
	Frequency:	Continuous						
	Geo. Extent:	National						
	Intensity:	Low						

7.2.2.2.4 Monitoring Measures

- Project will disclose the annual energy production information on their website.

7.2.2.3 Decommissioning Phase

Decommissioning of the Project will result in retrenchment of Project workers however it is not expected to lead to an increase in unemployment at the local level since the operation phase of the Project will not require high number of employees.

7.2.3 Labour and Working Conditions

The impact assessment of labour and working conditions is considered together for both the construction and operation phases, as similar consequences can arise as well as same mitigation measures will be applied for both phases of the Project. Within the scope of the Project, 317 employees will work during the construction phase and 25 employees will work in the operational phase. The social component *Labour and Working Conditions* was assigned a **Medium** value of sensitivity which may cause direct and negative consequences if not managed properly.

7.2.3.1.1 Construction and Operation Phases Impact factors

The impact factors from the Project activities potentially affecting Labour and Working Conditions in construction and operation phases are listed in Table 7-56.

Table 7-56: Project actions and related impact factors potentially affecting labour and working conditions during the construction and operation phases

Project actions	Impact factors
All project actions during the construction and operation phases	Labour and working conditions

- **Labor and Working Conditions**

Labour Management Plan and HR Policies recruitment procedures will aim to provide Positive opportunities for employment of local workforce to the extent possible considering unskilled, semi-skilled and skilled workforce, and giving priority to vulnerable persons. Priority will be placed on hiring skilled, semi-skilled and unskilled labour from Kadıköy, Subaşı, Gölcük and Demirli neighbourhoods.

7.2.3.1.2 Mitigation Measures

- All workers are required to provide criminal record, Social Security Institution service breakdown, place of residence, family declaration, and health checks,
- The recruitment processes will be transparent, public, and non-discriminatory, providing equal opportunities with respect to ethnicity, religion, language, gender and sexual orientation. The Contractors will provide information on the recruitment process, with particular emphasis on informing local communities of employment opportunities through different channels such as headmen and local associations,
- All workers will have freedom to join an association and union in compliance with Turkish Labour Law,
- The Client will follow Turkish law, while applying equal opportunities to women in all other branches where law does not prohibit women workers. Further measures will remain and Non-Discrimination and put in place to encourage female participation in non-employee workforce, such as Positive Equal Opportunity providing specific training where required, enabling flexibility and job-sharing opportunities for women with children to participate,
- The minimum age for the employment will be 18 and any use of child labour will be prohibited,
- Forced labour will be prohibited by ensuring full compliance with national legislation and the provisions of relevant conventions and other international standards. These measures will be reflected in the Project's Employment Policy Document,

- The ILO standards ratified by Turkey will be applied,
- The Client will be responsible of monitoring of the contractors' and supply chain companies,
- It should be noted that the Project will not cause retrenchment of existing personnel, but collective dismissal of the construction personnel will be required, after the completion of the construction phase. However, contract of limited duration will be used, and the workers will be informed on the duration of their work,
- The accommodation of the workers will be clean and safe, and it will meet the basic needs of workers, providing minimum amounts of space for each worker; sanitary, laundry and cooking facilities. Overcrowding will be avoided,
- Heating, air-conditioning, and ventilation will be appropriate for the climatic conditions and provide workers with a comfortable and healthy environment to rest and spend their spare time,
- Drinking water to be provided to Project workforce and water to be supplied to food preparation, washing and bathing areas will meet the requirements of the Turkish Regulation Concerning Water Intended for Human Consumption,
- Adequate lavatory facilities (toilets, urinals, washbasins, and showers) will be provided for the number of people expected to work in the facility and allowances will make for indicating whether the toilet facility is "In Use" or "Vacant". Toilet facilities will also be provided with adequate supplies of hot and cold running water, soap, and hand drying devices,
- First aid and medical facilities as well as provisions for safety against potential hazards (fire, etc.) will be provided at the camp sites,
- Domestic wastewater and waste to be produced at camp sites will be properly managed and disposed of in line with the requirements of Waste Management Plan,
- Workers who accommodate in the camps will be made aware of any rules governing the accommodation,
- Project's Grievance Mechanism will provide means to the Project personnel to lodge their complaints. The Client will ensure that the workers are informed of the grievance mechanism at the time of recruitment and make it easily accessible to them,
- The following plans will be implemented:
    - Camp Management Plan and Offsite Accommodation Management Plan
    - Community Health and Safety Plan
    - Security Management Plan
    - Labour Management Plan
- It will be ensured that the employees and any suppliers have access to human resources policies. Workers will be provided with information including, but not be limited to, entitlement to wages, hours of work, overtime arrangements and overtime compensation, and any benefits (such as leave for illness, maternity / paternity, or holiday),
- Independent audits and inspections should be undertaken.

- The Client will implement Human Resources policy which observes wage standards, working hour regulation, freedom of association and staff encouragement. The policy will also eliminate child and forced labour, discrimination on the basis of religion, language, gender or social status, bullying and harassment,
- All workers will be able to join trade unions of their choice and have the right to collective bargaining,
- Contracts will be verbally explained to all workers where this is necessary to ensure that workers understand their rights prior to any employment contract to be signed,
- Wages, benefits and conditions of work offered will be comparable to those offered by equivalent employers in Şanlıurfa and the same sector.
- The Project and all contractors will put in place a formal worker grievance mechanism.

7.2.3.1.3 Monitoring Measures

The following monitoring measures shall be implemented to assess the true impacts of the Project on labour and working conditions during the construction and operation phases and verify the effectiveness of the mitigation measures.

- Employment agreements made with contractors and subcontractors,
- Training Records (training materials, participant list, training planning, photos),
- records (contracts, employee register,
- Incident records,
- Grievance Records,
- Collective Agreements (if any),
- Occupational health and safety records.

7.2.3.2 Decommissioning Phase

The activities during the decommissioning phase are likely to be similar to the construction phase. Hence, the impacts will be similar to construction activities. Based on that, a new impact is not expected during the decommissioning phase of the Project, other than those listed in the construction phase.

7.2.3.2.1 Residual Impacts

The overall residual impact on labour and working conditions will be medium to low when mitigation measures are fully adopted.

Table 7-57: Project actions and related impact factors potentially affecting Labour and Working Conditions during the construction and operation phases

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Labour and working conditions related impacts	Duration:	Very long	Medium	Short-mid-term	**Medium**	Medium	**Low**
	Frequency:	Continuous					
	Geo. Extent:	National					
	Intensity:	Medium					

7.2.4 Land Use (Livelihoods and Land Access Restrictions)

7.2.4.1 Construction Phase

7.2.4.1.1 Impact factors

The Project area was declared an area suitable for the development of a solar project: a Renewable Energy Resource Area. Consequently, it was launched the "Competition Announcement on the Allocation of Renewable Energy Resource Areas and Connection Capacities Based on Solar Energy"; YEKA SPP-4 Erzin-Viranşehir (including G-4-Viranşehir-5,7,8) competitions were held on 28.06.2022. YEKA Right of Use Agreements were signed on 08.08.2022 with Kalyon Enerji Yatırımları A.Ş., which won the competition held by the Ministry of Energy and Natural Resources.

The Project will be established on a pastureland of 270 hectares. Adıyaman-Şanlıurfa-Diyarbakır Planning Region 1/100.000 Scale Environmental Plan Amendment (M44, N42 and N43 Plan Plots, Plan Amendment Explanation Report) was approved on 07.07.2020 in accordance with Article 102 of the Presidential Decree No. 1. This Environmental Layout Plan is located within the borders of "Grassland-Pastureland" as land uses in the 1/100.000 scale N43 Plan. The Project areas are also classified as "Pastureland" in terms of title deed.

Table 7-58: Project actions and related impact factors potentially affecting land use during construction phase

Project actions	Impact factors
General engineering/construction works;	Occupation of land

7.2.4.1.2 Mitigation measures

The following mitigation measures shall be implemented to mitigate the effects of the impact factors.

- Economic displacement impacts will be minimized during the design phase of the Project.
- Community Development Plan will be prepared and implemented to bridge the gaps between Turkish Expropriation Law and IFC PS-5. The following implementations are planned within the scope of the CDP:
  - Local employment (prioritizing Düzlük hamlet households),
  - Capacity building/development trainings for this employment,
  - Local procurement,
  - Pasture improvement project in coordination with Viranşehir District Directorate of Agriculture,

  - Equipment supply for animal breeders,
  - Veterinary support,
  - Equipment supply for agricultural activities,
  - Improvement of the village roads
  - Infrastructure improvements/supports to increase human life quality and welfare.
- Vulnerable people that will be affected due to Project will be determined and specific assistance will be provided.
- During the recruitment process priority will be provided to people who lost their livelihoods as a result of the establishment of the Project.
- All construction works will be continuing within the borders of the designated areas and in case of an unplanned damage, loss of the affected PAPs will be compensated by the contractors.
- Community Liaison Officer will be hired and collect grievances.
- If compensation alone is not sufficient to restore livelihoods, implementation of livelihood restoration in accordance with IFC requirements.
- Grievance mechanism will be established.
- Impacts to agricultural and pasture lands will be minimized as far as possible by keeping the Project construction footprint as narrow as possible, and efficiently restoring any damaged areas.
- Any business losses will be compensated at a full replacement value.
- Any loss of or damage to crops caused by Project activities will be compensated.
- Hunting and collection of wild animals will be strictly prohibited within the Project area.
- Kalyon Energy will initiate the Grazing Pilot Project at the site after the construction works are completed. If this project is successful, the site will be opened to controlled grazing.
- A CDP will be developed and implemented and one of the main target groups will be the ecosystem users.
- Following assessment and coordination will be undertaken to prevent the impacts on the pastureland based livelihoods;
  - Baseline Assessment: A baseline assessment will be conducted for the evaluation of the grazing capacity in detail taken into consideration of vegetation type, soil quality, and climate and the number of the animals and the households depended to the affected pastureland.
  - **Collaboration with Expert Organizations:** Official cooperation will be made with NGOs and universities specialized in pasture management and their expertise will be used to enhance the accuracy of the grazing assessment.
  - **Grazing Assessment Report:** A comprehensive report will be prepared detailing the findings of the grazing assessment, recommendations for sustainable grazing practices, consideration environmental and ecological factors will be taken into the consideration.

- **Grazing Procedure Development:** A detailed grazing procedure will be prepared based on the results of the assessment report that includes guidelines for optimal stocking rates, rotational grazing, and fallowing periods for vegetation recovery.
- **Government Collaboration:** The outcomes of the cooperation with the NGOs and the universities will be shared with the Ministry of Agriculture in a transparent way and further communication will be developed for their endorsement and support for widespread implementation.
- **Shepherd Recruitment and Training:** Shepherds who have received training in sustainable grazing practices will be hired to prevent over usage on the ecosystem services, to protect the life of the animals, and to prevent any damage on the power plant,
- **Livestock Development:** Mitigation measures will be implemented to increase the number of sheep in the area, considering factors such as breeding programs, veterinary care, and access to quality feed.
- **Monitoring and Adaptive Management:** Continuous monitoring of grazing activities and livestock development will be conducted throughout the project lifespan of the Project. The results will be discussed with the PAPs and the relevant stakeholders to identify areas for improvement and take necessary actions. The grazing procedure and livestock development strategies will be updated if required.
- **Construction Phase Mitigation:**To mitigate the impact of construction on grazing land and livestock:
  - Alternative feeding options will be provided.
  - Animal feed seeds will be distributed to promote vegetation growth and compensate for potential losses during the construction phase.
- **Community Engagement:** PAPs will be engaged continuously during the implementation phase to ensure their understanding and cooperation. The awareness programs will be implemented to convey the on the benefits of sustainable grazing practices and the economic potential of increased sheep farming.
- **Documentation and Reporting:** Detailed records of grazing activities, livestock development initiatives, monitoring results, and any implemented measures will be recorded and regular reports will be submitted rto the Ministry of Agriculture to keep them informed of project progress.
- **Project Dissemination:** Work with the Ministry of Agriculture to disseminate successful practices to other regions. Facilitate workshops and knowledge-sharing sessions for farmers and stakeholders.
- **Project Evaluation:** Conduct a comprehensive evaluation of the project's impact on the field's ecosystem, grazing capacity, livestock development, and community livelihoods. Use the results to refine future projects and contribute to the broader understanding of sustainable grazing management and livestock development and include the results in the annual Environmental and Social Report.

7.2.4.1.3 Residual Impacts

The land allocation impact will result in negative impacts. Before the implementation of the suggested mitigating measures are put into place, all impacts are expected to occur continuous. In order to properly compensate the PAPs through the implementation of Community Development Plan, the impact on occupation of pasturelands is

anticipated to decrease to between very high to high considering the sensitivity of the Kadıköy village and their dependency on the pasture lands for the grazing purposes. The required pasture land for the development of the project consists approximately 8% of the total lands of the Kadıköy village. Kalyon Energy will start the Grazing Project in this field after the construction works are completed. If this project is successful, the area will be opened to controlled grazing of sheep. It should be noted that, during the lifespan of the Project, impact monitoring will be held by considering the number of the animals, income levels and the grievances and further mitigation measures will be developed if required. In addition, this impact was assessed according to the expert judgement and the interviews with the Mukhtars. This impact level may be reevaluated in case of the completion of the detailed social study.

Table 7-59: Residual Impact Assessment Matrix for Land Acquisition During Construction Phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Occupation of pasture lands	Duration:	Very long	Very high	Long term	**Very High**	High	**Low**
	Frequency:	Continuous					
	Geo. Extent:	Local					
	Intensity:	Very high					

7.2.4.2 Decommissioning Phase

The Project would be decommissioned once it has reached the end of its economic life after the Project's anticipated economic useful lifespan of about 30 years. The ground surface will be covered according to appropriate vegetation selection (compatible with the soil, climate and flora of the region) after the rehabilitation operations are completed. The Project site will be handed over to the Ministry of Industry and Technology after the decommissioning works. The site can convert alternative uses by local communities according to the Ministry of Industry and Technology decision.

7.2.5 Community Health and Safety

The Project may have various implications for community health and safety. The potential impacts of the Project must be assessed to identify mitigation measures accurately. In terms of community health and safety, the activities in the construction, operation and decommissioning phases of the Project were evaluated separately, the potential risks were determined, and mitigation measures were developed accordingly. Regarding community health and safety, the following topics have been identified as potential impacts of the Project and included in the social impact assessment:

- The impacts on traffic density and rise in accidents,
- Dust and degradation of air quality due to the construction activities,
- Noise due to the construction activities,
- Population increase,
- Impacts of communicable diseases and waste increase.

7.2.5.1 Construction Phase

7.2.5.1.1 Impact Factors

The impact factors of the Project causing potential implications on community health and safety during the construction phase are presented in this section.

Table 7-60: Project actions and related impact factors potentially affecting community health and safety during construction phase

Project actions	Impact factors
General engineering/construction works;	Increase in traffic Emissions of particulate matter Emission of noise Increase of population Risk of Increasing Communicable Diseases Waste Management Employment of Security personnel

- **Increase in Traffic**

The site preparation and construction activities will require the movement of trucks entering and leaving the Project Area to transport machinery, equipment, construction material and staff. Hence, one potential impact of the Project on community health and safety is the increase in traffic density and the possibility of a rise in accidents related to vehicle increases due to construction works during the construction phase of the Project.

Traffic-related risk factors, which threaten human health and the environment, are generally caused by driver error. However, issues regarding regular maintenance of vehicles, road design, and construction activities contribute to traffic-related risk factors. The traffic-related impacts are assessed in the Traffic section in detail as well.

- **Emissions**

No air or noise emission is expected during the operation phase considering the nature of the Project. Low-level noise emissions from inverters are generally reduced by a combination of shielding, noise cancellation, filtering, and noise suppression. Heating and hot water needs will be provided by electric heaters and air conditioners.

- **Increase of Population**

Another potential impact of the Project on community health and safety is related to the expected population influx, especially in the construction phase of the Project. Approximately 317 personnel during the construction phase of the Project. Considering the expected population influx and the insufficient infrastructure system in some of the settlements in the AoI identified in the socioeconomic baseline, mitigation measures have been defined to prevent the pressure and negative impact on infrastructure and services caused by the population influx, especially during the construction phase.

- **Risk of Increasing Communicable Diseases and Waste**

The population increase may lead to the spread of infectious and communicable diseases. After the social field study, it has found that no epidemic disease, contagious diseases, or distinctive health problems arising from environmental effects pose a threat to human health in the AoI. However, considering that 10 workers will be accommodated together during the construction phase of the Project and a population influx is expected from

outside the local area, protection and prevention measures for both community and employee health will be implemented under the Community Health and Safety Plan throughout the Project process. As previously indicated in the socioeconomic baseline study, some settlements do not have health units, which makes these areas highly sensitive in case of a possible infectious disease. Another source of communicable diseases may be inadequate waste management due to population influx.

- **Employment of Security Personnel**

During the construction phase of the Project, security services will be needed on the Project site. According to the data obtained from the social field study, there are security personnel who obtained certification for private security living in the settlements located in the AoI. Security personnel who are already part of the community and familiar with local customs may serve as a positive and visible point of contact between the Project and the local community.

7.2.5.1.2 Mitigation Measures

Increase in Traffic

A Traffic Management Plan have been prepared within the scope of the Project to maintain traffic safety on the roads to be used and to prevent the risks which may outcome due to Project activities ensuring a “safe site, safe vehicle and safe driver” at all times. The following points will be considered as a minimum regarding traffic management:

- Referring to the Stakeholder Engagement section of this ESIA Report, a continuous stakeholder engagement process and grievance mechanism will be in place:
  - To exchange information on the Project with the local community and other stakeholders; and
  - To record and respond to complaints and concerns from the local community members and other stakeholders.
- Considerations will be given to traffic volumes at the rush hours of the day, and transportation of equipment and materials will be utilized at quieter periods to avoid increased congestion on the roads used by the local communities,
- It will be ensured that the roads will be made suitable for heavy vehicle use by taking necessary permits and making necessary arrangements. In case of any road damage, necessary maintenance works will be undertaken,
- Project site will be equipped with suitable and sufficient lighting to ensure sufficient visibility,
- Community Health and Safety Plan (CHSP) will be implemented,
- Village roads will be improved,
- In case construction activities are required on the existing roads will only start after the relevant permits are obtained; all necessary precautions will be taken as signage, barrier, fence, lighting,
- Vulnerable and critical points will be identified in the Project site (including sensitive receptors such as hospitals and schools) to envisage the access routes for construction traffic,
- Construction vehicles will only operate in the defined routes; vehicles will be monitored via an In Vehicle Monitoring System,

- Cameras will be placed in appropriate places on the roads so that construction vehicles belong to different projects can be distinguished and monitored,
- At all times, vehicles will be kept on designated site roads where established. Off-road driving is prohibited except in emergencies or if no roads have been established,
- If reversing cannot be avoided in the work areas, necessary reversing procedures will be identified, including installing reversing aids on vehicles, reversing sensors etc. Trained banksman will be used when reversing cannot be avoided,
- Parking areas will be designated with signs, and reverse parking will be implemented for emergencies,
- The routes to be used by pedestrians will be segregated from heavy vehicle routes where possible,
- Appropriate traffic signs, signals, lights and markings will be placed in the required areas to prevent potential accidents/incidents. Barriers will be placed in the required areas to protect human health and assets,
- The speed limits will be implemented. Vehicle speeds will be monitored randomly through speed gun tools,
- Seatbelts will be worn in vehicles and machinery when being operated,
- No vehicle/equipment/material will be allowed to enter work areas before obtaining approval from security,
- Loading areas will be designed appropriately to prevent/minimize vehicle/pedestrian contact and property damages,
- All operators will be licensed/certified for the type of vehicle being driven and will undergo medical surveillance,
- Repair and maintenance of vehicles will be done by the authorized bodies,
- Changes in the condition of the roads will be monitored regularly, and road improvement works will be carried out, when necessary,
- Fatigue and distraction procedures will be established considering the local legal requirements and the nature of the work,
- Project disclosure activities will include informing communities about the project traffic management controls, planned road closures, blasting activities and grievance mechanisms. Collaboration with local communities and responsible authorities will be ensured to improve signage, visibility, and road safety conditions, especially near the roads and other locations where children may be present.,
- In SEP of the Project, these information-sharing methods and schedules will be defined.

Emission of Particulate Matter

In order to minimize the particulate matter emission that will occur within the scope of the Project:

- The transportation routes to be used will be watered regularly with water sprinklers,
- The removal and laying operations of the materials will be carried out without tossing as much as possible.
- Pollution Prevention Plan will be followed.

Emission of Noise

- All machines to be used under normal operating conditions will not run simultaneously,
- Monthly and annual maintenance of machinery and equipment will be done periodically,
- Pollution Prevention Plan will be followed.
- Quality spare parts and lubrication products will be used.

Increase of Population

Considering the expected population influx and the insufficient infrastructure system in some of the settlements in the AoI identified in the socioeconomic baseline, mitigation measures have been defined to prevent the pressure and negative impact on infrastructure and services caused by the population influx, especially during the construction phase. Certain negative impacts related to the population influx due to the Project on infrastructure and services are as follows:

- The inability of vulnerable groups to equally access social and health services due to supply-demand imbalance,
- Population influx due to the Project intensifying health services and decreasing the quality of service,
- Delays in responding to emergencies on time,
- The emergence of inadequacies due to increased demand for drugs and medical needs.

Risk of Increasing Communicable Diseases

The population increase may lead increase in communicable and infectious diseases in the Project Area of Influence. The following are the essential control measures to be implemented to avoid the spread of communicable diseases:

- Pre-employment health screening and regular medical checks of workers per Turkish regulatory requirements,
- Regular cleaning principles to be applied in the Project site,
- Community Health and Safety Management Plan should be implemented for the Project that includes medical surveillance,
- Awareness-raising on healthy lifestyles for workers and community-level training.

Waste Management

- All waste or excess material that may be remained due to the activities in the Project area will be disposed of under laws and regulations.
- Measures defined in Chapter 7.1 of the ESIA Report and Waste Management Plan and Pollution Prevention Plan will be followed.

Employment of Security Personnel

A Security Management Plan have been prepared in line with the national (Private Security Services Law No: 5188, 2004) and international (e.g., IFC PS4) standards within the scope of the Project to manage the security-related

impacts and ensure the security of the activities, assets, work premises at the Project and avoid potential impacts on workers and the local community. The following measures will be considered as a minimum regarding security arrangements:

- Security will be provided at the Project area by third-party company or in-house security personnel with no criminal histories or history of abuse,
- Security personnel will be trained adequately in their envisaged roles and responsibilities, the use of force (and, where applicable, firearms), and appropriate conduct toward workers and affected communities and the applicable law,
- Security patrols will be done at regular intervals,
- Entry of unauthorized persons will be prevented by using appropriate tools and gadgets. Warning signs about unauthorized entry will be available at various locations at the Project crossings,
- Entry and removal of equipment/material will be controlled at the control points; the movement of equipment/material will be allowed after the approval of the relevant department,
- A grievance mechanism will be in place for the affected communities to express their concerns about the security arrangements and acts of the security personnel,
- Relevant Project officials will continuously accompany the visitors during their stay on the Project site, and all visitors will be recorded,
- All visitors will be given brochures explaining the Project area, site rules and what to do in case of emergencies,
- Personal Protective Equipment will be provided to visitors coming to the Project site,
- All areas that may be dangerous to visitors will be locked,
- All areas that pose a danger at the Project area will be marked with appropriate signs.

7.2.5.1.3 Residual Impacts

The assessment of the potential impacts caused by the identified impact factors on the component for the construction phase of the Project is provided in Table 7-61.

Table 7-61: Residual Impact Assessment Matrix for Community Health and Safety During Construction Phase.

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Increase in Traffic	Duration:	Short	Medium	Mid term	**Medium**	Medium high	**Low**
	Frequency:	Frequent					
	Geo. Extent:	Regional					
	Intensity:	Medium					

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Emission of Particulate Matter	Duration:	Short	Medium	Short-mid-term	**Low**	Medium high	**Negligible**
	Frequency:	Frequent					
	Geo. Extent:	Local					
	Intensity:	Medium					
Emission of Noise	Duration:	Short	Medium	Short-mid-term	**Low**	Medium high	**Negligible**
	Frequency:	Infrequent					
	Geo. Extent:	Local					
	Intensity:	Low					
Increase of Population influx	Duration:	Short	Medium-high	Mid term	**High**	Medium high	**Low**
	Frequency:	Frequent					
	Geo. Extent:	Local					
	Intensity:	High					
Risk of Communicable diseases	Duration:	Short	Medium	Short-mid-term	**Low**	Medium high	**Negligible**
	Frequency:	Reccurent					
	Geo. Extent:	Local					
	Intensity:	Low					
Waste management	Duration:	Short	Medium	Short-mid-term	**Low**	Medium high	**Negligible**
	Frequency:	Continuous					
	Geo. Extent:	Local					
	Intensity:	Medium					
Employment of Security Personnel	Duration:	Short	Medium low	Short-mid-term	**Low**	Medium high	**Negligible**
	Frequency:	Reccurent					
	Geo. Extent:	Local					
	Intensity:	Low					

7.2.5.1.4 Monitoring

Increase in Traffic

The following monitoring measures shall be implemented to assess the actual impacts of the Project on the traffic during the construction phase and to verify the effectiveness of the mitigation measures:

- Keeping a record of the number of traffic-related incidents involving contractor workers, subcontractor workers and external persons,
- Investigation of the incidents and accidents and use of lessons learned to improve traffic mitigations,
- Keeping a record of and tracking Training Records of Drivers and Training Records on Community Health and Safety,
- Following of the licenses and medical surveillance of the operators to ensure they are up to date,
- Closely monitoring compliance with speed limits to protect the health and safety of both community and employees,

- Changes in the condition of the roads will be monitored regularly, and road improvement works will be carried out, when necessary,
- Keeping a record of the number of total road closures caused by the Project activities,
- Controlling maintenance records of the vehicles to ensure regular maintenance activities take place,
- Weather forecast monitoring to ensure the safety of the operators,
- Keeping a record of and tracking the traffic accident/emergency response actions,
- Keeping a record of the number of grievances related to the traffic received and the percentage of grievances resolved positively,

Monitoring should be designed to identify the failure or ineffectiveness of mitigation measures in terms of road safety.

Emission of Particulate Matter

- Please See Air Quality Chapter of the report.

Emission of Noise

- Please see Noise Chapter of the report.

Increase of Population

- Community grievances registers by the grievance mechanism to be formed for the Project,
- Stakeholder Engagement and consultation registers and records by the Stakeholder Engagement Plan to be produced for the Project,
- Percentages of the local employees (which will be a performance indicator for ESMS to be prepared for the Project),
- Population figures of the settlements according to TURKSAT data.

Risk of Communicable Diseases

- Training records on community health and safety,
- Records of communicable diseases.

Waste Management

- Licenses and permits of quarries and excavation material storage/recycling facilities will be recorded,
- Waste management practices of the subcontractors will be monitored by means of document review (e.g., permits, waste recycling/disposal agreements) and visual checks at the work sites.

Employment of Security Personnel

- Training records of the security personnel.

7.2.5.2 Operation Phase

7.2.5.2.1 Impact factors

The impact factors of the Project causing potential implications on community health and safety during the operation phase are presented in this section.

Table 7-62: Project actions and related impact factors potentially affecting community health and safety during operation phase

Project actions	Impact factors
Plant/infrastructure operation	Increase in traffic

Increase in Traffic

The expected traffic impact during the operation phase of the Project due to the operation activities is anticipated to be reduced during the operation phase.

7.2.5.2.2 Mitigation Measures

A Traffic Management Plan have been prepared within the scope of the Project to maintain traffic safety on the roads to be used and to prevent the risks which may outcome due to Project activities ensuring “safe site, safe vehicle and safe driver” at all times.

Following points will be considered as a minimum regarding traffic management:

- Referring to Stakeholder Engagement section of this ESIA Report, a continuous stakeholder engagement process and grievance mechanism will be in place:
  - to exchange information on the Project with the local community and other stakeholders; and
  - to record and respond any complaints and concerns raised by the local community members and other stakeholders.
- Project site will be equipped with suitable and sufficient lighting to ensure sufficient visibility.
- At all times vehicles will be kept on designated site roads where established. Off-road driving will not be permitted other than emergency situations, or if no roads have been established yet.
- Parking areas will be designated with signs and reverse parking will be implemented for emergency situations.
- The routes to be used by pedestrians will be segregated from vehicle routes where possible.
- The speed limits will be implemented.
- Project disclosure activities will include informing communities about the project traffic management controls, planned road closures, blasting activities and grievance mechanism. Collaboration with local communities and responsible authorities will be ensured to improve signage, visibility, road safety conditions especially near the roads and other locations where children may be present.
- Appropriate traffic signs, signals, lights and markings will be placed at the required areas to prevent potential accidents/incidents. Barriers will be placed at the required areas to protect both human health and assets.

7.2.5.2.3 Residual Impacts

The assessment of the potential impacts caused by the identified impact factors on the component for the operation phase of the Project is provided in the table below.

Table 7-63: Residual impact assessment matrix for community health and safety during the operation phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Increase of traffic	Duration:	Very long	Medium	Short-mid-term	**Medium**	Medium high	**Negligible**
	Frequency:	Frequent					
	Geo. Extent:	Local					
	Intensity:	Low					

7.2.5.2.4 Monitoring

The following records will be monitored to ensure the effectiveness of the mitigation measures:

- The record of the number of traffic-related incidents involving contractor workers, subcontractor workers and external persons,
- The record of the number of full road closures caused by Project activities,
- The record of the number of grievances received and percentage of grievances resolved positively,
- The record Stakeholder engagements,
- Traffic accident /emergency response actions,
- Training Records of Drivers.

7.2.5.3 Decommissioning Phase

A new impact is not expected during the decommissioning and closure phase of the Project, other than those listed in the construction and operation phases. In order to prevent new impacts, the Project Site should be effectively and permanently blocked from all access to the public until the site can be converted into a new beneficial land use based on changed conditions at the site.

7.2.6 Infrastructure, Utilities and Services

As indicated in the social baseline study, the infrastructure, utilities and services in the neighbourhoods are insufficient. The details are provided below:

Kadıköy

- Irrigation water is extracted from wells. Electricity is used to extract water from the well. In this process, there are electricity cuts in the village to reduce the electricity load.
- There is no sewerage system in the village.
- Düzlük hamlet of Kadıköy village is the area that will be most affected by the Project. There are telecommunication problems in Dülzük hamlet.

- In the village, the roads are not sufficient.
- There is no health centre in the village. There is also no doctor visit to the village. Therefore, they go to Viranşehir district, 24 km away, to benefit from health services.
- There are no public transportation services in the village. There are public transportation services only in the Düzlük hamlet, but they move if they reach enough people, so there are public transportation problems.

Gölcük

- Electricity cuts are very frequent in the village of Gölcük.
- There is no drinking water service in the village, as the existing drinking water in the village is not of drinking quality. Although there are utility water and irrigation water to be used, they are not sufficient.
- There is no sewerage system.
- The source of heating in the village is stove. However, it is stated that the heating sources are not sufficient.
- Waste in the village is not collected by the municipality.
- There is no internet infrastructure in the village. The telecommunication system is also not sufficient.
- The roads in the village are not sufficient.
- There is no health unit in the village. Visits to the doctor are very rare. Villagers go to Viranşehir to access the health system.
- There is a school in the village, but not for all levels of education. Some of the students go to school via transported education.
- It is stated that the mosque in the village is insufficient.
- There is no cemetery in the village. They use central cemeteries in the districts.
- There is no public transportation service in the village.

Demirli

- Electricity cuts are very frequent in the village of Demirli.
- There is drinking water, utility water and irrigation water in the village, but they are insufficient both in quantity and quality.
- The sewerage system is not sufficient in the village.
- The source of heating in the village is stove. However, it is stated that the heating sources are not sufficient.
- Waste in the village is not collected by the municipality.
- There is no internet infrastructure in the village. The telecommunication system is also not sufficient.
- The roads in the village are not sufficient.
- There is no health unit in the village.

- It is stated that the mosque in the village is insufficient.
- There is no public transportation service in the village.

Subaşı

- Electricity cuts are very frequent in the village of Subaşı.
- The village has no drinking water service, as the existing water is not of drinking quality. Although there are utility water and irrigation water to be used, they are insufficient both in quantity and quality.
- There is no sewerage system.
- The source of heating in the village is stove. However, it is stated that the heating sources are not sufficient.
- Waste in the village is not collected by the municipality.
- There is no internet infrastructure in the village. The telecommunication system is also not sufficient.
- The health unit is not sufficient.
- It is stated that the mosque in the village is not sufficient.
- There is no public transportation service in the village.

7.2.6.1 Construction Phase

7.2.6.1.1 Impact Factors

The impact factors of the Project causing potential implications on infrastructure, utilities, and services during the construction phase are presented in this section.

Table 7-64: Project actions and related impact factors potentially affecting infrastructure, utilities, and services during the construction phase

Project actions	Impact factors
All Project actions during the construction and operation phases	Access to education Access to health Transportation Water sources Emergency response

Considering the expected population influx and the insufficient infrastructure system in the settlements of the AoI identified in the socioeconomic baseline, mitigation measures have been defined to prevent the pressure and negative impact on infrastructure and services caused by the population influx, especially during the construction phase. Certain negative impacts related to the population influx due to the Project on infrastructure and services are as follows:

- The inability of vulnerable groups to equally access social and health services due to supply-demand imbalance,
- Population influx due to the Project intensifying health services and decreasing the quality of service,
- Delays in responding to emergencies on time,

- The emergence of inadequacies due to increased demand for drugs and medical needs.

7.2.6.1.2 Mitigation Measures

It is possible to reduce the potential negative impacts emerged from the Project on the infrastructure and services of the AoI if certain mitigation measures are taken, such as:

- An Emergency Preparedness and Response Plan will be prepared and implemented during the construction phase of the Project,
- A Traffic Management Plan will be prepared and implemented,
- Before the establishment of the construction and the workers' accommodations, an engagement with the local authorities, including the Municipalities, will be held, and energy, transportation and water demand of the Project will be shared,
- Workers' accommodation will provide health services to the Project workers to not create pressure on the health services of the local communities,
- At minimum first aid and the medical unit will be established,
- District or province government hospitals will be used when required,
- In case of damage to the local infrastructure, including but not limited to telecommunication, electricity, road and water sources, immediate maintenance will be applied,
- A Project-specific Grievance Mechanism will be used to record, avoid, and solve the incident caused by the Project on the local infrastructure.

7.2.6.1.3 Residual Impacts

The impacts regarding the infrastructure during the construction phase are observed to be negative and to a local extent. All potential impacts may cause medium to very high receptor sensitivity due to insufficient infrastructure services in the local area. With the implementation of proposed mitigation measures, the extent of the infrastructure-related impacts is expected to be reduced.

Table 7-65: Residual impact assessment matrix for infrastructure, utilities, and services during the construction phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Access to education	Duration:	Short	Medium	Short-mid-term	**Low**	Medium high	**Negligible**
	Frequency:	Infrequent					
	Geo. Extent:	Local					
	Intensity:	Low					
Access to health	Duration:	Short	Very high	Short-mid-term	**Medium**	Medium	**Low**
	Frequency:	Reccurent					
	Geo. Extent:	Local					
	Intensity:	High					

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Transportation	Duration:	Short	Medium	Short-mid-term	**Low**	Medium high	**Negligible**
	Frequency:	Reccurent					
	Geo. Extent:	Local					
	Intensity:	Medium					
Water sources	Duration:	Short	Very high	Mid term	**High**	Medium	**Medium**
	Frequency:	Frequent					
	Geo. Extent:	Local					
	Intensity:	High					
Emergency Response	Duration:	Short	Medium	Short-term	**Negligible**	Medium high	**Negligible**
	Frequency:	Infrequent					
	Geo. Extent:	Local					
	Intensity:	Medium					

7.2.6.2 Operation Phase

7.2.6.2.1 Impact Factors

The impact factors of the Project causing potential implications on infrastructure, utilities, and services during the operation phase are presented in this section.

Table 7-66: Project actions and related impact factors potentially affecting infrastructure, utilities, and services during the operation phase

Project actions	Impact factors
All Project actions during the construction and operation phases	Access to education Access to health Transportation Water sources Emergency response

Since the population influx expected to occur in the construction phase will be decreased during the operation phase, the potential negative impacts may decline.

7.2.6.2.2 Mitigation Measures

It is possible to reduce the potential negative impacts emerged from the Project on the infrastructure and services of the AoI if certain mitigation measures are taken, such as:

- An Emergency Preparedness and Response Plan will be prepared and implemented during the construction phase of the Project,
- A Traffic Management Plan will be prepared and implemented,
- Before the establishment of the construction and the workers' accommodations, an engagement with the local authorities, including the Municipalities, will be held, and energy, transportation and water demand of the Project will be shared,

- Workers' accommodation will provide health services to the Project workers to not create pressure on the health services of the local communities,
- At minimum first aid and the medical unit will be established,
- District or province government hospitals will be used when required,
- In case of damage to the local infrastructure, including but not limited to telecommunication, electricity, road and water sources, immediate maintenance will be applied,
- A Project-specific Grievance Mechanism will be used to record, avoid, and solve the incident caused by the Project on the local infrastructure.

7.2.6.2.3 Residual Impacts

The assessment of the operation phase of the Project is provided in the table below.

Table 7-67: Residual impact assessment matrix for infrastructure, utilities, and services during the operation phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Access to education	Duration:	Very long	Medium-low	Short-mid-term	**Low**	Medium high	**Negligible**
	Frequency:	Infrequent					
	Geo. Extent:	Local					
	Intensity:	Negligible					
Access to health	Duration:	Very long	Medium-high	Short-mid-term	**Medium**	Medium high	**Low**
	Frequency:	Reccurent					
	Geo. Extent:	Local					
	Intensity:	Low					
Transportation	Duration:	Very long	Medium-low	Short-mid-term	**Low**	Medium high	**Negligible**
	Frequency:	Reccurent					
	Geo. Extent:	Local					
	Intensity:	Negligible					
Water sources	Duration:	Very long	Medium-high	Mid term	**High**	Medium high	**Low**
	Frequency:	Frequent					
	Geo. Extent:	Local					
	Intensity:	Low					
Emergency Response	Duration:	Very long	Medium-low	Short-term	**Negligible**	High	**Negligible**
	Frequency:	Infrequent					
	Geo. Extent:	Local					
	Intensity:	Negligible					

7.2.6.2.4 Monitoring

The following records will be monitored to ensure the effectiveness of the mitigation measures:

- The record of the number of traffic-related incidents involving contractor workers, subcontractor workers and external persons,
- The record of the number of full road closures caused by Project activities,
- The record of the number of grievances related to access to education and health received from the external stakeholders and percentage of grievances resolved positively,
- The record of emergency response actions,
- The usage of water sources affecting the local communities.

7.2.6.3 Decommissioning Phase

The Project infrastructure will be removed from the Project site as much as practicable during the decommissioning phase. Hence, no additional impact is anticipated during this phase of the Project.

7.2.7 Gender Issues

7.2.7.1 Construction and Operation Phases

7.2.7.1.1 Impact Factors

In this Section, the potential implications of the Project related to gender issues in the AoI are assessed.

Considering the lower levels of educational attainment of women and patriarchal structure in the rural area in Türkiye, women might experience Project impacts compared to others. Certain gender inequalities may occur in the AoI that include:

- Lack of access to information on the Project,
- Risks of gender-based violence and sexual harassment,
- With the lower educational levels and available skills of women compared to men, the women members of the local communities may not get the equal employment opportunities that emerged from the Project.

Table 7-68: Project actions and related impact factors potentially affecting women during the construction and operation phases

Project actions	Impact factors
All Project actions during the construction and operation phases	Access to information Gender-based violence and sexual harassment Women's employment

7.2.7.1.2 Mitigation Measures

Since these inequalities in the existing social structure are at risk of emerging in the activities originating from the Project and in the opportunities offered by the Project, necessary measures will be developed and implemented. In addition to the measures to be taken by the Project, enhancement measures will be implemented to increase women's use of the Project opportunities.

- For the job opportunities and benefits created within the scope of the Project to be equally beneficial, it will be ensured that the vulnerable groups, especially those affected by the Project, and women are informed at a sufficient level,

- Priority will be given to women when for the local employment and procurement opportunities.
- The Project will ensure that women of the local communities are informed about the Project on a sufficient level; women-only participation meetings will be held, when necessary,

It is recommended to develop and implement the Gender-Based Violence and Sexual Harassment contractor procedure to eliminate the risks of Gender-Based Violence and Sexual Harassment that may arise within the scope of the project. This procedure will include and define the following topics:

- Contractor policy prohibiting sexual harassment,
- Sexual harassment incident referral and reporting plan,
- Notice to employees of the policy against sexual harassment,
- Orientation training on policy against sexual harassment and gender-based violence,
- Monitoring and reporting of employee participation in orientation training,
- Contractor participation in sexual harassment meetings and workshops,
- Zero tolerance policy against violence and harassment,
- Mechanisms for reporting prohibited behaviour, consequences of violations, and suspected violations,
- Planning not to leave dark areas and blind spots during the operation and construction process,
- Effective Use of the Grievance Mechanism for these measures is one of the most important tools to detect and prevent risks early. The Project-specific GRM Procedure for the effective use of the grievance mechanism is included in the Project SEP document.
- In parallel with the actions included in this document, support will be provided to ensure that women have access to the Project's GRM.

The Minimum Requirements defined above against Sexual Harassment and gender-based violence will be implemented at all Phases of the Project.

7.2.7.1.3 Monitoring

The following records will be monitored to ensure the effectiveness of the mitigation measures:

- The record of women’s participation in public information disclosure meetings,
- The record of the number of grievances related to gender-based violence and sexual harassment received percentage of grievances resolved positively,
- The record of Project workers’ training on gender-based violence and sexual harassment,
- The usage of water sources affecting the local communities.

7.2.7.1.4 Residual Impacts

The residual impact on gender component after the application of the abovementioned mitigation measures during the construction and operation phases is presented in the following table.

Table 7-69: Residual impact assessment matrix for gender issues during the construction and operation phases

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Access to information	Duration:	Very long	Medium	Short-term	**Low**	Medium high	**Negligible**
	Frequency:	Continuous					
	Geo. Extent:	Local					
	Intensity:	High					
Gender-based violence and sexual harassment	Duration:	Very long	Medium-high	Long term	**High**	Medium high	**Low**
	Frequency:	Infrequent					
	Geo. Extent:	Local					
	Intensity:	Low					
Women's employment (positive)	Duration:	Very long	Medium-high	Short-mid-term	**Medium**	Medium	**Medium**
	Frequency:	Reccurent					
	Geo. Extent:	Local					
	Intensity:	High					

7.2.7.2 Decommissioning Phase

A new impact is not expected other than those listed in the construction and operation phases in the decommissioning and closure phase of the Project.

7.2.8 Human Rights Impact Assessment

Human rights are a set of principles and standards which seek to promote fundamental freedoms and human dignity. According to the Office of the United Nations High Commissioner for Human Rights (OHCHR)[15]:

> Human rights are rights inherent to all human beings, whatever our nationality, place of residence, sex, national or ethnic origin, colour, religion, language, or any other status. We are all equally entitled to our human rights without discrimination. These rights are all interrelated, interdependent and indivisible. (para. 1)

This Human Rights Impact Assessment (HRIA) study was prepared for the Project by WSP Türkiye and carried out to support requirements and Good Industry Practices (GIP) in line with the requirements of Equator Principles IV (dated July 2020).

An HRIA is an instrument for examining policies, legislation and programs to identify and measure their effects on human rights. Their fundamental purpose is to help prevent adverse effects and to maximise positive effects. As such, HRIAs are an indispensable part of making human rights considerations operational in a range of legal and policy contexts.

The HRIA is a study carried out to identify and inform management decisions and actions concerning anticipated human rights-related impacts and opportunities from the Project. The HRIA is part of the Project's commitment to

[15] https://bangkok.ohchr.org/what-are-human-rights/
https://www.ohchr.org/en/human-rights/universal-declaration/

fulfilling its Corporate Responsibility standards, which include respect for internationally recognised human rights and implementation of the United Nationals (UN) Guiding Principles on Business and Human Rights (2011).

The methodology for the HRIA was developed and refined to ensure that it complements the Environmental and Social Impact Assessment (ESIA) and the Stakeholder Engagement Plan (SEP). The ESIA and SEP cover parallel issues and are the primary studies for impact assessment concerning land and defined social rights.

The HRIA is described in international standards aimed at securing dignity and equality for everyone. The HRIA has considered the potential impacts of the Project, which are internationally recognised human rights, including those contained in relevant international standards that Türkiye has ratified, such as the European Convention on Human Rights, the International Bill of Human Rights – meaning the Universal Declaration of Human Rights, the International Covenant on Civil and Political Rights and the International Covenant on Economic, Social and Cultural Rights and the principles concerning fundamental rights set out in the International Labour Organisation's Declaration on Fundamental Principles and Rights at Work.

7.2.8.1 Legal Framework for Human Rights

The ESIA provides in-depth legislative framework to be adopted by the Project for all types of activities (See Chapter 2 of the ESIA). This chapter analyses the national and international requirements (specifically IFC's PSs within the scope of human rights aspect to be followed throughout the Project lifespan.

As part of the ESIA studies, Project human rights impact assessment was held to identify the mitigation methods for the potential impacts on the local communities and Project direct and indirect workers in compliance with Equator Principles IV, specifically the following clause: "The client is expected to include assessments of potential adverse Human Rights impacts and climate change risks as part of the ESIA or other Assessment, with these included in the Assessment Documentation."

National Requirements

The Constitution of the Republic of Türkiye is the fundamental legal document guaranteeing respect to human rights as stated in Article 2 of Chapter II of the Constitution:

"The Republic of Türkiye is a democratic, secular and social state governed by rule of law, within the notions of public peace, national solidarity and justice, respecting human rights, loyal to the nationalism of Atatürk, and based on the fundamental tenets set forth in the preamble."

The following national legislation and international conventional will be applicable to the Project:

- Constitution of the Republic of Türkiye
- The Law on the Human Rights and Equality Institution of Turkey (TIHEK) (Law No. 6701, 2016)
- Labour Law (Law No. 4857, 2003) and related regulations
- Regulation on the Implementation of the Law Concerning Private Security Services
- Labor Act No. 1475, 1971
- Occupational Health and Safety Law No. 6331, 2012
- Social Insurance and Universal Health Insurance Law No. 5510, 2006

- Regulation on Overtime and Extra Hours No. 25425, 2004
- Regulation on the Principles and Procedures Governing the Employment of Children and Young Workers published in gazette No. 25425 (April 2004)
- Law on Trade Unions and Collective Bargaining Agreements No. 6356, 2012

International Requirements

The following international standards will be applicable to the Project:

- International Labour Organisation (ILO) conventions ratified by Türkiye
- Equator Principles 4 (2020)
- IFC Performance Standards (2012)
- The UN Guiding Principles (UNGPs) on Business and Human Rights by the UN Human Rights Council (2011)
- Guidance Note on Implementation of Human Rights Assessments under EPs (2020)
- IFC Good Practice Note on Managing Contractors' E&S Performance (2017)
- IFC Good Practice Handbook on Use of Security Forces: Assessing and Managing Risks and Impacts (2017)
- IFC/European Bank for Reconstruction and Development (EBRD) Worker's Accommodation: Processes and Standards (2009)
- IFC Handbook for Addressing Project-Induced In-Migration (2009)
- IFC Good Practice Note on Addressing Grievances from Project-Affected Communities (2009)
- IFC Introduction to Health Impact Assessment (2009)
- IFC Stakeholder Engagement Handbook: A Good Practice Handbook for Companies Doing Business in Emerging Markets (2007)
- World Group Bank (WBG) General and Sector Specific Environmental, Health and Safety (EHS) Guidelines (2007)

Project Standards

- Social Impact and Human Rights Policy
- HR Policy
- Human Rights Management Plan

Cooperation with International Human Rights Mechanisms

Council of Europe

Türkiye is currently party to 121 of 225 conventions of the Council of Europe and signed another 31 conventions. Ahead of European Union countries, Türkiye ranks fifteen among all 47 Council of Europe member states.

Apart from the European Court of Human Rights, Türkiye maintains close cooperation with the monitoring and human rights bodies of the Council of Europe covering various areas such as fight against racism and discrimination,

prevention of torture and ill-treatment, fight against corruption, money-laundering and terrorism as well as combatting violence against women. In this context, Türkiye maintains its cooperation with the European Committee for the Prevention of Torture (CPT), European Committee Against Racism and Intolerance (ECRI) as well as the Council of Europe Commissioner for Human Rights, while taking into consideration the recommendations and the reports published by these mechanisms.

Türkiye – European Court of Human Rights (ECtHR) Relations

In 1987, Türkiye accepted the right to individual application to the ECtHR for a review based on the European Convention on Human Rights (ECHR). Türkiye recognized the compulsory jurisdiction of the ECtHR in 1990.

According to Article 90 of Turkish Constitution, international agreements duly put into effect have the force of law and no objection of unconstitutionality shall be raised with regard to these agreements. Moreover, in the case of a conflict between international conventions concerning fundamental rights and freedoms and the laws, due to differences in provisions on the same matter, the provisions of international agreements shall prevail.

Furthermore, the Constitutional Court also stated in its judgment dated 7 February 2008, that the ECHR has become a part of the domestic law within the framework of Article 90 of the Constitution; that the provisions of the Convention have the force of law and that the judgments of the ECtHR are binding. Therefore, the ECHR and the ECtHR case-law have been acknowledged among the sources of the Turkish legal system.

Furthermore, under the constitutional amendment adopted by the public referendum in 2010, the right to individual application to the Constitutional Court has been introduced. Accordingly, since 23 September 2012, every person may lodge an application to the Constitutional Court on the grounds of allegation of violation by public authority of any of his/her fundamental rights and freedoms safeguarded in the Constitution within the scope of the ECHR.

In accordance with the “Cooperation Protocol” between the Ministry of Justice and the Ministry of Foreign Affairs, that came into force on 1 March 2012, applications arising from domestic law issues and execution of the judgments rendered on these applications are followed by the Ministry of Justice. Applications communicated to the Government prior to the effective date of the Protocol or applications and execution of judgments related to the foreign policy and international relations of Türkiye are followed by the Ministry of Foreign Affairs.

UN Human Rights Mechanisms

Türkiye is party to sixteen UN human rights conventions. Compliance with UN conventions by the State parties are reviewed by the relevant committees (treaty-based bodies).

The Human Dimension of the Organization for Security and Co-operation in Europe (OSCE)

In accordance with the OSCE’s comprehensive approach to security, while **ODIHR** works on a wide range of areas such as democracy, the rule of law, human rights and fundamental freedoms, tolerance and non-discrimination, its most visible activity is election observation. ODIHR monitors national elections held in the OSCE participating States upon the invitations of these countries in line with their OSCE commitments. ODIHR deployed an Election Observation Mission to Türkiye to observe the Presidential and 27th Parliamentary Elections held on 24 June 2018.

The HCNM was established to identify ethnic tensions involving national minorities, make early warnings and find solutions to conflicts which could undermine stability, peace and friendly relations among states in the OSCE region.

The Representative on Freedom of the Media was established to observe media developments in the OSCE region as part of early warning function, ensure the formation of a free, independent and pluralist media and cooperate on these matters.

Actively contributing to the human dimension activities of the OSCE, Türkiye particularly prioritizes the topics of xenophobia, Islamophobia, intolerance and discrimination in the work of OSCE human dimension.

7.2.8.2 Human Rights Context of Türkiye

Human rights in Türkiye are protected by various international regulations, conventions treaties in addition to the national legislation. The issue of human rights became high importance during the negotiations with the European Union (EU). To prevent adverse impacts on human rights, an action plan for human rights in Türkiye was prepared by Ministry of Justice in March 2021. This plan aims that:

- **A stronger system for protection of human rights:** The Action Plan seeks to ensure the installation of a strong and accessible human rights protection system that is capable of producing results with a view to ensuring the stability of the rule of law with all of its components.
- **Strengthening judicial independence and the right to a fair trial:** The most basic feature of a fair trial is the reasoning of a decision. It is an indispensable principle for a person to know and understand which decision they are subjected to and for what reason.
- **Legal foreseeability and transparency:** When an application is submitted with an administration against one of its acts, it has to provide the individuals with a speedy and satisfactory reply; the bureaucratic red tape needs to be shortened and the cost of an act that is unlawful due to reasons originating from the part of the administration should not be placed on the individuals.
- **Protection and promotion of the freedoms of expression, association and religion:** The Action Plan further resumes the determination to preserve and improve the diversity and pluralism originating from the common history, culture and civilisation of our nation.
- **Strengthening personal liberty and security:** The Action Plan envisages certain activities aimed at ensuring application of detention as an exceptional preventative measure. In this connection, it primarily seeks to strengthen the rights of objection and defence in case of detention.
- **Safeguarding the physical and moral integrity and the private life of the individual:** Protecting the honour and dignity of individuals as their physical and moral integrity and enabling them to live as respectable citizens in the society, are the most important reasons for the existence of the State.
- **A more effective protection of the right to property:** The Action Plan addresses the inviolability of the right to property in a tone that also reminds the administration of this fact. Having the support of the political will for strengthening the right to property, the Plan also proposes solutions to the problems stemming from the practice.
- **Protecting vulnerable groups and strengthening social wealth:** Another concept that continuously develops within the human rights discipline is the rights of the youth. In addition, it is aimed to protect and strengthen human rights regarding areas such as healthy and liveable environment, public health, and informatics.
- **High-level administrative and social awareness on human rights:** By keeping the awareness on human rights at a high level, it is aimed to not only strengthen but also perpetuate the sensitivity at administrative and societal spheres towards rights and freedoms.

7.2.8.3 Methodology

In line with the Equator Principles 4 guidance methodology, the overall impact assessment on human rights for the Project is based on the following factors:

- **Scale:** How serious are the impacts for the victim?
- **Scope:** How many people could be affected by the harm?
- **Remediability:** Will a remedy restore the victim to the same or equivalent position before the harm; how easy or difficult would it be for the victim to get a remedy?
- **Likelihood:** What is the likelihood of the impact occurring?

The approach to managing such impacts is based on those most severe (based on scale, scope, and remediability) and with the greatest likelihood of occurring.

The Human Rights impacts of the Project may be various, and they vary according to the context, type, and scale of the Project. The content shall be tailored to the local conditions and the nature and characteristics of the Project and shall address potential risks and impacts in at least the following areas:

- **Civil and Political Rights**
  - Right to life
  - Freedom of thought and opinion
  - Right to information
- **Labour Rights**
  - Working conditions and working hours
  - Wages
  - Non-discrimination
  - Right to form and join trade unions and the right to strike
  - Right not to be subjected to slavery, servitude or forced labour
  - Right to abstain from work
  - Right to social security, including social insurance
  - Labour standards in supply chain
  - Grievance Mechanism
- **Economic, Social and Cultural rights**
  - Right to an adequate standard of living and housing
  - Right to health, food, water and sanitation

- Right to take part in cultural life

- **Rights of Vulnerable Persons**
  - Migrant workers
  - Right of protection for the children
  - The rights of minorities
  - Women's rights
- **Community Health and Safety**
  - Environmental risks
  - Security risks

The following risk classification is used in the human rights impact assessment for the pre-mitigation conditions. With the implementation of the proposed mitigation measures, the risks of the human rights aspects are reduced.

Table 7-70: Human Rights Risk Classification

Definition	Risk Classification
Human rights violation is in place and no mitigation measure can be applicable.	**High**
Potential risks are in place for workers and external stakeholders but can be mitigated with appropriate control measures.	**Medium**
The risks are in place for workers and external stakeholders at minimal level in general and can be further mitigated with additional control measures.	**Low**

7.2.8.4 Project Human Rights Assessment

Human rights impacts are primarily influenced by the local human rights context and the nature of a project's specific activities. In order to be consistent with the UN Guiding Principles, the full range of human rights impacts needs to be considered, including those caused or contributed to by the Project, cumulative impacts, and those directly linked to the Project, e.g., through business relationships. An adverse human rights impact occurs when an action removes or reduces the ability of an individual to realize their human rights. As articulated by the UN Guiding Principles on Business and Human Rights (2011), the human rights due diligence process focuses companies on identifying and addressing adverse impacts, which is the main focus of this Human Rights Impact Assessment. It is important to note that potential issue areas typically considered in ESIA are similar to that key to human rights, such as civil and political rights, labour rights, social rights, vulnerability and community health and safety.

This study has been conducted to determine the levels of human rights risks and potential mitigation measures pertinent to the Project. The table below is formed to assess the Project-specific human rights context and determine the level of risk in terms of human rights.

Table 7-71: Human Rights Impact Assessment

Topic	Project Context	Stakeholders	Impact Factor Features	Pre-mitigation	Mitigation Measures	Risk Categorization
Civil and Political Rights						
Right to life	As stated in EP4 Guidance Note, individuals have the right not to be deprived of life arbitrarily or unlawfully. This includes the right to have one's life protected, for example, from physical attacks or health and safety risks. The human rights risks in terms of right to life may occur under the categories of security, community and occupational health and safety. For example, security risks may occur as the lethal use of force by security forces to protect company resources, facilities, or personnel. As for the health and safety, operations that pose life-threatening safety risks to workers or neighboring communities through, for example, exposure to toxic chemicals. The likelihood of such risks is determined as low for the Project. Yet, to make sure the risks are minimized, certain mitigation measures need to be followed.	▪ Local communities ▪ Project workers	Scale: High Scope: Medium Remediability: Low Likelihood: Low	**Medium**	The following plans are relevant and implemented for the mitigation measures in case of potential risks on right to life: ▪ Human Rights Management Plan ▪ Community Health and Safety Management Plan ▪ Security Management Plan ▪ Hazardous Material Management Plan ▪ Emergency Preparedness and Response Plan ▪ Traffic Management Plan Before the construction, local communities will be informed about the risks of the entering the construction sites. Security personnel will patrol the site area to prevent any unauthorized access onto the site. Conflict Management Training will be provided to security personnel. The grievance mechanism for the Project will capture all grievances raised in relation to security and safety issues. These will be addressed promptly, and actions will be taken.	**Low**
Freedom of thought and opinion	According to Article 25 of Constitution of Republic of Türkiye. Everyone has the right to freedom of thought and opinion. No one shall be compelled to reveal his thoughts and opinions for any reason or purpose, nor shall anyone be blamed or accused on account of his thoughts and opinions.	▪ Local communities ▪ Project workers	Scale: High Scope: Medium Remediability: High Likelihood: Medium	**Medium**	Project-specific Stakeholder Engagement Plan and External Grievance Mechanism will be implemented to provide a space for the stakeholders to express their thoughts and the opinions on the Project.	**Low**

Topic	Project Context	Stakeholders	Impact Factor Features	Pre-mitigation	Mitigation Measures	Risk Categorization
Right to information	Law on the Right to Information No. 4982 (Issued on 24.10.2003, Official Gazette No. 25269) regulates the procedure and the basis of the right to information according to the principles of equality, impartiality and openness that are the necessities of a democratic and transparent government. Everyone has the right to information on the activities of public institutions and professional organisations, which qualify as public institutions. In accordance with Turkish Republic Ministry of Environment and Urbanisation Environmental Impact Assessment Regulation (Official Gazette Nov. 25, 2014; No: 29186), stakeholder meetings for information disclosure had been held.	▪ Local communities ▪ Project workers	Scale: High Scope: Medium Remediability: High Likelihood: Medium	**High**	Project-specific Stakeholder Engagement Plan will be implemented in all phases of the Project. ESIA disclosure activities will be performed to inform all stakeholders of the Project impacts. During the construction and operation phases of the Project, all stakeholders will be informed about the status of the Project with various tools including the face-to-face meetings, project website, media.	**Medium**
Labour Rights						
Working conditions and working hours	The Turkish Labour Law sets rules for starting and ending of an employment relationship. Employment starts with an employment contract. The employment contract is not subject to any special form unless the contrary is stipulated by the Law. Workers are free to terminate their working contracts following the advance notice periods, and without an advance notice in situations of just cause identified by Labour Law Article 24. Wages may be paid in cash on a monthly basis, or more, but no less frequently. According to Labour Law Article 41, overtime work requires the employee's consent. Within the scope of the Project, it is planned to employ 317 people during the construction phase of the Project and 25 people during the operation phase. It is projected that among 42 Kalyon Enerji employees to be worked during construction period, 32 of the	▪ Project workers	Scale: High Scope: Medium Remediability: Medium Likelihood: Medium	**Medium**	The Project will implement Human Resources Policy and Labor Management Plan in compliance with the IFC PS-2 on Labour and Working Conditions. Such policies are expected to provide more predictable employment opportunities for direct and indirect employees. A Human Rights Management Plan will also be prepared and implemented. The copies of relevant human resources policy and any collective agreements will be readily available to workers. Formal, and transparent recruitment process will be implemented to provide equal opportunity to the applicants. The employees will be provided with a written contract. The contracts as a minimum will include information on terms and conditions of employment, including the period of employment, wages, hours of work, overtime arrangements, procedures for termination of the contract and any benefits. The contract will be in the native language of the employee, and it will be clear and understandable to the employee. A copy of contract will be given to the employee. The Project will enhance local employment and referential employment will be given to qualified local people. Hiring preference criteria will prioritise settlements directly affected by the current activities of the Project. Equal tender process will be applied.	**Low**

Topic	Project Context	Stakeholders	Impact Factor Features	Pre-mitigation	Mitigation Measures	Risk Categorization
	employees will be skilled and 10 of the employees will be semiskilled. Where possible workforce is being sourced from local communities during the Project construction phase. National requirements, ILO Conventions ratified by Türkiye and IFC PS2 will be applied both direct and subcontractor workers. A large proportion (approximately 200 workers, mostly unskilled and semiskilled) of the workforce will be accommodated in the construction camp. The camp is located inside the Project site borders. The rest (approximately 117 workers, skilled) will be accommodated in rental houses and hotels in in Viranşehir District and Şanlıurfa Province.				Before the procurement, local suppliers will be identified and if required. Capacity development will be applied including the OHS and HR. Necessary measures will be ensured for the safety and health protection of workers, including prevention of occupational risks and provision of information and training, as well as provision of the necessary organization and means and shall ensure that these measures are adjusted taking account of changing circumstances and aim to improve existing situations. Project specific Camp Site and Offsite Accommodation Management Plan implemented within the scope of the Project in line with the IFC/EBRD's Guidance Note on Workers' Accommodation, 2009. Contractor Management Plan which monitors the compliance with the international labour and human rights standards (IFC PS2) of the subcontractors will be prepared and implemented.	
Wages	The Labour Law (Law No. 4857, 2003) includes provisions on wages, their renumeration and payment conditions and stipulates that with the object of regulating the economic and social conditions of all employees working under an employment contract, either covered or uncovered by the Law, the minimum limits of wages shall be determined every two years at the latest by the related Ministry. At the peak construction phase, the number of construction workforce, will be 317. It will be 25 during the operation phase.	▪ Project workers	Scale: Medium Scope: Medium Remediability: Medium Likelihood: Low	**Medium**	Payroll records of the direct and indirect workers will be controlled by Kalyon Enerji strictly. The contracts of the workers will include the information regarding to salary and annual increase. All workers will be paid equal for equal jobs. Human Resources Policy and Labor Management Plan will be implemented for these mitigation measures. Contractor Management Plan which monitors the compliance with the international labour and human rights standards (IFC PS2) of the subcontractors will be prepared and implemented.	**Low**
Non-discrimination	Labour Law: Article 5 of the Labour Law of Türkiye regulates the ban of discrimination in employment. According to that article 'no discrimination based on language, race, sex, political opinion, philosophical belief, religion and sex or similar reasons is permissible in the employment relationship. The same article also serves as a base for the principle of equal pay for equal value of work by stating that "differential remuneration for similar jobs or	▪ Project workers	Scale: High Scope: Medium Remediability: Medium Likelihood: Low	**Medium**	Human Rights Management Plan will be prepared and implemented for the mitigation measures. An employee code of conduct will be prepared and implemented ensuring non-discrimination. Equality of treatment and prohibition harassment in the workplace, commitment on continual improvement, consultation and participation of workers will be promoted. Employment decisions, such as recruitment, dismissal, promotion, will be transparent and will not be made (directly or indirectly) on the basis of personal characteristics such as sex, race, nationality, etc., but rather on the ability to do the job.	**Low**

Topic	Project Context	Stakeholders	Impact Factor Features	Pre-mitigation	Mitigation Measures	Risk Categorization
	for work of equal value is not permissible.”					
Right to form and join trade unions and the right to strike	Unions and Collective Agreements Law No. 6356 (dated on 07.11.2012, Official Gazette No. 28460) ensures the rights of the workers to join the union and right to strike. However, unionisation is not a common practice in Türkiye.	▪ Project workers	Scale: Medium Scope: Medium Remediability: High Likelihood: Medium	**Medium**	Human Resources Policy and Labour Management Plan will be implemented for relevant mitigation measures. In case of the absence of the unions, workers representatives should be elected, and periodical meetings will be held with the representatives. The employer shall consult workers or representatives authorized by trade unions in enterprises with more than two workers' representatives or workers' representatives themselves in the absence of trade union representative to ensure the consultation and participation of workers.	**Low**
Right not to be subjected to slavery, servitude or forced labour	Turkish Constitution: Article 18 of the Constitution states that “No one can be forced to work. Slavery is prohibited.” Employers are not allowed to take deposits of money from workers and retain ID Cards. However, in construction projects carried out in Türkiye, it can often be seen that overtime exceeds local standards due to the signing of a fixed-term work contract and the high turnover of employees due to the nature of the projects. In addition, work on the national day and public holidays can be required.	▪ Project workers	Scale: High Scope: Medium Remediability: Medium Likelihood: Low	**Medium**	Shift schedule of the direct and indirect workers will be strictly monitored and the annual overtime working hours will not extend 275 hours. In compliance with the article 44 of the Labour Law employee’s consent will be taken into consideration during the arrangements of the work on national day and public holidays. The issue of whether or not work will be done on the national day and public holidays will be decided by the collective agreement or by employment contracts. The employee’s consent is required if there is no provision in the collective agreement or in employment contracts. There will not be forced labour and employees will be free to terminate their employment in accordance with national law. Human Resources Policy, Labor Management Plan and Human Rights Management Plan will be implemented. Contractor Management Plan which monitors the compliance with the international labour and human rights standards (IFC PS2) of the subcontractors will be prepared and implemented.	**Low**
Right to abstain from work	According to Occupational Health and Safety Law No. 6331, workers have the right to leave their workstation in the event of serious, imminent and unavoidable danger.	▪ Project workers	Scale: Medium Scope: Medium Remediability: High Likelihood: Low	**Medium**	In the event of serious, imminent, and unavoidable danger; workers shall leave their workstation or dangerous area and proceed to a place safety. Workers may not be placed at any disadvantage because of their action. Human Resources Policy, Labor Management Plan and Human Rights Management Plan will be implemented for these mitigation measures.	**Low**
Right to social security, including social insurance	Social Insurance and General Health Insurance Act No. 5510 of 31 May 2006 determines the rights of beneficiaries and provides for general rules for the functioning of the insurance system and funding conditions. Also contains provisions on employers and workplaces,	▪ Project workers	Scale: High Scope: Medium Remediability: High Likelihood: Low	**Medium**	Social insurance payments of all direct and indirect workers will be strictly controlled by Kalyon Enerji. Awareness meetings will be held with the Project workers if required. Human Resources Policy will be implemented. Contractor Management Plan and Labour Management Plan which monitors the compliance with the international labour and human rights	**Low**

Topic	Project Context	Stakeholders	Impact Factor Features	Pre-mitigation	Mitigation Measures	Risk Categorization
	short-term and long-term insurances. All direct and indirect workers will have right for social insurance and general health insurance; however, for the construction sector it is a common implementation to pay insurance on the minimum wage regardless to the salary which will create decrease on the pension payment.				standards (IFC PS2) of the subcontractors will be prepared and implemented.	
Labour standards in Supply chain	Not all rights potentially impacted by a project are necessarily within the client's immediate control as in the case of supply chain. Project activities may unknowingly pose risks through the supply chains from the labour of workers who have been trafficked and are forced to work, for example, in factories. Women and children may be subject to particularly severe impacts in such situations. The material needed for the construction activities, including bedding, padding, back filling and aggregate, concrete will be provided from companies in Bor district which have permits/licenses in accordance with national regulations. The origin of PV Panels is Türkiye (Kalyon PV) and will be transported by road. Polysilicon, raw material of PV panels, will be provided from Germany and United States of America. Transportation will be provided by road from Germany and by air from the United States of America. The origin of DC Combiner Box is India and will be transported by sea and road. The origin of Inverter Station is United Kingdom (Inverter) and Türkiye (Transformer and RMU), and the transportation method is by road. The origin of Substation and Switchyard is Türkiye and will be transported by road. The origin of Cable is Türkiye and will be transported by road.	▪ Workers in production in the supply chain	Scale: High Scope: Medium Remediability: Medium Likelihood: Low	**Medium**	Kalyon Enerji will supply necessary products from companies/countries that comply with the international labour standards in which human rights violations are eliminated at the highest level. Supplier Management Plan which monitors the compliance with the international labour and human rights standards (IFC PS2) of the supply chain will be prepared and implemented. Human Rights Management Plan will be prepared and implemented. Kalyon Enerji will not meet Project's material needs from suppliers where forced and child labour is being used. Kalyon Enerji will ensure the suppliers' compliance with the codes of conduct for suppliers based on international labour standards. All suppliers and vendors will have the responsibility to ensure the Company's quality standards are achieved. This may include quality inspections by Kalyon Enerji, if deemed necessary.	**Low**

Topic	Project Context	Stakeholders	Impact Factor Features	Pre-mitigation	Mitigation Measures	Risk Categorization
Grievance Mechanism	The fundamental legal base rights on the freedom and rights of the citizens with respect to communication, expression and dissemination of thought, and information request are guaranteed by the Constitution of the Republic of Türkiye. The Article of the Constitution on the Right of Petition, Right to Information and Appeal to Ombudsperson specifies that the citizens and foreigners resident in Türkiye, on the condition of observing the principle of reciprocity, have the right to apply in writing to the competent authorities and to the Grand National Assembly of Türkiye regarding the requests and complaints concerning themselves or the public. The Presidency's Communication Centre (CIMER) has been providing a centralised complaint system for Turkish citizens, legal persons and foreigners. CIMER will be available to Project stakeholders as an alternative and well-known channel for conveying their Project-related grievances and feedback directly to the state authorities.	▪ Local communities ▪ Project workers	Scale: Medium Scope: Medium Remediability: Medium Likelihood: Low	**Medium**	Project specific Grievance Mechanism both for the Project workers and the stakeholders were prepared and will be implemented to raise the grievances and the feedbacks of the stakeholders. Project-specific Human Resources Policy and Human Rights Management Plan will be implemented. All direct and indirect workers will be informed on the Project specific documents and the procedures including the grievance mechanism. An internal audit will be performed to monitor the performance of the subcontractors and the supply chain against the human rights aspects.	**Low**
Economic, Social and Cultural Rights						
Right to an adequate standard of living and housing	According to the results of the desktop research, social field studies and background project information, there will be no resettlement and economic displacement in the Project. A large proportion (approximately 200 workers, mostly unskilled and semiskilled) of the workforce will be accommodated in the construction camp. The camp is located inside the Project site borders. The rest (approximately 117 workers, skilled) will be accommodated in rental houses and hotels in in Viranşehir District and Şanlıurfa Province.	▪ Local communities ▪ Project workers	Scale: High Scope: Medium Remediability: Medium Likelihood: Medium	**High**	Camp Site and Offsite Accommodation Management Plan will be implemented. Stakeholder Engagement Plan will be prepared and implemented. Grievance mechanism will be prepared and implemented. Also, Community Development Plan will be implemented.	**Medium**

Topic	Project Context	Stakeholders	Impact Factor Features	Pre-mitigation	Mitigation Measures	Risk Categorization
	As indicated in the socioeconomic baseline study, the villages in the AoI are deprived from the fundamental needs such as health care center, sewage system, heat sources, water sources, and waste management. The services provided to the villages are insufficient. Therefore, the villages of the AoI can be considered as vulnerable in terms of the baseline conditions.					
Right to health, food, water and sanitation	Potential risks to local communities identified in the ESIA include traffic increase in construction, communicable diseases, construction related environmental impacts, increased need for resources, security aspects, etc. As indicated in the socioeconomic baseline study, the villages in the AoI are deprived from the fundamental needs such as health care center, sewage system, heat sources, water sources, and waste management. The services provided to the villages are insufficient. Therefore, the villages of the AoI can be considered as vulnerable in terms of the baseline conditions.	▪ Local communities ▪ Project workers	Scale: High Scope: Medium Remediability: Medium Likelihood: Medium	**High**	Community Health and Safety Management Plan, Traffic Management Plan, Security Management Plan, and Community Development Plan will be prepared and implemented.	**Medium**
Right to take part in cultural life	As indicated in EP4 Guidance Note, individuals have a right to take part in the cultural life of society and enjoy the benefits of scientific progress, especially disadvantaged groups. Potential risks may include activities involving resource extraction or new construction could impact this right by separating groups from areas of cultural importance and knowledge, or by damaging their cultural heritage. Since no such activities will be done within the scope of the Project, the likelihood of potential impact is assessed as low.	▪ Local communities ▪ Project workers	Scale: Medium Scope: Medium Remediability: Medium Likelihood: Low	**Medium**	Human Rights Management Plan, Stakeholder Management Plan, and Cultural Heritage Management Plan will be implemented.	**Low**
Rights of Vulnerable Groups						

Topic	Project Context	Stakeholders	Impact Factor Features	Pre-mitigation	Mitigation Measures	Risk Categorization
Migrant workers	As indicated in the EP4 Guidance Note, the International Convention on the Protection of the Rights of All Migrant Workers and Members of their Families establishes how migrant workers, and their families should be protected. Since to employ migrant workers unregistered is prohibited for the Project, the potential risks are determined as low after the implementation of mitigation measures.	▪ Project workers	Scale: High Scope: Low Remediability: Medium Likelihood: Low	**Medium**	Considering OHS, working conditions and personnel rights, migrant workers will not be allowed to work unregistered in the field and monitoring studies will be carried out on this issue. Human Resources Policy, Labor Management Plan and Human Rights Management Plan will be implemented for relevant mitigation measures.	**Low**
Right of protection for the children	Labour Law No. 4857, Article 71 states that employment of children who have not reached the age of fifteen is prohibited. However, children who have reached the age of fourteen and have completed their primary education may be employed in light labour that will not hinder their physical, mental or moral development. For those who continue their education, they may only work jobs that will not prevent their school attendance.	▪ Children ▪ Project workers	Scale: High Scope: Low Remediability: Medium Likelihood: Low	**Medium**	The minimum working age will be 18 for all direct and indirect workers. Subcontractor monitoring system will be established by Kalyon Enerji to ensure that all subcontractors comply with work age limits. Human Resources Policy, Labor Management Plan and Human Rights Management Plan will be implemented for relevant mitigation measures.	**Low**
Rights of minorities	During the construction phase of the Project a workers' accommodation camp will be established and approximately 200 workers are planned to be accommodated, which may create impact on the daily life of the village.	▪ Local communities ▪ Project workers	Scale: Medium Scope: Medium Remediability: Medium Likelihood: Medium	**Medium**	Cultural awareness training will be provided to the workers who will be accommodated in the camp site. Camp Site and Offsite Accommodation Management Plan and Security Management Plan will be prepared and implemented.	**Low**
Women's rights	As indicated in EP4 Guidance Note, The Convention on the Elimination of all Forms of Discrimination Against Women exists to promote women's rights and their protection. The potential risks to women's rights may include the following: ▪ Discrimination against women based on their marital status or reproductive status, ▪ Company's operations or products have had negative impacts on people's health in a way that discriminates against women (such as by failing to recognize the	▪ Women of local communities ▪ Female Project workers	Scale: High Scope: Medium Remediability: Medium Likelihood: Medium	**High**	Equal pay for equal work especially considerate of women employees will be implemented. Positive discrimination will be applied to female candidates during the recruitment process. The safety and needs of female staff staying in the camp will be met at a high level. Human Resources Policy, Labor Management Plan and Human Rights Management Plan will be implemented for relevant mitigation measures.	**Medium**

Topic	Project Context	Stakeholders	Impact Factor Features	Pre-mitigation	Mitigation Measures	Risk Categorization
	particular harm to their reproductive health), ▪ Project activities pollute or threaten existing water resources in a way that significantly interferes with local communities' ability to access clean drinking water. In such situations, there may be particular negative impacts on women and girls, who are responsible for water collection in many communities. Considering such examples, the likelihood of potential negative impacts on women's rights for the Project is assessed as medium. In terms of women's employment, there is a visible gender gap in female and male labour force participation in Türkiye. In 2021, the employment rate for women was 28% whereas it was 62.8% for men in Türkiye (TURKSTAT, 2023). In the construction sector, it is observed that female employees are generally employed as OHS or service personnel.					
Community Health and Safety						
Environmental risks	The fundamental law in Turkish Environmental Legislation is the Environmental Law No. 2872 (Issued on 11.08.1983, Official Gazette No.18132, amended by Law No. 5491). According to Environmental Law, citizens, as well as the State, bear responsibility for the protection of the environment based on the "polluter pays" and "user pays" principles. According to the Article 56 of Constitution of Republic of Türkiye Everyone has the right to live in a healthy, balanced environment. It is the duty of the state and citizens to improve the natural environment and to prevent environmental pollution.	▪ Local communities ▪ Project workers	Scale: High Scope: Medium Remediability: High Likelihood: Low	**Medium**	Suitable and sufficient environmental management plans for waste, wastewater, noise and air quality will be established and implemented. The following management plans will be implemented for preventing and reducing environmental risks: ▪ Pollution Prevention Plan ▪ Hazardous Material Management Plan ▪ Soil Management Plan ▪ Waste Management Plan ▪ Biodiversity Management Plan ▪ Cultural Heritage Management Plan and Chance Find Procedure ▪ Camp Site and Offsite Accommodation Management Plan The construction site and the construction camp site are to be regularly monitored for environmental aspects. In case of a grievance, additional measurements will be held, and the results will be shared with the local communities.	**Low**

Topic	Project Context	Stakeholders	Impact Factor Features	Pre-mitigation	Mitigation Measures	Risk Categorization
	Since Türkiye is not a not party to the Aarhus and Espoo Conventions, there is no climate change legislation in place.					
Security risks	During the construction phase of the Project, unarmed security will be needed on the site and especially during the access to the pastureland may create social tension between the security personnel and the local communities.	▪ Local communities ▪ Project workers	Scale: High Scope: High Remediability: Medium Likelihood: Medium	**High**	Before the construction, local communities will be informed about the risks of the entering the construction sites. Security personnel will patrol the site area to prevent any unauthorized access onto the site. Security Management Plan and Community Health and Safety Management Plan will be established and implemented by the Contractor, outlining expectations around security. Conflict Management Training will be provided to armed security personnel. The grievance mechanism for the Project will capture all grievances raised in relation to security and safety issues. These will be addressed promptly, and actions will be taken.	**Medium**

7.2.8.5 Human Rights Management Plan of the Project

Every human being should be treated with dignity and equality, according to international standards on human rights. The Human Rights Management Plan (HRMP) for the G4-Viranşehir-5,7,8 Solar Power Plant Project will be implemented. The HRMP will include the issues assessed in the Human Rights Assessment under the topics of civil and political rights, labour rights, social rights, rights of vulnerable groups and community health and safety, together with relevant mitigation measures for potential human rights risks. In accordance with the requirements of Good International Industry Practices (GIIP), Equator Principles IV (dated July 2020), internationally recognized Human Rights, and implementation of the United Nations (UN) Guiding Principles on Business and Human Rights (2011), Kalyon Enerji will develop and implement a management process that will ensure respect for Human Rights. All subcontractors will be informed about the Human Rights Management Plan of the Project and the HRMP will be put in the visible locations of the Project site. The requirements set out in this HRMP are applied to all activities throughout the lifecycle of the Project, including those carried out by contractors.

Human Rights will be managed according to the following principles:

- Strive for continuous improvement in upholding and respecting Human Rights through ongoing dialogue with internal and external stakeholders.
- Continue to avoid all forms of child labour, forced labour and modern slavery for all activities in which the Project are engaged and across the entire supply chain.
- Avoid discrimination against any individual based on race, colour, national or ethnic origin, religion, age, sex, sexual orientation, sexual minorities, religious minorities, ethnic minorities, gender identity or expression, marital status, family status, pregnancy, disability, genetic characteristics or any other arbitrary characteristic unrelated to the individual's job performance.
- Promote diversity at all levels of the Project.
- Enhance employment, supply chain, training and community investment programs to advance the socio-economic empowerment of women in communities and eliminate barriers to the advancement and fair treatment of women in workplaces.
- Respect the collective and customary rights of local peoples near the Project construction and operation areas and ensure consultation with all relevant stakeholders.
- Establish confidential mechanisms to identify, receive and respond to Human Rights and ethical concerns from any stakeholder in an objective manner.
- Take action to terminate any contracts or arrangements with the EPC, subcontractors and suppliers should the Client become aware that their practices and performance conflict with the requirements of this Human Rights Policy.
- When working with public or private security forces, implement a security approach consistent with the Voluntary Principles on Security and Human Rights.

In further detail, the HRMP serves the following purposes:

- Incorporate respect for Human Rights into management, governance practices and programs as defined in the International Bill of Human Rights and the International Labor Organization's Declaration on Fundamental Principles and Rights at Work.
- Ensure that EPC, subcontractors, suppliers and business partners share this commitment to Human Rights – including those in regard to working conditions, freedom of association, freedom of speech, collective

bargaining, maximum working hours, fair wages and benefits, equal opportunity and freedom from discrimination.

- Define the roles and responsibilities within Kalyon Enerji for the management of Human Rights related issues.
- Continually review and evaluate changing Human Rights conditions in the jurisdictions in which the Project operate.

7.2.8.6 Key Performance Indicators and Monitoring

The stage of monitoring and evaluation involves subjecting the HRIA itself to assessment in order to determine the extent to which it has met its objectives and is acceptable to stakeholders. This step will also examine the extent to which the duty-bearers have incorporated the recommendations of the HRIAs during the implementation of the policy intervention and enables information-gathering about the actual impacts of the policy intervention. The monitoring activities are defined in the table below. The indicators for monitoring will be followed through the Human Rights Management Plan to be prepared specifically for the Project. The detailed monitoring activities and key performance indicators regarding human rights are presented in the Human Rights Management Plan of the Project.

Table 7-72: Monitoring for Human Rights Risks

Activity	Steps	Areas For Further Attention and Considerations	Frequency	Responsibility
Reporting	Share the main findings and lessons learnt of the process with the stakeholders and ensure that their views are adequately reflected in the report. Discuss possible mitigation measures and ensure these reflect preferred mitigations measures of the stakeholders. Manage expectations of the stakeholders regarding the report to avoid disappointment and frustration. Ensure that the report is available in appropriate language and shared with the stakeholders in an accessible manner, through websites, posters, leaflet etc. Ensure that the impact management plan adopted by the Project Company/Contractors is communicated to the stakeholders.	Consider using other means of engaging with the stakeholders on the HRIA report, i.e., through media such as visual aids, orally or through participatory exercises, tailored specifically to engage with the stakeholders. Consider holding separate meetings for specific groups of stakeholders to ensure that they have the opportunity to express themselves on the recommended mitigation measures. Given the extensive time it could take, set a reasonable deadline for receiving comments on the HRIA report from the stakeholders.	Biannual	■ Kalyon Enerji ■ Subcontractors

Activity	Steps	Areas For Further Attention and Considerations	Frequency	Responsibility
Supplier Social Responsibility and Labour Standards	In line with the EBRD PR2, eliminate risks related to social and labour issues, including human rights violations, forced labour, child labour, unsafe working conditions, and discrimination. The Supply Chain of the Project is provided in Chapter 1-5 of the ESIA. Kalyon Enerji will supply necessary products from companies/countries that comply with the international labour standards in which human rights violations are eliminated at the highest level.	Ensuring supply chain's compliance with international labour standards and promoting fair labour practices. Evaluating the HSE, Quality, System, Legal and Compliance performance of the suppliers/service providers.	Continuous	■ Kalyon Enerji
Engagement Activities	Support the establishment of participatory monitoring mechanisms to allow the stakeholders to be continuously engaged in the follow-up to the report. Suggest regular meetings are held between the Project Company and the stakeholders.	To request ongoing feedback on impacts of the Project from the stakeholders, e.g., through internal and external grievance mechanisms. To publicly report on progress made on the implementation of the mitigation measures in an ongoing manner.	Continuous	■ Kalyon Enerji ■ Subcontractors
Internal and External Grievance Mechanisms	Implement Project-specific grievance mechanism both for Project workers and local communities. Encourage stakeholders' effective participation in the grievance mechanism. Provide tools in accessible places for stakeholders to raise grievances and requests.	Grievance registration and closing rates to be monitored regularly. Grievance closing percentage target/term target to be determined.	Continuous	■ Kalyon Enerji ■ Subcontractors

Monitoring should answer the following questions:

- What mitigating measures have been adopted by the duty-bearers to mitigate any adverse effect foreseen by the HRIA?
- Has any human rights risk and impact that the HRIA foresaw materialized? If so, who were the relevant affected stakeholders? Have the relevant duty-bearers taken measures to mitigate the adverse effects of those risks?
- Have there been major human rights risks and impacts unforeseen by the HRIA? If so, who were the relevant affected stakeholders?
- Suppose some substantial change of the policy intervention occurred after the HRIA was produced (e.g., replication of the policy in another area of the country, a major expansion of the Project, etc.). Have the relevant duty-bearers considered the recommendations of the HRIA when undertaking those changes?
- Have there been recurring grievances related to the policy intervention? If so, who were the relevant affected stakeholders?

The Human Rights Compliance Assessment[16] (HRCA), developed by the Danish Institute for Human Rights and designed to help companies detect potential human rights violations caused by the effect of their operations, runs on a database of over 350 questions and 1,000 corresponding human rights indicators, which were developed from over 80 human rights treaties and conventions. To monitor Project's compliance from a human rights perspective, HRCA can be used as a mentor to create indicators to follow up Project's activities for monitoring purposes.

Also, the *Project-level community grievance mechanism can provide helpful information to inform the monitoring of impact management measures* and key performance indicators.

7.2.9 Cultural Heritage

Based on the information collected for the definition of the baseline (see Ch 6.2.10), the physical component *Cultural Heritage* was assigned a **Low** value of sensitivity. The sensitivity of the Project component has been assessed low for the following reasons:

- Absence of archaeological heritage in the AoI

7.2.9.1 Construction phase

7.2.9.1.1 Impact factors

The impact factors from the Project activities potentially affecting cultural heritage during construction phase are listed in Table 7-73**.**

Table 7-73: Project actions and related impact factors potentially affecting cultural heritage during construction phase

Project actions	Impact factors
General engineering/construction works	Removal of soil

Impacts potentially affecting this component are assessed here below for the construction phase.

- **<u>Removal of Soil</u>**

The impacts on cultural heritage may occur during the construction of the Project components especially during removal of soil. Removal of soil will be realized during; earthworks (excavation, filling) to create the surface over

[16] https://www.humanrights.dk/tools/human-rights-indicators-business

which the Project will be constructed, trenching activities for cable laying and excavation works for the foundations of buildings (e.g., control building). Since there are no surface cultural heritage assets, chance finds may be encountered during the excavation works and trenching activities.

7.2.9.1.2 Mitigation measures

The following mitigation measures shall be implemented to mitigate the effects of the impact factors.

- Cultural Heritage Management Plan and Chance Find Procedure, which are necessary for the management of the “chance finds”, prepared in compliance with the project organization will be implemented. All operators, who are to be engaged in the soil works, and project workers should receive training related to “project requirements, protection of cultural and archaeological heritage, laws and legislations related with the archaeological and cultural heritage and cultural heritage management plan and chance find procedures”.
- In case any chance find is encountered during the construction activities, the further steps should be taken in accordance with the plans and procedures and the relevant bodies and the Directorate of the Museum will be notified immediately. In cases where any find or information associated with archaeological potential of the site is already discovered, relevant instructions about the sensitivity of the site will be shared with all construction teams a few days before the construction activities. The construction activities will be conducted with appropriate equipment and methods. The appropriate equipment will be identified together with the directorate of the museum and the construction teams.
- Protection of site: chance find should not be moved, removed or further disturbed
- In particular, all operators and Project workers assigned to land preparation works should receive training on project requirements, protection of cultural and archaeological heritage, laws and regulations regarding archaeological and cultural heritage, Cultural Heritage Management Plan and Chance Find Procedure;

7.2.9.1.3 Residual impacts

The table below summarizes the impacts caused by the identified impact factors on the component assessed.

Based on the baseline conditions of the assessed component, the project characteristics and actions, as well as the proper implementation of the mitigation measures proposed above, a potential **negligible** is expected on the cultural heritage during the construction phase.

Table 7-74: Residual impact assessment matrix for the cultural heritage during construction phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Removal of Soil	Duration:	Short	Low	Short-mid-term	**Negligible**	Medium high	**Negligible**
	Frequency:	Frequent					
	Geo. Extent:	Project Site					
	Intensity:	Low					

7.2.9.1.4 Monitoring measures

During construction phase of the Project, excavated areas should be monitored in case of chance finds.

7.2.9.2 Operation Phase

Considering the nature of the Project no impacts are expected on the cultural heritage component during the operation phase.

7.2.9.3 Decommissioning and Closure Phase

The impacts during the decommissioning phase are likely to be similar to the construction phase hence the activities will be similar to construction activities.

7.2.10 Visual Aesthetics

Based on the information collected for the definition of the baseline (see Ch 6.2.10), the physical component *Cultural Heritage* was assigned a **Medium-Low** value of sensitivity. The AoI is considered to be sensitive for the following reasons:

- Presence of two settlements within four km of Project Area.
- Absence of areas of touristic interest within the visual zone of visual influence.
- Presence of roads and volume of traffic within the visual zone of visual influence.

Methodology

- The first step of the visual impact assessment is to determine sensitive receptors and baseline conditions.
- The closest settlements to the Project components and some associated facilities were taken into account in identification of the sensitive receptors. During the field trip, sensitive receptors where access is not difficult and is possible were visited and baseline photos were taken. However, some parts of the railway line and some associated facilities could not be accessed due to unsafe road conditions at the time of site visit.
- After the determination of the viewpoints (i.e., sensitive receptors), sensitivity levels of these receptors have been determined. Sensitivity levels of the viewpoints were defined considering (i) the area of the Project components that can be visible; (ii) the number of sensitive receptors (including settlements and people around the Project Area and common areas such as school, mosque, astro pitch etc.).
- Then, impact factors of the project footprint have been determined for the construction and operation phases and impact matrix for each phase has been prepared.

Sensitive Receptors

Sensitive receptors are defined in Section 6.2.11.

7.2.10.1 Construction Phase

7.2.10.1.1 Impact factors

The impact factors from the Project activities potentially affecting visual impacts during construction phase are listed in Table 7-75.

Table 7-75: Project actions and related impact factors potentially affecting visual impact during construction phase

Project actions	Impact factors
General engineering/construction works;	Emission of particulate matter Introduction of buildings/infrastructures Emission of light

During construction works, construction machinery will be introduced to the site and dust emissions will be of concern. On the other hand, temporary and permanent structures will also be constructed during this phase of

the project. During construction phase it is also expected to have light emissions around the project area. Construction vehicles, dust, and equipment will have visual impacts on viewers and general visibility (clarity of air) in the immediate vicinity of the construction site. Visual impacts during construction will be temporary.

7.2.10.1.2 Mitigation Measures

There are no industry standards or best practice guidance regarding with landscape mitigation and management within the scope of the national legislation. The proposed mitigation measures associated with the Project comprises of professional judgement.

- After the completion of construction, the areas used as construction area will be returned to their original use.
- During the construction phase, restricted hours of working will be proposed especially for built up areas. Using machinery during those hours should be avoided in residential properties.
- The housekeeping of the entire Project Area will be given importance throughout the life of the Project.
- To minimize light spillage from the site, every effort should be made to minimize the number of lights consistent with health and safety standards. In a similar way, all lights should be shielded and as much as possible pointed to the ground to avoid direct light effects on sensitive receptors around the Project Area.
- Regular monitoring of the affected people's grievances with regard to visual impacts. For this, the external grievance mechanism should be implemented properly, and all stakeholders should have access to this mechanism.
- Implementation of dust suppression during construction.

7.2.10.1.3 Residual Impacts

The residual impact following the above mentioned mitigation measures during the construction phase is presented in the following table (Table 7-76). Based on the baseline conditions of the assessed components, the Project characteristics, and actions, as well as the proper implementation of the mitigation measures proposed above, **negligible negative impact** is expected on visual impact during the construction phase.

Table 7-76: Impact Assessment Matrix for Visual Impact During Construction Phase After Mitigation

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Emission of particulate matter	Duration:	Short	Low	Short-term	**Negligible**	Medium high	**Negligible**
	Frequency:	Frequent					
	Geo. Extent:	Local					
	Intensity:	Low					
Introduction of buildings/infrastructures	Duration:	Short	Medium-low	Short-mid-term	**Low**	Medium	**Negligible**
	Frequency:	Continuous					
	Geo. Extent:	Local					
	Intensity:	Low					
Emission of light	Duration:	Short	Medium-low	Short-term	**Negligible**	Medium high	**Negligible**
	Frequency:	Frequent					
	Geo. Extent:	Local					
	Intensity:	Low					

7.2.10.1.4 Monitoring

Monitoring of visual impacts includes monitoring of community and stakeholders. Related grievances will be recorded and dealt with via the Grievance Mechanism, within the Project's Stakeholder Engagement Plan, continuously in construction and operation phases.

The Client will be responsible for periodically monitoring the visual and aesthetic condition of the Project facilities. Monitoring will generally be conducted during construction, routine operations and maintenance of the Project facilities. Qualified staff will visually assess the aesthetic condition of these facilities using accepted visual and aesthetic standards and take appropriate actions in consultation with the contractors or upper management if needed.

7.2.10.2 Operation Phase

7.2.10.2.1 Impact factors

The impact factors from the Project activities potentially affecting visual impacts during operation phase are listed in Table 7-77.

Table 7-77: Project actions and related impact factors potentially affecting visual impact during operation phase

Project actions	Impact factors
Plant/infrastructure operation	Introduction of buildings/infrastructures

During operation phase, permanent structures and solar panels will be present in the Project Area. The PV panels have impacts on visual aesthetics in terms of glint and glare impacts.

The glint effect is also defined as a right-angle reflection. It is formed as a result of direct reflection of sunlight on the surface of PV solar panels. Glare effect is instantaneous bright light, creating a strobe effect, which is generally perceived by medium-speed and fast-moving receivers. The glare effect is not unique to solar panels, but is also seen on glass building facades.

The glare effect is defined as the continuous and excessive glint effect. Although this effect is not a direct reflection of sunlight, it occurs as a result of the reflection of the bright sky around the sun. The intensity of the glare effect is lower than the glint effect, and it is perceived by immobile receivers.

The study, "General Design Procedures for Airport-Based Solar Photovoltaic Systems[17]", conducted for the design of the solar photovoltaic systems for the airport-based solar photovoltaic systems reveals that, "*The reflection off a solar PV panel from most near normal angles is less than 3% and represents no risk to air traffic. The reflections off of the PV panel surface were found to be pretty stable until the tilt reached glancing angles, from where it started to increase substantially. This is akin to the behavior of light reflecting from a still source of water such as a pond. The refractive index of still water is 1.33 and the front glass of solar PV modules are made of standard soda lime glass, which has a refractive index of 1.50–1.52. It would thus be expected that for a given angle reflection from a PV front glass surface without any antireflecting coating is less intense than that of water. With the current progress in solar module technology and development in anti-reflection materials such as materials with an index of refraction of 1.05, it is safe to assume that solar PV module will have reflection off their surface dropped further with future technologies. However, even today with the refractive index off PV with anti-reflective coating dropping below 1.33 to 1.20–1.30, PV poses no (or presents tolerable/safe) hazards from*

[17] Anurag, Zhang, Gwamuri, Pearce, "General Design Procedures for Airport-Based Solar Photovoltaic Systems" , 2017

reflection for airport solar PV projects. It is clear that modern PV have less intense reflectivity than still surface water."

Anti-reflective is a type of coating applied to glass that is used to increase the efficiency of photovoltaic (PV) modules used in solar panels. Solar panels are designed to absorb the maximum amount of energy from sunlight. For this reason, reducing reflection is important both to increase energy efficiency and to protect public health and safety.

Anti-reflective glass coating reduces reflections on the glass surface, allowing more sunlight to be absorbed on the glass. This allows the photovoltaic cells to absorb more light and consequently generate more electricity. Anti-reflective coating improves the efficiency of PV modules by reducing reflection on glass surfaces.

These coatings improve the optical properties of the glass by reducing reflections on the surface while increasing the transmission of sunlight, allowing glare from the glass to be reduced.

In addition, depending on the anti-reflective glass used, the coating applied can make the solar panels more resistant to outdoor conditions and provide an easy surface for cleaning. AR coated glass exhibiting hydrophobic behaviour can contribute to the self-cleaning properties of the glass by preventing dust and dirt from adhering to the surface, which shades the light.

Anti-reflective coatings are usually applied to the glass surface using thin film layers or chemical vapour deposition (CVD) method.

In this project, SiO2 coating will be used. Silica is the most widely used ARC coating material in solar panels. This coating reduces reflections by applying a thin layer of silica on the front surface of the solar panel. The coated solar panels to be used in this project:

- Anti-Reflection Coated (ARC) Glass minimises reflection at the glass/air interface without affecting the excellent adhesion between the glass and the interlayer used for laminating photovoltaic modules.
- Low iron soda lime tempered glass used in mass production has a porous SiO2 single layer anti-reflective coating.
- The single-sided AR coating increases the light transmittance by at least 2%.
- The silica coating also contributes to the solar panel to be more resistant to outdoor conditions. Silica extends the life of the panel by protecting the glass surface against scratches, chemical effects and weather conditions.

7.2.10.2.2 Mitigation Measures

There are no industry standards or best practice guidance regarding with landscape mitigation and management within the scope of the national legislation. The proposed mitigation measures associated with the Project comprises of professional judgement.

- The housekeeping of the entire Project Area will be given importance throughout the life of the Project.
- To minimize light spillage from the site, every effort should be made to minimize the number of lights consistent with health and safety standards. In a similar way, all lights should be shielded and as much as possible pointed to the ground to avoid direct light effects on sensitive receptors around the Project Area.
- Regular monitoring of the affected people's grievances with regard to visual impacts. For this, the external grievance mechanism should be implemented properly, and all stakeholders should have access to this mechanism.

7.2.10.2.3 Residual Impacts

The residual impact after the application of the above-mentioned mitigation measures during the operation phase is presented in the following table (Table 7-78).

Table 7-78: Impact Assessment Matrix for Visual Impact During Operation Phase After Mitigation

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Introduction of buildings/infrastructures	Duration:	Long	Medium-low	Short-term	**Negligible**	Medium	**Negligible**
	Frequency:	Frequent					
	Geo. Extent:	Local					
	Intensity:	Low					

7.2.10.2.4 Monitoring

Monitoring of visual impacts includes monitoring of community and stakeholders. Related grievances will be recorded and dealt with via the Grievance Mechanism, within the Project's Stakeholder Engagement Plan, continuously in construction and operation phases.

Kalyon Enerji will be responsible for periodically monitoring the visual and aesthetic condition of the Project facilities. Monitoring will generally be conducted during construction, routine operations and maintenance of the Project facilities. Qualified staff will visually assess the aesthetic condition of these facilities using accepted visual and aesthetic standards and take appropriate actions in consultation with the contractors or upper management if needed.

7.2.10.3 Decommissioning Phase

The decommissioning phase will have similar impacts to the construction and operation phases, so the activities will be the same. The same considerations described for this component during the construction phase would be applicable to the decommissioning phase.

In general, decommissioning activities would comprise the removal of the plants and the associated facilities. Also, the structures' foundations would be removed. The site is expected to be restored for future use. Decommissioning of infrastructure could have a **positive impact** if the natural state of the land is recovered.

7.3 Biological Components

As resulting from the desktop baseline assessment, whose results are detailed in Section 6.3.3, the AoI is characterized by the dominance of Natural Habitats (89%), while Modified Habitats cover a smaller portion of the AoI (11%). No field confirmation on the habitats identified through desktop analysis is currently available. The most abundant Natural Habitat is represented by EUNIS habitat "E6.2 - Continental Inland Salt Steppes" (87% of the entire AoI), while Modified Habitats are mainly constituted of intensive unmixed crops. The Project AoI is not located within the boundaries of any legally protected area or internationally recognized area.

Potential Critical Habitats (CHs) identified within the AoI could be triggered by two fauna species: the Leopard Barbel (*Luciobarbus subquincunciatus, CR*) and Euphrates Softshell Turtle (*Rafetus euphraticus, EN*). However, since no biodiversity field survey was carried out within the AoI the presence of these species within the AoI needs to be confirmed.

- In addition, "species of conservation concern" was defined by considering the fauna species classified as Near Threatened (NT), Vulnerable (VU), Endangered (EN), or Critically Endangered (CR) at a global or

regional level according to IUCN Red List of Threatened Species[18], and by also considering the locally or regionally endemic species present or potentially present within the AoI. The "species of conservation concern" identified as potentially present in the AoI are:

- 1 reptile species, Common Tortoise(*Testudo graeca, VU*);
- 23 bird species, including 13 species classified as Near Threatened (*Aegypius monachus*, *Circus macrourus*, *Aythya nyroca*, *Marmaronetta angustirostris*, *Gallinago media*, *Glareola nordmanni*, *Limosa limosa*, *Numenius arquata*, *Tetrax tetrax*, *Emberiza cineracea*, *Lanius senator*, *Turdus iliacus*, and *Pelecanus crispus*), 5 species classified as Vulnerable (*Aquila heliaca*, *Clanga clanga*, *Streptopelia turtur*, *Falco vespertinus*, and *Otis tarda*), 4 species classified as Endangered (*Aquila nipalensis*, *Neophron percnopterus*, *Oxyura leucocephala*, and *Falco cherrug*), and 1 species classified as Critically Endangered (*Vanellus gregarius*);
- 2 mammal species, classified as Vulnerable (*Myotis capaccinii*, *Vormela peregusna*).

The sensitivity of the various biodiversity components is defined as follows:

- General sensitivity of the component is considered Medium-High;
- Critical Habitats (CHs) are considered having a High sensitivity.

In the present chapter potential direct and indirect impacts are considered for biodiversity features and according to their characteristics. The impact assessment for biodiversity follows the semi-quantitative method described in the ESIA Methodology in Chapter 5.0, which is very briefly summarized again here. An impact value for an impact factor affecting a biodiversity feature is calculated by summing scores for impact criteria, such as duration and intensity, and multiplying by the sensitivity of the biodiversity feature. The sensitivity scale is given in the IA Methodology Chapter and Sensitivity rankings have been provided above.

Project actions, resulting direct and indirect impact factors and biodiversity components potentially affected have been outlined in previous chapters and are explored more below. Impacts on general biodiversity, including flora fauna and habitats, are assessed in section 7.3.1 for the construction phase, in section 7.3.1.5 for the operation phase, and in section 7.3.3 for the decommissioning and closure phase.

Avoidance, mitigation and rehabilitation are proposed in this section according to the mitigation hierarchy principle. Monitoring measures are also proposed.

7.3.1 Construction Phase

7.3.1.1 Impact factors

The impact factors from the Project activities potentially affecting biodiversity components during construction phase are listed in Table 7-14.

Table 7-79: Project Actions and Related Impact Factors During Construction Phase

Project actions	Impact factors
General engineering/construction works	Vegetation and topsoil disturbance Emission of noise Emission of particulate matter Increase of vehicular traffic Changes in water quality Accidental introduction and dispersal of alien species

[18] The International Union for the Conservation of Nature Red List of Threatened Species – Source: https://www.iucnredlist.org/

Project actions	Impact factors
Material transportation	Emission of noise Emission of particulate matter Increase of vehicular traffic Changes in water quality
Material storage	Emission of particulate matter Increase of vehicular traffic

- For construction the Project footprint was considered including the areas covered by the photovoltaic (PV) panels, the permanent facilities (e.g., inverter stations, administrative buildings, internal roads, etc.) and the temporary facilities (e.g., campsite, administrative building, etc.). All the impact factors above identified are described and discussed in the following assessment.

Vegetation and topsoil disturbance

Construction activities will cause vegetation disturbance, with direct habitat loss, at least within the areas of construction of permanent and temporary facilities. In comparison, the areas where the PV panels will be arranged will experience a reduced vegetation and soil disturbance. On the contrary, the entire Project Site will be impacted by the passage of heavy machinery transporting the construction material, equipment, workers, waste, and other material. Access to the Project area is provided through the existing cadastral roads and the road deviating from the Şanlıurfa-Mardin Road-D400/E90 highway, and no additional access roads will be created. There will not be any heavy-load transportation that goes beyond standard road transportation limitations; therefore, no road improvement is required for the transportation of the equipment. Internal access roads will be designed and constructed inside the Project area.

Flora species present in the areas of construction of the facilities will be directly impacted by vegetation disturbance during construction works. In addition, the disturbance of vegetation will determine the destruction of suitable habitats for fauna species that use the vegetation present as food or shelter. Local fauna – and in particular the identified terrestrial reptile species of conservation concern (*Testudo graeca*) and the identified mammal species of conservation concern (*Myotis capaccinii* and *Vormela peregusna*) – could be directly impacted by the vegetation and soil disturbance activities performed during site preparation. Species characterized by low mobility (such as reptiles) may not be able to move ahead of construction. Species with a hiding strategy to escape predators might also be accidentally killed during the construction operations.

- **Emission of noise**

The emission of noise is expected to be of medium-high intensity during the construction phase. Construction activities such as surface levelling, transport, and temporary stockpiling of material such as the PV panels are expected to generate noise.

The emission of noise could cause indirect habitat degradation due to temporary avoidance of surrounding areas by sensitive fauna species. Noise shows its greatest effects on wildlife species which heavily rely on auditory signals for survival, therefore especially on birds and mammals. Disturbance from anthropogenic noise, for example, is known to be correlated with reduced densities of breeding birds (Reijnen et al., 1995[19]; Canaday & Rivadeneyra, 2001[20]). Anthropogenic noise is demonstrated to cause severe decreases in

[19] Reijnen M.J.S.M., Veenbaas G. & Foppen R. (1995). Predicting the effects of motorway traffic on breeding bird populations. Wageningen, IBN-DLO, 1998, 92 pp.

[20] Canaday C. & Rivadeneyra J. (2001). Initial effects of a petroleum operation on Amazonian birds: Terrestrial insectivores retreat. Biodiversity and Conservation. 10. 567-595. 10.1023/A:1016651827287.

species richness and abundances also for insect and amphibian species (Penone et al., 2012[21]; Clauzel et al., 2013[22]). The effects of noise disturbance from human activity on wildlife are mostly perceived over short distances in a species-specific way (up to ~ 300 m, Reijnen et al., 199519; Canaday and Rivadeneyra, 200120). Therefore, using a precautionary approach, a 300 m buffer is considered around Project footprint during construction.

During the construction phase, most fauna species may temporarily avoid construction areas and their immediate vicinities and, according to Helldin et al. (2013[23]), this behavior is mainly due to the increase in human activity. An impact could be expected especially during the breeding period of birds and mammals, which may be frightened by noise and might abandon their nest/mating ground.

- **Emission of particulate matter**

Construction activities such as surface levelling, temporary stockpiling of resulting material, transportation of soil and construction materials, construction of the facilities, and realization of the pavement, along with the simple crossing of heavy trucks, are expected to generate pollutants, dust and particular matter emissions.

Dust from construction activity could affect the surrounding vegetation and habitats due to the continuous and significant dust deposition. In particular, dust emissions could impact vegetation by covering leaf surface and through impacts on soil composition and structure (Farmer A.M., 1993[24]). Dust can block stomata on the leaf surface, affect photosynthesis, respiration, transpiration, and may cause leaf injury symptoms. As a result, the productivity of plants can decline. With the consequent reduction in vegetation growth, abundance and species loss.

A clear guideline value to protect vegetation from dust is not available. Airborne soil dust is typically coarse and therefore remains airborne only for short periods. United States Environmental Protection Agency (US EPA) research shows that 90% of total airborne dust returns to the earth's surface within 100 m of the emission source and over 98% within 250 m. However, under strong wind conditions, these effects could extend further.

Fauna species that depend on those habitats for food and shelter can also be indirectly affected by the habitat degradation due to dust emission in the atmosphere and its consequent deposition with the reduction of habitat suitability for terrestrial wildlife. Also, direct effects to fauna species could be through inhalation or ingestion of vegetation or soil particles.

Due to the dispersion of dust and particulate matter, which is considered highly frequent and of low intensity, the impacts are focused on and around the Project footprint, involving a geographic extent defined as local (within a 100 m buffer). The reversibility from this impact factor is considered as short/mid-term.

Increase of vehicular traffic

During construction, an increase in vehicular traffic is expected within the Project footprint and in the access roads, due to the necessity of transportation of construction material, equipment, workers, waste, and other

[21] Penone C., Kerbiriou C., Julien J., Julliard R., Machon N. & Le Viol I. (2013). Urbanisation effect on Orthoptera: Which scale matters?. Insect Conservation and Diversity. 6. 319–327. 10.1111/j.1752-4598.2012.00217.x.

[22] Clauzel C., Girardet X. & Foltête J. (2013). Impact assessment of a high-speed railway line on species distribution: Application to the European tree frog (*Hyla arborea*) in Franche-Comté. Journal of environmental management. 127C. 125-134. 10.1016/j.jenvman.2013.04.018.

[23] Helldin J., Collinder P., Bengtsson D., Karlberg A. & Askling J. (2013). Assessment of traffic noise impact in important bird sites in Sweden - A practical method for the regional scale. Oecologia Australis. 17. 48-62. 10.4257/oeco.2013.1701.05.

[24] Farmer A. M., The effects of dust on vegetation — a review. (1993). Environmental Pollution, Volume 79, Issue 1, 1993, Pages 63-75, ISSN 0269-7491, https://doi.org/10.1016/0269-7491(93)90179-R. (https://www.sciencedirect.com/science/article/pii/026974919390179R)

material. Increased vehicular traffic may result in direct mortality for fauna species and indirect habitat degradation. Accidental collisions with wildlife and related road kills can have a significant impact on some wildlife populations, in particular for low-mobility species, such as the identified terrestrial reptile species of conservation concern (*Testudo graeca*) and the identified mammal species of conservation concern (*Vormela peregusna*). Animals could be attracted to roads for a variety of reasons, and traffic can have an important influence on wildlife species, their behavior responses, and their distribution, thus on the use of space by local populations (Jacobson et al., 2016[25]). For example, an increase in vehicular traffic could impact reptiles and other ectotherms, which use the roads to bask in the sun. Vultures, crows, foxes and other scavengers seek out roadkill and often become roadkill themselves.

Changes in water quality

During the construction phase, activities the disturbance of soil and vegetation could cause an increment in sediment run off into the freshwater habitats located in proximity to the Project Site. Pollution deriving from accidental spills during construction, if not properly remediated, could also reach the river due to heavy rain and run off. Sediment or pollutants may cause a change in water quality and a loss in nursery habitat, because of silt deposition and accumulation. Particulate run-off and sediment release caused by construction activities would likely have a localized impact with sediments and pollutants moving downstream. In addition, freshwater fauna, in particular the species of conservation concern Leopard Barbel (*Luciobarbus subquincunciatus*, CR) and Euphrates Softshell Turtle (*Rafetus euphraticus*, EN), could be impacted sediment run off o and other potential pollutants. Using a precatory approach, a 100 m buffer is considered around Project facilities.

- **Accidental introduction and dispersal of alien species**

Removal of natural vegetation cover and soil disturbance could facilitate the spreading of alien (non-native) and/or invasive species, accidentally introduced by cars, trucks and other heavy machinery usen during construction. Invasive alien species tend to have an advantage in disturbed ecosystems (Rejmanek & Richardson, 2013[26]), and, if they penetrate into a habitat, they can potentially change its functionality and species composition, including priority biodiversity species (Chornesky & Randall, 2003[27]). For example, the alteration in flora species community could be of particular risk for the endemic flora species present within the AoI.

Local fauna that depends on the ecosystems impacted by invasive species could also be indirectly affected. The natural habitats within and around the Project footprint could experience a decrease in biodiversity, with a consequent trivialization (potential appearance of more dominant species) of the ecosystem.

For these reasons, using a precautionary approach, a 100 m buffer around the Project facilities is considered for this impact factor.

Habitat loss and degradation will be the most significant impact deriving from vegetation and soil disturbance. Although no clearing of natural vegetation is planned to be performed, it can be assumed that possible vegetation disturbance due to construction activities (e.g., movement of vehicles, material and workers) will negatively affect the entire Project footprint and, potentially, although with lower intensity, the entire AoI. The effects of the potential impact factors on biodiversity, and in particular on natural habitats, are quantified and discussed below. The direct impacts on Natural and Modified habitats were assessed within the Project footprint,

[25] Jacobson S., Bliss-Ketchum L., de Rivera C. & Smith W. (2016). A behavior-based framework for assessing barrier effects to wildlife from vehicle traffic volume. Ecosphere. 7. 1-15. 10.1002/ecs2.1345.

[26] Rejmanek M. & Richardson D. (2013). Plant Invasions and Invasibility of Plant Communities. Vegetation Ecology: Second Edition. 10.1002/9781118452592.ch13.

[27] Chornesky E. & Randall J. (2003). The Threat of Invasive Alien Species to Biological Diversity: Setting a Future Course. Annals of the Missouri Botanical Garden. 90. 67. 10.2307/3298527.

while the indirect impacts were assessed within a buffer of 100 m from the borders of the Project footprint and within a buffer of 300 m from the borders of the Project footprint. The areas potentially impacted are represented in Figure 7-3 and their numerical estimation is presented in Table 7-80. Vegetation and flora species will be affected at the same time by several of the above described impact factors, first of all by vegetation and soil disturbance.

Fauna species of conservation concern sensitive to these construction impacts will be the ones characterized by a low-mobility and/or the ones whose ecological requirements are strongly connected to the soil, in particular among the species of conservation concern Common Tortoise (*Testudo graeca*, VU) and Marbled Polecat (*Vormela peregusna*, VU).

Bird species and Long-fingered Bat (*Myotis capaccinii*, VU), identified as species of conservation concern, are considered to be less affected by the construction phase due to the higher mobility and because their ecological requirements are not strictly connected to soil.

Direct impacts related to vegetation and topsoil disturbance will impact 17% of the total AoI. The direct impacts will be concentrated on continental inland salt steppes (E6.2 EUNIS habitat type). Direct impacts will affect 20% of this habitat within the AoI (i.e., 272.47 ha).

Indirect impacts in the 100 m buffer deriving from construction, such as changes in water quality and introduction of invasive alien species, could impact a total of 7% of the AoI. Indirect impacts from construction in the 100 m buffer will be mainly on continental inland salt steppes (E6.2, 114.72 ha) but could also interest freshwater habitat (C2.3 and C2.5)

Indirect impacts in the 300 m buffer deriving from construction, such as emission of noise, could impact a total of 22% of the AoI. Indirect impacts within the 300 m buffer will be mainly on continental inland salt steppes (E6.2, 339.48 ha), with lower impacts on permanent non-tidal smooth-flowing watercourses (C2.3, 7.43 ha) and on temporary running waters (C2.5, 3.55 ha).

Table 7-80: Direct and Indirect Impacts on EUNIS Habitats calculated within the AoI for the Construction Phase

EUNIS Habitat Type	Total AoI	Footprint impact		Impact on 100 m buffer		Impact on 300 m buffer (ha)	
	ha	ha	%	ha	%	ha	%
Natural habitats							
C2.3 - Permanent non-tidal, smooth-flowing watercourses	12.15	-	0	0.38	3	7.43	61
C2.5 - Temporary running waters	16.60	-	0	0.35	2	3.55	21
E6.2 - Continental inland salt steppes	1364.47	272.47	20	114.72	8	339.48	25
Subtotal	*1393.22*	*272.47*	*20*	*115.45*	*8*	*350.46*	*25*
Modified habitats							
I1.1 - Intensive unmixed crops	110.80	-	0	-	0	1.05	1
J1.2 - Residential buildings of villages	60.66	-	0	-	0	0.05	<0.1
J5.3 - Highly artificial non-saline standing waters	1.20	-	0	-	0	-	0
Subtotal	*172.66*	*-*	*0*	*-*	*0*	*1.10*	*1*
Total	***1565.88***	***272.47***	***17***	***115.45***	***7***	***351.56***	***22***

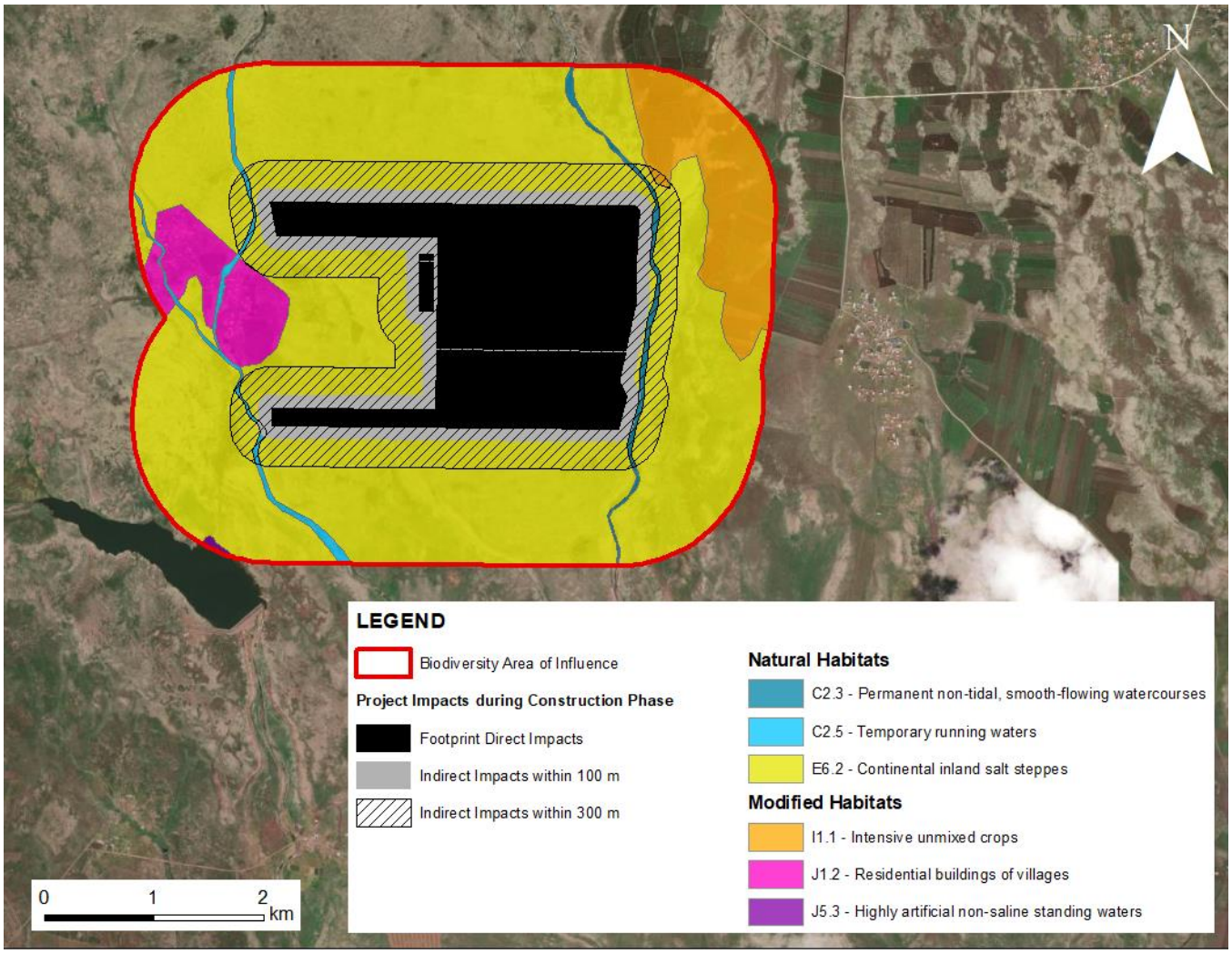


Figure 7-3: Map of the Construction Impacts on EUNIS Habitats within the AoI

7.3.1.2 Mitigation Measures

The mitigation measures listed below follow the mitigation hierarchy and are proposed for the construction phase for the entire area that will be disturbed by the Project:

- **Avoidance**

Avoidance measures have been considered particularly during the design of the facilities and include:

- minimisation of the footprint of individual facilities;
- utilization of the existing modified habitat for placement of temporary facilities was prioritized as much as possible.

- **Minimization**

1) vegetation and topsoil disturbance:

- limiting natural vegetation disturbance to the minimum necessary during construction works. For this purpose, limits of temporary and permanent facilities will be clearly signed in order to reduce the risk of footprint creep;
- in order to minimize the mortality of wildlife species, biological surveys (pre-construction surveys) will be implemented to identify and eventually relocate fauna species. Company's Biodiversity Assistant Specialist will perform pre-construction surveys in the areas where temporary and permanent facilities will be located (not earlier than 7 days before). The survey will focus on fauna species with limited mobility (e.g., mammals and reptiles) that cannot move ahead of construction. If any of these species are observed, they will be collected by the -Company's Biodiversity Assistant Specialist and translocated to undisturbed but similar sites within the AoI.
  - Reptiles will be caught and moved to a suitable receptor site, no smaller than the capture site and containing the same habitat characteristics and prey availability, at a minimum distance of 50 m from the Project footprint during construction phase. If essential works are required in winter, when tortoise are hibernating, then the works area should be checked carefully for hibernation burrows. If a reptile is found during such works and it is hibernating, it should be carefully moved to an alternative part of the site that will remain undisturbed. If this is not possible, then the animal should be taken in to care until it can be released on site, the following spring.
  - The monitoring of the activity of the identified species of conservation concern Marbled Polecat (*Vormela peregusna*, VU) will be performed, through the use of endoscopic cameras located within the burrows. If any living specimen is observed and essential works that involve breaking ground are required in the areas where burrows are present, a gradual increase of the level of disturbance over a few days (at least 4 consecutive days) will be implemented, in order to allow for the animal to autonomously leave the burrow before it is fully excavated (e.g., day 1 machinery and equipment bought to the working area, day 2 manual excavation, day 3 mechanical excavation in the vicinity of the borrow).
- vehicle movement will be restricted to the Project Site and the existing roads that connect the construction sites with the surrounding areas. Off road driving will be prohibited in order to avoid any unnecessary disturbance of natural vegetation.

2) emission of noise:

- night works will be avoided to reduce impacts on nocturnal fauna species;
- limiting the number and the speed of vehicle movements along the existing access roads.

3) emission of particulate matter:

- Dust deriving from construction material handling will be minimized by using covers and/or control equipment (water suppression, bag house, or cyclone) and increasing the moisture content by water spraying.
- Speed limit for all vehicles will be implemented so as not to generate dust emissions, and all trucks will be properly maintained at all times.
- Internal roads will be adequately compacted, maintained, and sprayed with water if needed, to minimize dust from vehicle movements. If water spraying is deemed insufficient, other means of surface treatment (e.g., hygroscopic media, such as calcium chloride, and soil natural–chemical binding agents) for unpaved internal roads will be implemented, by using a sprinkler system or a "water-mist cannon".

4) increase of traffic:

- install speed limits and animal crossing signs on the access roads.

- avoid the accumulation of stagnant water and organic waste within the construction site and on the roads, that could attract wildlife.
- if fauna species are encountered employees and contractors will wait until it moves on by itself or they will ask the assistance of the - authorized personnel trained in reptile transport and/or Company's Biodiversity Assistant Specialist for its safe removal and relocation in a suitable environment.
- awareness among employees and contractors working on site about the protected species/habitats potentially present in the area will be developed, in order to ensure constant monitoring and promote actions to be taken if wildlife is encountered.

5) accidental introduction and spreading of alien species:

- the use of non-native flora species, and especially of species classified as invasive alien species must be avoided during rehabilitation/restoration works.
- if the spreading of invasive species is observed, an appropriate eradication program will be developed and implemented.

- **Rehabilitation/Restoration**

Areas cleared during construction for temporary use will be restored, as soon as possible, with the goal of producing a stable vegetative cover to minimize erosion, dust deposition and spreading of invasive alien species, and the aim of re-establish the original habitat with a positive impact on biodiversity.

Only plants that are native to the region will be used for restoration and habitat rehabilitation. Seeding and planting of grass and shrub species typical of the local flora will be implemented to ensure optimal ground cover. The use of autochthonous adult plants and/or of seeds collected at the shortest distance possible from the restoration sites will be of fundamental importance in order to maximize the success of the translocation operations (Abeli & Dixon, 2016[28]).

7.3.1.3 Residual Impacts

Considering the application of the above-mentioned mitigation measures, the impact on Biodiversity component is presented in Table 7-81 and it is expected to be **Medium**.

- The main residual impact on natural habitats could derive from vegetation disturbance and introduction and spreading of alien species, with consequent modification and possible impoverishment of the original plant species community.In order to monitor these impacts, monitoring measures are suggested in the following section.
-
-

Table 7-81: Residual Impact Assessment Matrix for Biodiversity Component during Construction Phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features - Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Vegetation and topsoil disturbance	Duration:	Medium	Medium-high	Long term	**High**	Medium	**Medium**
	Frequency:	Frequent					
	Geo. Extent:	Project footprint					
	Intensity:	Medium					

[28] Abeli T. & Dixon K. (2016). Translocation ecology: the role of ecological sciences in plant translocation. Plant Ecology. 217. 10.1007/s11258-016-0575-z.

Emission of noise	Duration:	Medium	Medium-high	Short-term	**Low**	Medium	**Negligible**
	Frequency:	Highly frequent					
	Geo. Extent:	Local					
	Intensity:	High					
Emission of dust	Duration:	Medium	Medium-high	Short-term	**Low**	Medium	**Negligible**
	Frequency:	Highly frequent					
	Geo. Extent:	Local					
	Intensity:	High					
Increase in vehicular traffic	Duration:	Medium	Medium-high	Short-term	**Low**	Medium	**Negligible**
	Frequency:	Moderately frequent					
	Geo. Extent:	Local					
	Intensity:	Medium					
Changes in water quality	Duration:	Medium	Medium-high	Mid term	**Medium**	Medium	**Low**
	Frequency:	Moderately frequent					
	Geo. Extent:	Local					
	Intensity:	Medium					
Accidental introduction and dispersal of alien species	Duration:	Medium	Medium-high	Long term	**High**	Medium-high	**Low**
	Frequency:	Sporadic					
	Geo. Extent:	Local					
	Intensity:	Medium					

7.3.1.4 Critical Habitats

The impact factors from the Project activities potentially affecting biodiversity components during construction phase are listed in Table 7-82.

Table 7-82: Project Actions and Related Impact Factors During Construction Phase

Project actions	Impact factors
General engineering/construction works	Emission of noise Changes in water quality
Material transportation	Emission of noise Changes in water quality
Material storage	Emission of particulate matter Increase of vehicular traffic

The effects of impact factors and general mitigation measures for overall biodiversity were described in the previous chapters, while the potential direct and indirect impact that could occur on species triggering CH are summarized in the table below.

Additional studies and mitigation measures are discussed whenever necessary and residual impacts are also assessed below. Monitoring measures are presented in Section 7.3.1.5.

The no net loss/net gain assessment is discussed in Section 7.3.4 including potential offset measure Net Gain.

Table 7-83: Potential direct and indirect impact on fauna species potentially triggering CH and Additional Mitigation Measures

Taxon	Species	Global IUCN Status	Lit./ Obs.	Potential Direct and Indirect Impacts	Mitigation Measures
Fish	Leopard Barbel *(Luciobarbus subquincunciatus)*	CR	L	Indirect impacts from the Project could occur in a 100 m and 300 m buffer and are mainly associated with the potential degradation of freshwater habitats (C2.3 and C2.5) due to possible changes in water quality and repulsion due to the presence of noise and vibration.	■ Additional Studies: ■ freshwater surveys will be performed in at least 2 seasons to confirm the presence of the Leopard Barbel and Euphrates Softshell Turtle ■ ■ Minimization: no disturbance of natural vegetation and or vehicle movement will be allowed within 20 m from the River bank
Reptile	Euphrates Softshell Turtle *(Rafetus euphraticus)*	EN	L		

According to the baseline study performed, the general sensitivity is considered to be **High** for fauna species triggering CHs.

Considering the application of the abovementioned mitigation measures, the impact on biodiversity components is presented in the following tables and it is expected to be **Negligible** for the species triggering CH in the AoI.

Table 7-84 : Residual impact assessment matrix for fauna species triggering CH in the AoI during the operation phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features - Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Emission of noise	Duration:	Medium	High	Short-term	**Low**	Medium-high	**Negligible**
	Frequency:	Highly frequent					
	Geo. Extent:	Local					
	Intensity:	High					
Changes in water quality	Duration:	Medium	High	Short-term	**Low**	Medium-high	**Negligible**
	Frequency:	Moderately frequent					
	Geo. Extent:	Local					
	Intensity:	Medium					

7.3.1.5 Monitoring

The following monitoring activities are foreseen in natural habitats to ensure the implementation and effectiveness of the proposed mitigation measures:

- presence and spreading of invasive flora species within and around the construction site will be surveyed by an expert botanist. These periods are;

- during the flowering period before construction,
- during the construction phase, at least once, possibly during the flowering period (June/July));
- after the end of construction phase and during the first year of operation phase, with a survey performed in March and one in September
- Then Company's Biodiversity Assistant Specialist will continue to monitor.

- Then, Kalyon Enerji Biodiversity Assistant Specialist will continue the monitoring of invasive flora species during the following years of operation phase. Monitoring dates should be updated after field studies by the expert botanist. If necessary, extirpation campaign will be put in place in order to avoid the spreading of the invasive species.observations of fauna species, and in particular of the identified species of conservation concern, within and around the AoI, shall be registered also with photographic documentation and reported to the Company's Biodiversity Assistant Specialist responsible on site.
- accidents involving wildlife or the observation of live animals or carcasses along the access road or on the construction site will be recorded. Additional mitigation measures to discourage wildlife presence on site and avoid roadkill will be taken if needed;
- during active construction weekly monitoring of the riverbank will be performed to ensure no in adverted disturbance occurred within 20 m from the river and no sediment run off.

7.3.2 Operation Phase

7.3.2.1 Impact factors

The impact factors from the Project activities potentially affecting biodiversity components during operation phase are listed in Table 7-85.

Table 7-85: Project Actions and Related Impact Factors During Operation Phase

Project actions	Impact factors
General engineering/construction works	Presence of permanent infrastructures Emission of noise Emission of light Changes in water quality Accidental introduction and dispersal of alien species

- For operation phase, direct impacts deriving from the Project were assessed on two different types of Project footprint, the first corresponding to the areas covered by the photovoltaic panels and the second corresponding to the areas occupied by permanent facilities (e.g., inverter stations, administrative buildings, internal roads, etc.). Temporary facilities (e.g., campsite, administrative building, etc.) were excluded from this assessment, as they will be rehabilitated after the construction phase. All the impact factors above identified are described and discussed in the following assessment.
- **Presence of permanent infrastructures**

  The presence of permanent infrastructures (e.g., inverter stations, administrative buildings, internal roads, etc.) will cause a loss of available natural habitat during the entire operation phase, that will directly and indirectly affect habitats, flora, and fauna species. The habitat loss is calculated in Table 7-86. Habitat loss will not affect temporary facilities (e.g., campsite, administrative building, etc.), as they will be rehabilitated after the construction phase and during the operation phase.

Flora and vegetation are expected to at least partially recover during the operation phase, due to rehabilitation of the temporary facilities, but also in the areas under the PV panels. An appropriate long-term management and restoration plan should be implemented, and adequate monitoring surveys should be planned to verify the effectiveness of the restoration activities.

Another impact could be represented by the reflection of sunlight operated by the photovoltaic panels, which could attract aquatic insects and possibly birds, since these species could confuse the surface of the panels with the reflective surface of waterbodies. These sources of reflected polarized light can become ecological traps associated with reproductive failure and mortality in organisms that are attracted to them and by extension with rapid population declines or collapse, particularly for insects which lay eggs in water (Horvath *et al.*, 2010[29]).

However, literature shows that the construction of Solar Power Plants (SPPs) in desertic and steppe areas, which are often chosen because of their insolation rates and subsequent great potential for producing solar power, could determine positive effects for biodiversity, in terms of increased plant diversity and increased plant biomass (Bai *et al.*, 2022[30]; Graham *et al.*, 2021[31]; Hassanpour *et al.*, 2018[32]). The positive effects derive primarily from the shade offered by the PV panels, which determines a decrease in temperature and in increase in soil moisture in the areas under the panels, but also in the areas close to the panels. Indeed, these areas could receive shade from the panels only partially throughout the day, but biodiversity in these areas could anyway experience beneficial effects (Tanner *et al.*, 2020[33]).For these reasons, it will be important to restore the areas cleared during construction and to plan a long-term monitoring in order to assess the success of the restoration activities, which are expected to produce positive effects on local flora, fauna and habitats.

- **Emission of noise**

While solar panels are largely silent, the permanent infrastructures around the SPP (i.e., tracking motors, inverters, high voltage transformers, energy storage devices) could generate noise (Kaliski *et al.*, 2020[34]). However, high levels of noise are attested only for larger commercial photovoltaic projects and noise levels up to 60 dBA do not result in negative or adverse responses to animals.

In general, fauna disturbance due to the emission of noise connected to the operation phase is expected to be minimal compared to the construction phase. In addition, fauna species are expected to habituate to the disturbance deriving from operation and maintenance activities.

Using a precautionary approach, a 300 m buffer around the footprint is considered for this impact factor.

- **Emission of light**

[29] Horvath G., Blahó M., Egri A., Kriska G., Seres, I., Robertson B. (2010). Reducing the Maladaptive Attractiveness of Solar Panels to Polarotactic Insects. Conservation biology : the journal of the Society for Conservation Biology. 24. 1644-53. 10.1111/j.1523-1739.2010.01518.x.

[30] Bai Z., Jia A., Bai Z., Qu S., Zhang M., Kong L., Sun R., Wang M. (2022). Photovoltaic panels have altered grassland plant biodiversity and soil microbial diversity. Front Microbiol. 2022 Dec 15;13:1065899. doi: 10.3389/fmicb.2022.1065899. PMID: 36590393; PMCID: PMC9797687.

[31] Graham M., Ates S., Melathopoulos A., Moldenke A., DeBano S., Best L. and Higgins C. (2021). Partial shading by solar panels delays bloom, increases floral abundance during the late-season for pollinators in a dryland, agrivoltaic ecosystem. Scientific Reports. 11. 7452. 10.1038/s41598-021-86756-4.

[32] Hassanpour E., Selker J. and Higgins C. (2018). Remarkable agrivoltaic influence on soil moisture, micrometeorology and water-use efficiency. PLOS ONE. 13. e0203256. 10.1371/journal.pone.0203256.

[33] Tanner K. E., K. A. Moore-O'Leary, I. M. Parker, B. M. Pavlik, and R. R. Hernandez. (2020). Simulated solar panels create altered microhabitats in desert landforms. Ecosphere 11(4):e03089. 10.1002/ecs2.3089.

[34] Kaliski K., Old I., Duncan E. (2020). An overview of sound from commercial photovoltaic facilities. NOISE-CON 2020, On-Line Conference, Week of November 16, 2020.

Lights can have an attracting effect on night-flying wildlife, which would result being attracted towards the permanent infrastructures, with subsequent risk of collision and/or of unexpected encountering with workers. In addition, ecological light pollution can affect fauna species foraging and their reproductive behaviour, biological clocks, predator-prey interactions, movement and dispersal patterns, community structure, and interactions among and within species (Longcore & Rich, 2004[35]).

Effects are likely species-specific, based on the role ambient light plays in physiology and behaviour, and might also depend on the type of lighting used. The taxa that are more likely to be affected by light pollution are bats, nocturnal birds, and insects. Bats, depending on the species, are either attracted to lights by the presence of insects or they avoid lighted areas. Species of reptiles, amphibians, birds, bats and spiders have been shown to wait around artificial lights for prey.

Artificial lighting increases the foraging efficiency of many bat species, but it might simultaneously increase their risk of being predated. Voigt *et al.* (2018[36]) highlighted a response of migratory bats towards light that was dependent on light color. Artificial lighting can also negatively affect nocturnal and migratory bird species (Rich & Longcore, 2006[37]). Nocturnal migratory species may be disorientated and attracted by the sky glow during the night. Fixed white lights attract more individuals than flashing or colored ones. Insects are not only attracted to lights, but they are also more susceptible to predation around lighted areas. Artificial lighting might also undermine the evasive and defensive tactics normally used by insects.

Changes in water quality

During the operation phase, if the vegetation if not reestablished, an increment in sediment run off into the freshwater habitats located in proximity to the Project Site could cause changes in water quality. Pollution deriving from accidental spills during maintenance, if not properly remediated, could also reach the river due to heavy rain and run off.

Silt deposition and accumulation could cause loss in nursery habitat. Freshwater fauna species, in particular the species of conservation concern Leopard Barbel (*Luciobarbus subquincunciatus*, CR) and Euphrates Softshell Turtle (*Rafetus euphraticus*, EN), could also be impacted by degraded water quality. Using a precautionary approach, a 100 m buffer is considered around Project facilities.

- **Accidental introduction and dispersal of alien species**

Ongoing maintenance activities during construction could facilitate the arrival and spread of high-competitive invasive alien plant species, in addition alien species established during the construction phase, without proper measures, could further spread taking advantage of the novel environmental conditions, determined by the modified shade and water runoff regimes imposed by panels (Tanner *et al.*, 2020[33]).

Invasive alien species can potentially change functionality of ecosystems and composition of plant species community, including priority biodiversity species (Chornesky & Randall, 2003[27]).

The implementation of an appropriate management and rehabilitation plan will be of fundamental importance also to minimize the impacts deriving from the introduction and dispersal of alien species. Using a precautionary approach, a 100 m buffer around the footprint is considered for this impact factor.

[35] Longcore T. &Rich C. (2004). Ecological light pollution. Front. Ecol. Environ. 2004; 2[4]: 191– 198.

[36] Voigt C., Rehnig K., Lindecke O., Pētersons G. (2018). Migratory bats are attracted by red light but not by warm-white light: Implications for the protection of nocturnal migrants. Ecology and Evolution. 8. 10.1002/ece3.4400.

[37] Rich C. & Longcore T. (2006). Ecological Consequences of Artificial Night Lighting. Island Press Washington, DC.

Habitat loss and modification will be the most significant impact deriving from presence of permanent infrastructures, including PV panels. However, flora and vegetation are expected to at least partially recover during the operation phase, due to rehabilitation of the temporary facilities, but also in the area of the PV panels. Indeed, the modified temperature and soil conditions under the PV panels and the grazing exclusion could potentially promote an increase in local species richness, diversity and biomass for the most common and generalist flora species, in comparison with the surrounding overgrazed continental salt steppe habitat (EUNIS habitat E6.2).

The effects of the potential impact factors on biodiversity, and in particular on natural habitats, are quantified and discussed below. The direct impacts on Natural and Modified habitats were assessed within the Project footprint, while the indirect impacts were assessed within a buffer of 100 m from the borders of the Project footprint and within a buffer of 300 m from the borders of the Project footprint. The areas potentially impacted are represented in Figure 7-4, and their numerical estimation is presented in Table 7-86.

- For some fauna species the presence of a fenced area occupied by permanent facilities and PV panels will create a loss of potential habitats, while for others such as the species of conservation concern Common, Tortoise (*Testudo graeca*, VU) and Marable Polecat ((*Myotis capaccinii*, *Vormela peregusna*), the area could still be considered a suitable habitat, and in some cases the fence and the PV panels could even offer protection from grazing and from predators. The disturbance for terrestrial fauna species, and in particular to species of conservation concern, due to emission of noise and the presence of artificial lights connected to the operation phase is expected to be minimal. Terrestrial fauna species are expected to habituate to these forms of disturbance, deriving from operation and maintenance activities.

Direct impacts deriving from the presence of permanent infrastructures (e.g., inverter stations, administrative buildings, internal roads, etc.) will impact <1% of the total AoI and will be entirely on continental inland salt steppes (E6.2 EUNIS habitat type, 10.78 ha).The direct impacts deriving from the presence of PV panels will impact 17% of the total AoI and will be entirely on continental inland salt steppes (E6.2 EUNIS habitat type, 241.70ha).

Indirect impacts in the 100 m buffer deriving from operation, such as changes in water quality and introduction and spreading of alien species, could impact a total of 20% of the AoI. Indirect impacts from operation in the 100 m buffer will be mainly on continental inland salt steppes (E6.2, 279.59 ha). Indirect impacts but could also interest freshwater habitat (C2.3 and C2.5)..

Indirect impacts in the 300 m buffer deriving from operation, such as noise and emission of light, could impact a total of 44% of the AoI. Indirect impacts within the 300 m buffer will be mainly on continental inland salt steppes (E6.2, 595.79 ha).

Table 7-86: Direct and Indirect Impacts on EUNIS Habitats calculated within the AoI for the Operation Phase

Habitat	Total AoI	PV Panels Area		Direct Impact (Permanent facilities)		Impact on 100 m buffer		Impact on 300 m buffer	
	ha	ha	%	ha	%	ha	%	ha	%
Natural habitats									
C2.3 - Permanent non-tidal, smooth-flowing watercourses	12.15	-	0	-	0	0.38	3	7.43	61
C2.5 - Temporary running waters	16.60	-	0	-	0	0.35	2	3.54	21
E6.2 - Continental inland salt steppes	1364.47	241.70	18	10.78	<1	279.59	20	595.79	44

Habitat	Total AoI	PV Panels Area		Direct Impact (Permanent facilities)		Impact on 100 m buffer		Impact on 300 m buffer	
	ha	ha	%	ha	%	ha	%	ha	%
Subtotal	*1393.22*	*241.70*	*17*	*10.78*	*<1*	*280.32*	*20*	*606.76*	*44*
Modified habitats									
I1.1 - Intensive unmixed crops	110.80	-	0	-	0	-	0	1.05	<1
J1.2 - Residential buildings of villages	60.66	-	0	-	0	-	0	0.05	<0.1
J5.3 - Highly artificial non-saline standing waters	1.20	-	0	-	0	-	0	-	0
Subtotal	*172.66*	*0.00*	*0*	*0*	*0*	*0.00*	*0*	*1.10*	*<1*
Total	***1565.88***	***241.70***	***15***	***11***	***<1***	***280.32***	***18***	***607.86***	***39***

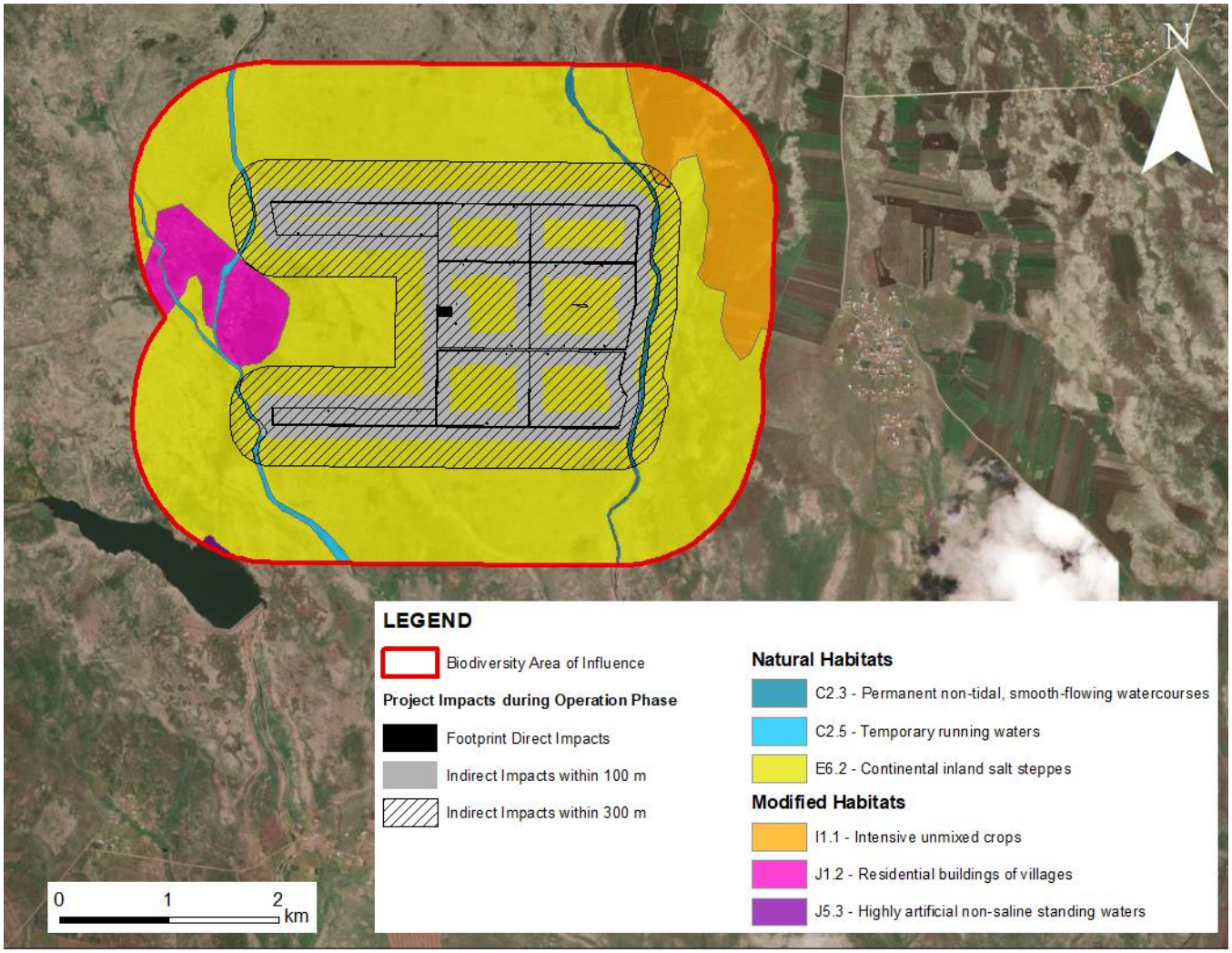


Figure 7-4: Map of the Operation Direct and Indirect Impacts from permanent facilities on EUNIS Habitats within the AoI

7.3.2.2 Mitigation Measures

The mitigation measures listed below follow the mitigation hierarchy and are proposed for the operation phase for the entire area that will be disturbed by the Project.

- **Avoidance**:

Avoidance measures have been considered particularly during the design of the facilities and include:

- minimisation of the footprint of individual facilities.
- utilization of the existing modified habitat for placement of temporary facilities was prioritized as much as possible.

- **Minimization**

1) Presence of permanent infrastructures:

- The areas occupied by the new permanent infrastructures will be fenced but modification to fencing will be made in order to minimize the barrier effect. Modifications to fencing can involve maintaining gaps between the base of the fence and the These gaps will occur at regular intervals along the fence line, with a frequency of 1 gap every 100 m. In addition, each single gap could have a height of 10 cm and a width of 1 m.
- Non-reflective coating are applied to the panels to minimize reflection, which can attract aquatic insects and possibly birds, as it mimics reflective surfaces of waterbodies.
- Flora and fauna specific monitoring campaigns within and without the areas occupied by the new permanent infrastructures will be implemented (see section 7.3.2.4).
- Vehicle movement will be restricted to the existing roads that connect the operation sites with the surrounding areas. Off road driving will be prohibited in order to avoid any unnecessary disturbance of natural vegetation.

2) Emission of noise:

No additional minimization measures are deemed necessary in addition to those included in Chapter 7.1.2.

3) Emission of light:

- it is recommended to keep the number of light sources to the minimum;
- preferred types of light in exterior lighting (e.g.: lights on site due to security reasons) applications are:
  - low pressure sodium lamps (SOX);
  - light emitting diodes (LEDs): light source of choice, emitted more directional, warmer colour temperatures (closer to 3000°K);
  - light triggered by presence detectors, and lights oriented to the ground.
- these types of lights should be avoided:
  - mercury lamps (MBF): bluish-white lamps (attract insects and tolerant bat species);
  - high pressure sodium lamps (SON): brighter pinkish-yellow lamps, used as road lighting.

4) Introduction of alien species

- the use of non-native flora species, and especially of species classified as invasive alien species must be avoided during rehabilitation/restoration works.

- if the spreading of invasive species is observed, an appropriate eradication program will be developed and implemented.

- **Rehabilitation/Restoration:**

Areas cleared of vegetation under the PV panels will be restored, as soon as possible, with the goal of recreating the original natural habitat and possibly enhancing flora species richness and diversity. The restoration will be based on a long-term plan, with the aim of producing a stable vegetative cover to minimize erosion, dust deposition and spreading of invasive alien species.

Only plants that are native to the region will be used for restoration and habitat rehabilitation. Seeding and planting of grass and shrub species typical of the local flora will be implemented to ensure optimal ground cover. The use of autochthonous adult plants and/or of seeds collected at the shortest distance possible from the restoration sites will be of fundamental importance in order to maximize the success of the translocation operations (Abeli & Dixon, 2016[28]).

Literature shows that the construction of Solar Power Plants (SPPs) in desertic and steppe areas, which are often chosen because of their insolation rates and subsequent great potential for producing solar power, could determine positive effects for biodiversity, in terms of increased plant diversity and increased plant biomass (Bai *et al.*, 2022[38]; Graham *et al.*, 2021[39]; Hassanpour *et al.*, 2018[40]). The positive effects derive primarily from the shade offered by the PV panels, which determines a decrease in temperature and in increase in soil moisture in the areas under the panels (Tanner *et al.*, 2020[41]). There could be beneficial effects also per terrestrial fauna species, in particular for small-sized mammals, reptiles and birds, which could find protection from predators offered by the fence and the PV panels themselves.

7.3.2.3 Residual Impacts

Considering the application of the above-mentioned mitigation measures, the impact on biodiversity components is presented in Table 7-87 and it is expected to be **Low.**

- The main residual impacts could consist in the loss of natural habitat, due to the presence of new permanent infrastructures, and in the arrival and spreading of invasive alien species, which could determine a strong modification and possible impoverishment of the original plant species community.

Table 7-87: Residual Impact Assessment Matrix for Biodiversity Component during Operation Phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Presence of permanent infrastructures	Duration	Long	Medium-high	Mid-term	**High**	Medium-high	**Low**
	Frequency	Continuous					
	Geo. Extent	Project site					
	Intensity	Low					

[38] Bai Z., Jia A., Bai Z., Qu S., Zhang M., Kong L., Sun R., Wang M. (2022). Photovoltaic panels have altered grassland plant biodiversity and soil microbial diversity. Front Microbiol. 2022 Dec 15;13:1065899. doi: 10.3389/fmicb.2022.1065899. PMID: 36590393; PMCID: PMC9797687.

[39] Graham M., Ates S., Melathopoulos A., Moldenke A., DeBano S., Best L. and Higgins C. (2021). Partial shading by solar panels delays bloom, increases floral abundance during the late-season for pollinators in a dryland, agrivoltaic ecosystem. Scientific Reports. 11. 7452. 10.1038/s41598-021-86756-4.

[40] Hassanpour E., Selker J. and Higgins C. (2018). Remarkable agrivoltaic influence on soil moisture, micrometeorology and water-use efficiency. PLOS ONE. 13. e0203256. 10.1371/journal.pone.0203256.

[41] Tanner K. E., K. A. Moore-O'Leary, I. M. Parker, B. M. Pavlik, and R. R. Hernandez. (2020). Simulated solar panels create altered microhabitats in desert landforms. Ecosphere 11(4):e03089. 10.1002/ecs2.3089.

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Emission of noise	Duration	Long	Medium-high	Short-term	**Low**	Medium-low	**Low**
	Frequency	Highly frequent					
	Geo. Extent	Project site					
	Intensity	Negligible					
Emission of light	Duration	Long	Medium-high	Short-term	**Low**	Medium-low	**Low**
	Frequency	Highly frequent					
	Geo. Extent	Project site					
	Intensity	Negligible					
Changes in water quality	Duration	Long	Medium-high	Mid-term	**Medium**	Medium-high	**Low**
	Frequency	Moderately frequent					
	Geo. Extent	Local					
	Intensity	Low					
Accidental introduction and dispersal of alien species	Duration	Long	Medium-high	Long-term	**High**	Medium-high	**Low**
	Frequency	Concentrated					
	Geo. Extent	Local					
	Intensity	Medium					

7.3.2.4 Critical Habitat

The impact factors from the Project activities potentially affecting biodiversity components during operation phase are listed in Table 7-88.

Table 7-88: Project Actions and Related Impact Factors During Operation Phase

Project actions	Impact factors
General engineering/construction works	Emission of noise Emission of light Changes in water quality

The effects of impact factors and general mitigation measures for overall biodiversity were described in the previous chapters, while the potential direct and indirect impact that could occur on species triggering CH are summarized in the table below.

Additional studies and mitigation measures are discussed whenever necessary and residual impacts are also assessed below. Monitoring measures are presented in Section 7.3.2.5.

The no net loss/net gain assessment is discussed in Section 7.3.4 including potential offset measure Net Gain.

Table 7-89: Potential direct and indirect impact on fauna species potentially triggering CH and Additional Mitigation Measures

Taxon	Species	Global IUCN Status	Lit./ Obs.	Potential Direct and Indirect Impacts	Mitigation Measures
Fish	Leopard Barbel *(Luciobarbus subquincunciatus)*	CR	L	Indirect impacts from the Project could occur in a 100 m and 300 m buffer and are mainly associated with the potential degradation of freshwater habitats (C2.3 and C2.5) due to possible changes in water quality and repulsion due to the presence of noise and light emission.	▪ <u>Minimization</u>: • vehicle movement will be allowed within 20 m from the riverbank; • external lights will be directed / screened to minimize the lights towards the river.
Reptile	Euphrates Softshell Turtle *(Rafetus euphraticus)*	EN	L		

According to the baseline study performed, the general sensitivity is considered to be **High** for fauna species triggering CHs.

Considering the application of the abovementioned mitigation measures, the impact on biodiversity components is presented in the following tables and it is expected to be **Low** for the species triggering CH in the AoI.

Table 7-90: Residual impact assessment matrix for fauna species triggering CH in the AoI during the operation phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features - Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Changes in water quality	Duration:	Long	Medium-high	Mid term	**Medium**	Medium-high	**Low**
	Frequency:	Moderately frequent					
	Geo. Extent:	Project footprint					
	Intensity:	Negligible					
Emission of noise	Duration:	Long	High	Short-term	**Low**	Medium	**Negligible**
	Frequency:	Highly frequent					
	Geo. Extent:	Project footprint					
	Intensity:	Negligible					
Emission of light	Duration:	Long	High	Short-term	**Low**	Medium	**Negligible**
	Frequency:	Highly frequent					
	Geo. Extent:	Project footprint					
	Intensity:	Negligible					

7.3.2.5 Monitoring

The following monitoring activities are foreseen to ensure the implementation and effectiveness of the proposed mitigation measures:

- a floristic and vegetational monitoring will be performed in the areas located under the photovoltaic panels where plant translocation and restoration activities have been conducted, in order to assess the success of such activities in enhancing species richness and diversity and in rehabilitating the original natural habitat. This monitoring will be carried out by a expert botanist during the vegetation season (twice a year, in March and in September), the first year of operation. Then Company's Biodiversity Assistant Specialist will continue to monitor.
- presence and spreading of invasive flora species in the areas under the photovoltaic panels will be monitored by a expert botanist during the vegetation season (twice a year, in March and one in September), the first year of operation. Then Company's Biodiversity Assistant Specialist will continue to monitor. If necessary, extirpation campaign will be put in place in order to avoid the spreading of the invasive species.
- a terrestrial fauna monitoring, in particular focusing on the identified species of conservation concern, will be performed at the end of construction in the areas located under the photovoltaic panels, in order to assess the possible beneficial effects offered by solar panels in offering protection to these animals from their predators, therefore possibly enhancing the local fauna species richness and abundance. This monitoring will be conducted - by Company's Biodiversity Assistant Specialist during the construction and operation phase.
- accidents involving wildlife or the observation of live animal or carcasses along the permanent access roads or in the areas occupied by permanent infrastructures will be recorded. Additional mitigation measures to discourage wildlife presence on site and avoid roadkill will be taken if needed.

7.3.3 Decommissioning/Closure Phase

The Project is not expected to be decommissioned at least for 30 years. Impacts during decommissioning are expected to be temporary and the magnitude of the impact will depend on how much of the infrastructure is removed.

The general focus of the decommissioning and closure phase is to rehabilitate the disturbed lands to create stable, non-polluting and self-sustaining ecosystems capable of being incorporated into the future landscape, which will be consistent with activities in the general surrounding area. However, considering that Decommissioning and Closure will not happen for many years, the future land use of the area is not known, and no detailed information is available at this stage, it is not possible to discuss in detail the effects of this phase on the biodiversity component.

In general, it is expected that during decommissioning, the impact factors will be similar to those considered for the construction phase.

However, positive impacts deriving from the re-establishment of natural vegetation and the restoration of the disturbed areas will allow to reclaim most of the areas with an expected overall positive effect on biodiversity compared to the operation phase.

7.3.4 Net loss Assessment for Natural and Critical Habitats

The present net loss assessment identifies and discusses residual and unavoidable impacts on Natural Habitats and on Critical Habitats. Residual impacts are assessed considering the effect of the avoidance mitigation and monitoring measures for construction and operation.

7.3.4.1 Natural Habitats

For Natural Habitats direct impacts are mainly associated with habitat loss in correspondence of the permanent footprints of the Project.

Restoration activities will be conducted on all temporary facilities used for the construction phase (i.e., campsite and administrative building). It is expected that a total of 10.78 ha occupied by temporary facilities during construction will be restored with the aim of returning the areas to their former natural condition as "E6.2-Continental inland salt steppes".

The effect of indirect impacts such as emission of noise, dust, and light, increase in vehicular traffic, accidental introduction and dispersal of alien species. will be mitigated by measures presented in for the construction and operation phases to the point that their effect on Natural Habitat and Species of Conservation Concern is expected to be negligible. Therefore, the only direct impacts remaining will be those due to the presence of permanent buildings/infrastructures.

Monitoring measures and remedial actions are planned and will be carried out during operation to ensure the avoidance and minimization of any indirect impacts and the full restoration of the natural habitats within the area of the temporary facilities.

Considering that no detailed information is available at this stage on the decommissioning and closure plan that will occur after 30 years of operation, using a precautionary approach, the net loss is calculated conservatively at the end of the operation phase corresponding to the areas permanently occupied by the presence of permanent buildings/infrastructures.

Permanent buildings/infrastructures occupy an area of 10.78 ha. This area is considered as an unavoidable residual impact and as a net loss of the natural habitat "E6.2 - Continental inland salt steppes".

In addition, PV panels occupy an area of about 241.70 ha that also fell within "E6.2 - Continental inland salt steppes" habitat. Within this areas flora and vegetation is expected to recover during the operation phase. In fact, SPPs have shown to determine beneficial effects on biodiversity, observed in the many case studies considered and reported also by IUCN Guidelines (Bennun *et al.*, 2021[42]), especially when a Project is accompanied by implementation of a long-term management and restoration measures.

Literature shows several examples of positive impacts for biodiversity deriving from the construction of SPPs, especially on arid grassland ecosystems, such as increased plant species diversity and soil microorganisms (Bai et al., 2022[43]), increase in plant species diversity, plant biomass and plant functional traits connected to reproductive fitness (Zhai et al., 2018[44]), increase aboveground biomass, soil moisture and vegetation cover (Hassanpour et al., 2018[45], Zhang et al., 2023[46]), floral and pollinator abundance (Graham et al., 2021[47]).

The particular edaphic conditions present under the PV panels and the grazing exclusion, could potentially determine an increase in local species richness, diversity and biomass for the most common and generalist

[42] Bennun L., van Bochove J., Ng C., Fletcher C., Wilson D., Phair N., Carbone G. (2021). Mitigating biodiversity impacts associated with solar and wind energy development. Guidelines for project developers. Gland, Switzerland: IUCN and Cambridge, UK: The Biodiversity Consultancy.

[43] Bai Z., Jia A., Bai Z., Qu S., Zhang M., Kong L., Sun R., Wang M. (2022). Photovoltaic panels have altered grassland plant biodiversity and soil microbial diversity. Front Microbiol. 2022 Dec 15;13:1065899. doi: 10.3389/fmicb.2022.1065899. PMID: 36590393; PMCID: PMC9797687

[44] Zhai B., Gao Y., Dang X. H., Chen X., Cheng B., Liu X. J. & Zhang C. (2018). Effects of photovoltaic panels on the characteristics and diversity of *Leymus chinensis* community. Chinese Journal of Ecology. 37. 2237-2243. 10.13292/j.1000-4890.201808.029

[45] Hassanpour E., Selker J. and Higgins C. (2018). Remarkable agrivoltaic influence on soil moisture, micrometeorology and water-use efficiency. PLOS ONE. 13. e0203256. 10.1371/journal.pone.0203256.

[46] Zhang Y., Tian Z., Liu B., Chen S. and Wu J. (2023) Effects of photovoltaic power station construction on terrestrial ecosystems: A meta-analysis. Front. Ecol. Evol. 11:1151182. doi: 10.3389/fevo.2023.1151182

[47] Graham M., Ates S., Melathopoulos A., Moldenke A., DeBano S., Best L. and Higgins C. (2021). Partial shading by solar panels delays bloom, increases floral abundance during the late-season for pollinators in a dryland, agrivoltaic ecosystem. Scientific Reports. 11. 7452. 10.1038/s41598-021-86756-4

flora species (Tanner et al., 2020[48]) compared to the surrounding overgrazed continental salt steppe habitat. However, the change could disadvantage the specialist species, such as arid and salt tolerant endemic species due to the novel microenvironments generated under the solar panels. Endemic species may be particularly disadvantaged because they often have limited distributions, narrow climatic envelopes, or specialized life histories.

Specific mitigation measures for the long-term management and restoration of the temporary facilities and PV panels are identified in the previous chapters to maximize the potential positive effects on biodiversity and ecosystem services and mitigate the negative impacts.

For some fauna species the presence of a fenced area occupied by permanent facilities and PV panels will create a loss of potential habitats, while for others in particular among the species of conservation concern Common Tortoise (*Testudo graeca*, VU) and Marable Polecat (*Vomela peregusna*, VU) the area could still be considered a suitable habitat, and in some cases the fence and the PV panels could even offer protection from grazing and from predators.

The presence and abundance of most affected flora and fauna species of conservation concern will be carefully monitored within the AoI. Specific monitoring measures for both flora and fauna species will be detailed in the Biodiversity Management Plan. In case set Key Performance Indicator are not met remedial actions will be proposed and implemented by the Company's Biodiversity Assistant Specialist

The results of the monitoring during the operation phase will also allow to confirm or modify the net loss estimated for Natural Habitat. In case of non-conformities remedial actions will be elaborated, including additional mitigation and offset measures.

7.3.4.2 Critical Habitats

Potential Critical Habitats (CHs) identified within the AoI could be triggered by two fauna species: the Leopard Barbel (*Luciobarbus subquincunciatus, CR*) and Euphrates Softshell Turtle (*Rafetus euphraticus, EN*). However, since no biodiversity field survey was carried out within the AoI the presence of these species within the AoI needs to be confirmed.

No net loss is expected for these species considering that only indirect impacts on freshwater habitat are possible and that strong mitigation and monitoring measures are in place.

These mitigation measures presented for the construction and operation phase are considered sufficient to avoid any long-term loss, however monitoring on freshwater habitat during both construction and operation phase will be crucial to ensure these measures are properly applied and ensure that corrective actions are in place in a timely manner, if needed.

Table 7-91: Potential Net Loss of Species Determining CH

Taxon	Species	Global IUCN Status	Lit./ Obs.	Net Loss
Fish	Leopard Barbel *(Luciobarbus subquincunciatus)*	CR	L	No net loss is expected for these species considering that only indirect impacts on freshwater habitat (C2.3 and C2.5) are possible

[48] Tanner K. E., K. A. Moore-O'Leary, I. M. Parker, B. M. Pavlik, and R. R. Hernandez. (2020). Simulated solar panels create altered microhabitats in desert landforms. Ecosphere 11(4):e03089. 10.1002/ecs2.3089.

Taxon	Species	Global IUCN Status	Lit./ Obs.	Net Loss
Reptile	Euphrates Softshell Turtle *(Rafetus euphraticus)*	EN	L	and that strong mitigation and monitoring measures are in place.

In case the presence of the species is confirm by the additional studies, in order to ensure order to ensue net gain for these species, in addition to the mitigation measures already suggested, additional offset measures will be implemented. These measures include:

a) Educational activities to be performed in villages and local schools with the aim of sensitizing the population on the protection of freshwater habitat and the potential damage of illegal practices such as waste dumping.

b) Protection or restoration of natural habitats affected by impacts other than the Project (erosion, past development and infrastructures, etc.) by:

- Reforestation of suitable areas using mix of tree and shrub species and planting schemes on techniques to maximize biodiversity and mimic mixed forest vegetation succession;
- Sustainable grazing management of steppe habitats to promote flora species diversity, cover and minimize soil erosion.

c) Restoration/creation of riparian vegetation to provide a buffer around existing wetlands to protect them from disturbance and runoff of pesticide and other pollutants.

Table of Contents

TABLES

No table of figures entries found.

FIGURES

No table of figures entries found.

APPENDICES

No table of contents entries found.

11.0 CLIMATE CHANGE RISK ASSESSMENT

The "*Equator Principles 4 – Principle 2: Environmental and Social Assessment*" requires that a Climate Change Risk Assessment (CCRA) is required to be prepared:

- For all Category A and, as appropriate, Category B Projects and will include consideration of relevant physical risks as defined by the TCFD[1], and
- For all Projects, in all locations, when combined Scope 1 and Scope 2 Emissions are expected to be more than 100,000 tonnes of CO_2 equivalent annually. Consideration must be given to relevant Climate Transition Risks (as defined by the TCFD) and an alternatives analysis completed which evaluates lower Greenhouse Gas (GHG) intensive alternatives.

TCFD divided climate-related risks into two major categories In the Recommendations Report[2], which are:

- **Transition Risks:** Risks related to the transition to a lower-carbon economy, and
- **Physical Risks:** Risks related to the physical impacts of climate change.

Since the Project is proposed as "Category A" according to EP4, a Climate Change Risk Assessment (CCRA) has been prepared by WSP. The combined emissions of the Project are below 100,000 tons of CO_2 equivalent annually, therefore, only Physical Risks are included in the CCRA Report.

The results of the CCRA show the degree to which the project region is vulnerable to the physical risks (acute and chronic) of climate change and the potential consequences. The project area's temperatures are gradually rising, and the average total amount of precipitation is trending downward. According to future forecasts, this trend will continue and, if mitigation measures for climate change are insufficient, there may be even more drastic changes by the end of the century. The climate risk assessment for the project area draws attention to the potential risks.

This assessment should be considered a screening level CCRA aimed at supporting the Environmental and Social Assessment process in the frame of the Equator Principles IV provisions. This CCRA relies on the interpretation of the results of modelling of future climatic conditions which have an inherent high level of uncertainty, and on the identification of project vulnerability that are based on a feasibility level of definition. The conclusions and recommendations are meant to guide the Client in defining an appropriate Risk Management framework and should not be relied upon in the design and sizing of specific infrastructures, nor in taking financial decisions regarding the feasibility or level of exposure to future damages or losses related to climate change.

[1] Task Force on Climate-related Financial Disclosures (TCFD)

[2] TCFD. (2017). *Recommendations of the Task Force on Climate-related Financial Disclosures*. Task Force on Climate-Related Financial Disclosures, June.

DRAFT REPORT

Project ANKA - G4-Viranşehir-5,7,8 Solar Power Plant Project, Şanlıurfa

CLIMATE CHANGE RISK ASSESSMENT

Submitted to:

KALYON YEKA GES 3 ve 4 GÜNEŞ ENERJİSİ YATIRIMLARI A.Ş.

Mimar Sinan Mah. Çavuşdere Cad. No: 41A İç Kapı No: 30 Üsküdar / İstanbul, Türkiye

Submitted by:

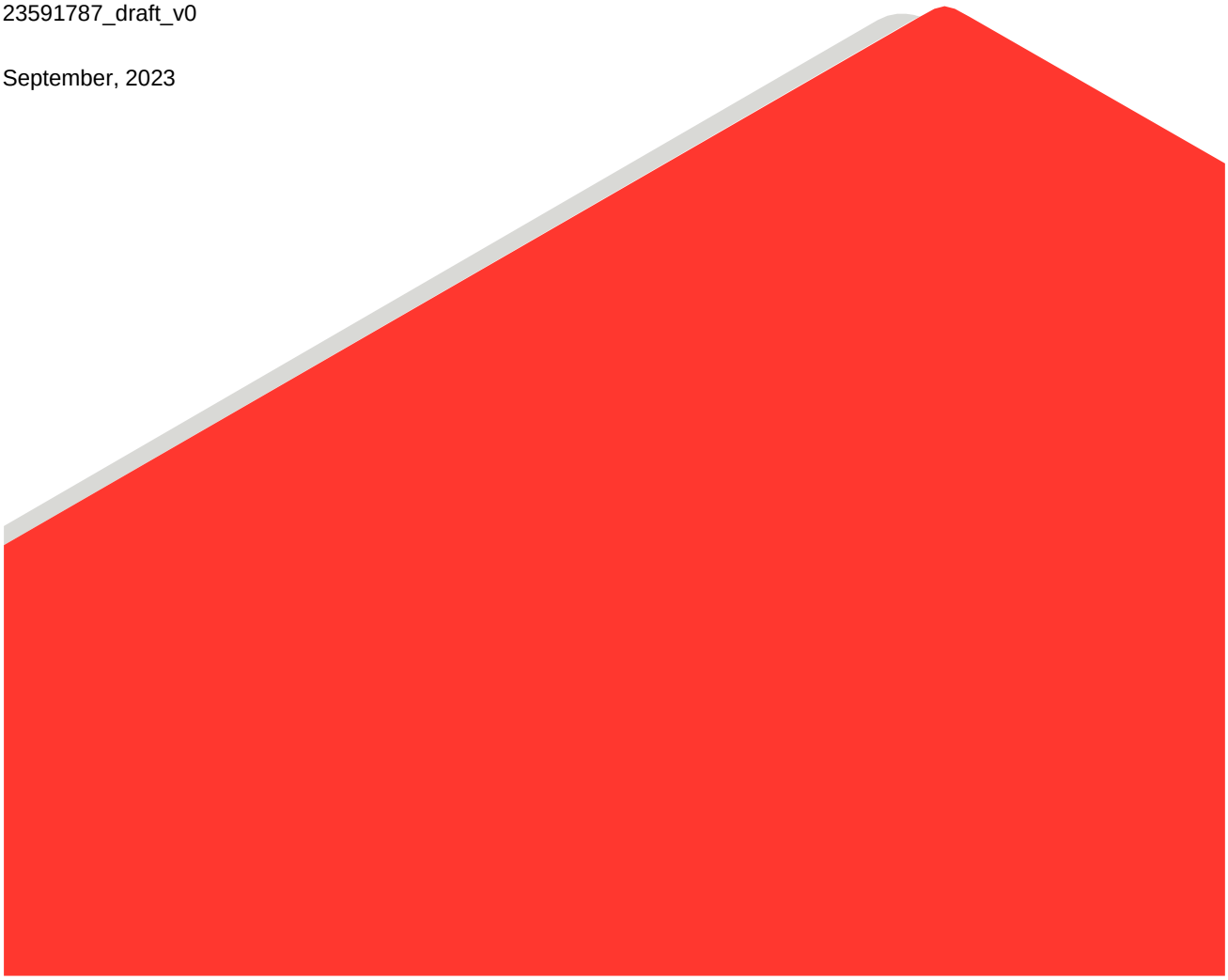
WSP Turkey Ltd.

Hollanda Cad. 691. Sok. Vadi Sitesi No:4, Yıldız 06550 Ankara, Türkiye

+90 312 4410031

23591787_draft_v0

September, 2023



Distribution List

1 copy - Lenders

1 copy - KALYON YEKA GES 3 ve 4 GÜNEŞ ENERJİSİ YATIRIMLARI A.Ş.

1 copy - WSP Türkiye

Record of Issue

Company	Client Contact	Version	Date Issued	Method of Delivery
KALYON YEKA GES 3 ve 4 GÜNEŞ ENERJİSİ YATIRIMLARI A.Ş.	Defne Arısoy	Draft_rev0	15.09.2023	e-mail

Table of Contents

TABLES

FIGURES

1.0 INTRODUCTION

G4-Viranşehir-5,7,8 Solar Power Plant Project (“the Project”) having a capacity of 195 MWp/150MWe, is planned by Kalyon Enerji Yatırımları A.Ş. (“Kalyon Enerji”) and Kalyon YEKA GES 3 ve 4 Güneş Enerjisi Yatırımları A.Ş. (”Client”), a subsidiary of Kalyon Enerji. The Project will be located in Şanlıurfa Province, in the Viranşehir District, Kadıköy Neighbourhoods in Türkiye.Kalyon Enerji retained WSP Danışmanlık ve Mühendislik Ltd. Şti. (“WSP Türkiye”) to prepare the Environmental and Social Impact Assessment (“ESIA”) for the Project in compliance with the national and international requirements detailed above.

Climate change is a multifaceted and complex issue that can lead to serious environmental and socioeconomic consequences and even threaten the security of countries. The impacts of climate change have become one of the most important challenges for the life of future generations.

This report presents a Climate Change Risk Assessment (CCRA) for the evaluation, at present and in the future, of the potential climate-related events that could affect the Project and that may exacerbate as a consequence of the climate change.

Within this framework stands the revision and release of the Equator Principles[3] (EPs, version IV) which is a risk management framework adopted by financial institutions for determining, assessing, and managing environmental and social risks in projects and is primarily intended to provide a minimum common standard for due diligence and monitoring to support responsible risk decision-making. Currently more than 110 Equator Principles Financial Institutions (EPFIs) have officially adopted the EPs, covering the majority of international project finance debt within developed and emerging markets. The EPs categorize projects that are financed by EPFIs based on the environmental and social impacts that they generate and the risks that they may pose to financing. Category A projects have the highest risks, while category C is used for low-risk projects.

According to EPIV, a Climate Change Risk Assessment (CCRA) is required to be undertaken:

- For Category A and, as appropriate, Category B projects. For these projects, the CCRA has to include consideration of relevant climate-related ‘Physical Risks’ as defined by the Task Force on Climate-Related Financial Disclosure (TCFD)[4].
- For all projects, in all locations, when combined Scope 1 and Scope 2 emissions are expected to be more than 100,000 tons of CO_2 equivalent annually. For these projects, the CCRA is to include considerations of climate-related ‘Transition Risks’ (as defined by the TCFD). The CCRA must also include a completed alternatives analysis which evaluates lower greenhouse gas (GHG) intensive alternatives.

As per the environmental and social categorization criteria of the applicable standards, based on the discussions held with the Lenders and Lenders’ Advisor, available data, the National EIA, Project area being located inside Key Biodiversity Area (KBA), the Project is categorised as “Category A”. Since combined emissions of the Project are below 100,000 tons of CO_2 equivalent annually, only Physical Risks are included in this CCRA Report.

The TCFD Recommendations on Climate-related Financial Disclosures state that “Physical risks resulting from climate change can be event driven (acute) or longer-term shifts (chronic) in climate patterns”.

[3] The Equator Principles Association, 2020 (The Equator Principles_EP4_July2020 (equator-principles.com).

[4] Task Force on Climate-Related Disclosures (TCFD), Recommendations of the Task Force on Climate-related Financial Disclosures, June 2017.

Acute physical climate risks can include increased severity and frequency of droughts, storms, floods, heat waves and wildfires. Chronic physical climate risks can include sea level rise and longer-term temperature increase. Climate-related Physical Risks may include a variety of effects:

- Direct damage to assets, as a result of extreme weather events (i.e., drought, storms) or rising sea levels.
- Changes in water availability, sourcing and quality, often with consequent social impacts.
- Disruption to operations, ability to transport goods and supplies and impacts on employee/community safety, and more.

This assessment should be considered a screening level CCRA aimed at supporting the Environmental and Social Assessment process in the frame of the Equator Principles IV provisions. This CCRA relies on the interpretation of the results of modelling of future climatic conditions which have an inherent high level of uncertainty, and on the identification of project vulnerability that are based on a feasibility level of definition. The conclusions and recommendations are meant to guide the Client in defining an appropriate Risk Management framework and should not be relied upon in the design and sizing of specific infrastructures, nor in taking financial decisions regarding the feasibility or level of exposure to future damages or losses related to climate change.

2.0 PROJECT BACKGROUND

The Project area had been declared as an area suitable for the development of a solar project: a Renewable Energy Resource Area (“YEKA”). Consequently, Ministry of Energy and Natural Resources had launched the "Competition Announcement on the Allocation of Renewable Energy Resource Areas and Connection Capacities Based on Solar Energy"; YEKA SPP-4 Erzin-Viranşehir (including G-4-Viranşehir-5,7,8) competitions were held on 28.06.2022. YEKA Right of Use Agreements were signed on 08.08.2022 with Kalyon Enerji Yatırımları A.Ş., which won the competition held by the Ministry. The main components of the plant consist of solar panels, a panel carrier system, an inverter station (inverter, transformer, ring main unit and the substation). Infrastructure and utilities can be listed as the administrative building, Supervisory Control and Data Acquisition (SCADA) System and the overhead transmission line (OHTL). Once the Solar Power Plant is put into operation, it is planned to produce 390000 MWh-electricity in annual basis, and the electricity produced will be transferred to the Viranşehir Substation via a new ~26.7 km length 154 kV OHTL. Details of the Project components are provided in Chapter 3 of this report.

The Project pre-construction activities, namely, mobilization of temporary site facilities, site preparation, grading and levelling, material delivery and storage and certain early trenching activities for cable laying have been started in August 2023. The construction period of the Project is estimated to be 10 months, test and commissioning period will be 7 months and the total operation period will be 30 years.

The Project will be established on a pasture land of 270 hectares. Adıyaman-Şanlıurfa-Diyarbakır Planning Region 1/100.000 Scaled Environmental Master Plan Amendment (M44, N42 and N43 Plan Plots, Plan Amendment Explanation Report) was approved on 07.07.2020 in accordance with Article 102 of the Presidential Decree No. 1. This Environmental Master Plan is located within the borders of "Grassland-Pastureland" as land uses in the 1/100.000 scale N43 Plan. The Project areas are also classified as "Pastureland" in terms of title deed. .

3.0 METHODOLOGY

According to the ISO 14091 Standard "Adaptation to climate change – Guidelines on vulnerability, impacts and risk assessment[5]" Climate Risk Assessments fulfil diverse objectives depending on the information needs of a Client, and on challenges caused by climate change. These can include the following.

- Raising awareness: Risk assessments help increase awareness of the consequences of climate change.
- Identification and prioritization of risks: many factors contribute to a system's sensitivity, exposure and adaptive capacity. Climate change risk assessments provide insight into these factors and this helps the Client to prioritize the risks to be addressed.
- Identification of entry points for climate change adaptation intervention: the final results and the process of risk assessment can help identify possible adaptation responses. Risk assessments can show where early action is required.
- Tracking changes in risk and monitoring and evaluating adaptation: repeating risk assessments can help to track changes over time and generate knowledge on the effectiveness of adaptation.

This section of the CCRA chapter presents an overview of the methodology for CCRA for physical risks and applies it to the Project. The assessment will result in the identification of physical risks that may affect the Project within a certain time frame, and in a number of adaptation measures that the Client may consider and implement to mitigate these risks.

WSP developed a risk assessment methodology based on existing methodologies for the assessment of climate change risks and vulnerability as part of adaptation strategies. Guidelines and methodologies from the ISO 14091 as well as the Intergovernmental Panel on Climate Change (IPCC)[6] and the World Bank Group[7] were used as a guidance for defining factors that contribute to determine the risk. These methodologies consider a variety of risk components whose definitions are as follows:

- Climate-related Hazard: natural or human induced climate-related hazard, such as flood, wildfire, extreme heat, that can occur at the Project Site. The changes in intensity of hazard related events and of their probability over-time are influenced by climate change.
- Exposure: the possibility for a Project in a specific site to be adversely affected by a certain hazard because of the presence of certain Project services, resources, infrastructures, people and other Project's intrinsic elements that are prone to be affected. A Project, depending on its intrinsic nature and characteristics, may or may not be exposed to a certain hazard that occur at the Project Site. Exposure is therefore an indicator of if the Project "can or cannot be affected" by a certain hazard.
- Sensitivity: propensity or predisposition of elements of the Project to be affected by a certain hazard. Sensitivity is a measure of "how much" a Project exposed to a certain hazard can be affected.
- Adaptive capacity: the ability of the Project to adjust to climate hazard-related events, to mitigate potential damages, to take advantage of opportunities, or to respond to the consequences.

[5] ISO 14091 gives guidelines for assessing the risks related to the potential impacts of climate change. It describes how to understand vulnerability and how to develop and implement a sound risk assessment in the context of climate change.

[6] The Intergovernmental Panel on Climate Change (IPCC) is the United Nations body for assessing the science related to climate change.

[7] The World Bank Group (WBG) is a family of five international organizations that make leveraged loans to developing countries.

- Vulnerability: expresses the magnitude of potential effects and consequences of climate hazard-related events on elements of the Project. Vulnerability results from the combination of Sensitivity and Adaptive capacity.
- Risk: the result of the combination of Hazard probability or intensity at a certain time and the Vulnerability.

This methodology assesses all different climate-related hazards independently, at present and in the future, over a time consistent with the temporal scope of the assessment, and according to multiple future carbon emission scenarios. For each specific hazard, the risk components are assigned a qualitative class ("i.e., "high", "medium", "low") and then combined using qualitative matrices, as explained in Figure 1. The result is a class of Risk ("low", "medium", "high" or "extreme") for each climate-related hazard considered in the analysis. The following figure shows risk assessment process for a specific hazard "h" the Project is exposed to.

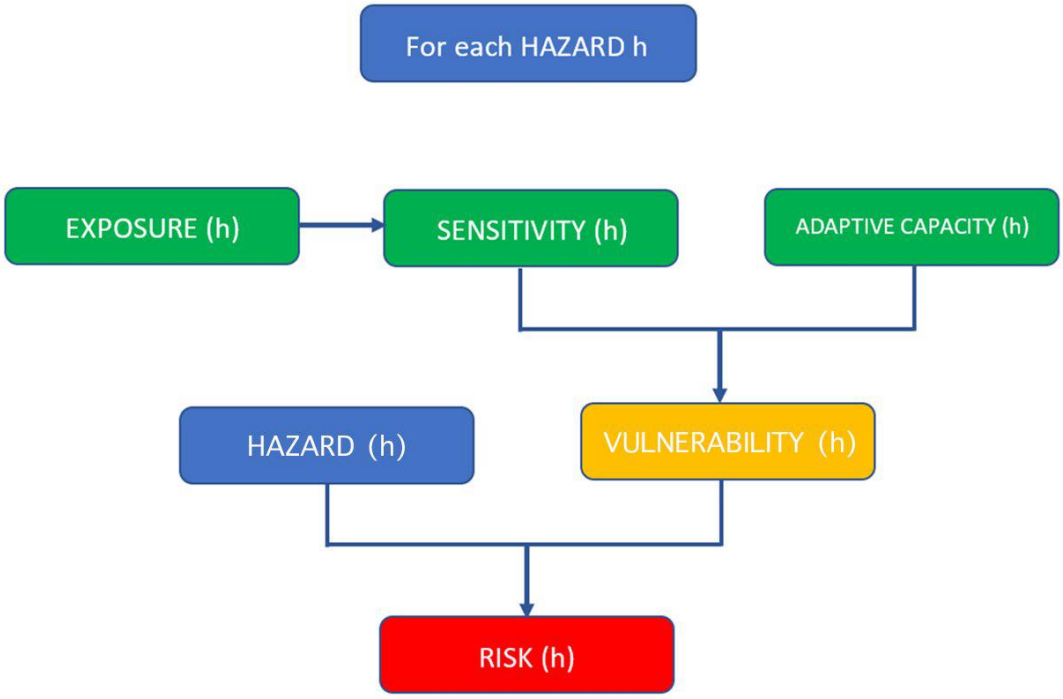


Figure 1: Workflow of the risk assessment for a specific hazard "h" the Project is exposed to, showing how different risk factors are combined across the analysis.

4.0 CLIMATE CHANGE RISK ASSESSMENT

This section presents the of CCRA that takes into consideration all project facilities as described in ESIA Section 3 - Project Description.

4.1 Current Climate Overview

The Project is located in the city of Şanlıurfa, Türkiye. Information collected from the World Bank Group – Climate Change Knowledge Portal[8] was used for an overview of the current climate and the mean climate projections. Meteorological data were obtained from Meteorology Stations located around the Project site. The data were recorded in Şanlıurfa Meteorology Station and obtained from the Turkish State Meteorology General Directorate to establish the basic conditions for meteorology and climatology.

Türkiye is located between the subtropical and temperate zones, giving rise to a variety of climate zones observed in the country. These climate zones include the Mediterranean Climate, characterized by hot and dry summers and mild, rainy winters. The Black Sea Climate features cool summers and warm winters along the coastal areas, while the higher regions experience cold, snowy winters. The Terrestrial Climate exhibits significant temperature differences between seasons and day and night. Additionally, the Marmara Climate acts as a transition zone, combining characteristics of the Terrestrial, Black Sea, and Mediterranean climates. In terms of precipitation, Türkiye receives the majority of its rainfall during winter and spring. During the summer months, precipitation decreases, while temperatures and evaporation rates increase. The annual long-term mean precipitation is recorded at 574 mm. However, there has been an observable increase in the number of meteorological extreme events, particularly since 2000 (covering the period from 1981 to 2017). These events include phenomena such as severe storms, floods, and heatwaves, reflecting a trend towards more extreme weather occurrences in recent years.

Şanlıurfa is located in the Southeastern Anatolia region of Türkiye. Şanlıurfa has a continental climate. Summers are very dry and hot; winters are rainy and relatively mild. Şanlıurfa is closer to the equator in terms of mathematical location. It is located in an area far from the influence of the sea. For this reason, the continental climate feature predominates. This feature shows itself in terms of temperature and precipitation. According to the observation records of Şanlıurfa Meteorology Station between 1960 and 2021, the annual average temperature is 18.6°C. The highest temperature was recorded in July with 46.8°C, and the lowest temperature was measured in February with -9.6°C.. Temperature observations show that Şanlıurfa has warmed significantly in recent decades. Between 1901 and 2021, the average annual temperature increased by about 1.5°C as can be seen from Figure 2 below.

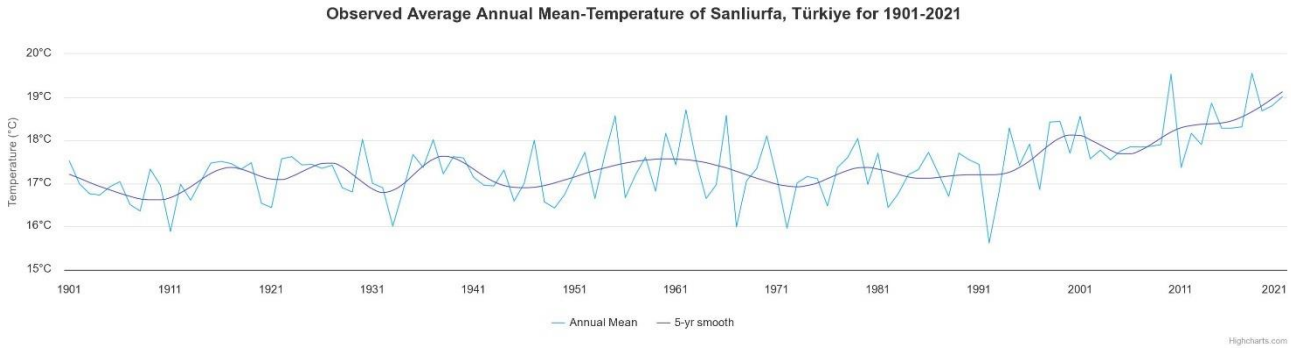


Figure 2: Observed Average Annual Mean-Temperature of Şanlıurfa for 1901-2021

[8] The Climate Change Knowledge Portal (CCKP) provides global data on historical and future climate, vulnerabilities, and impacts.

Historical climate trends show that between the years 1901 and 2021 the average annual precipitation in Şanlıurfa decreased about 24.74 mm as presented in Figure 3. According to the observation records of Şanlıurfa Meteorology Station between 1960 and 2021, the annual average total precipitation is 462.5 mm. The maximum amount of precipitation was measured in January with 119.5 mm.

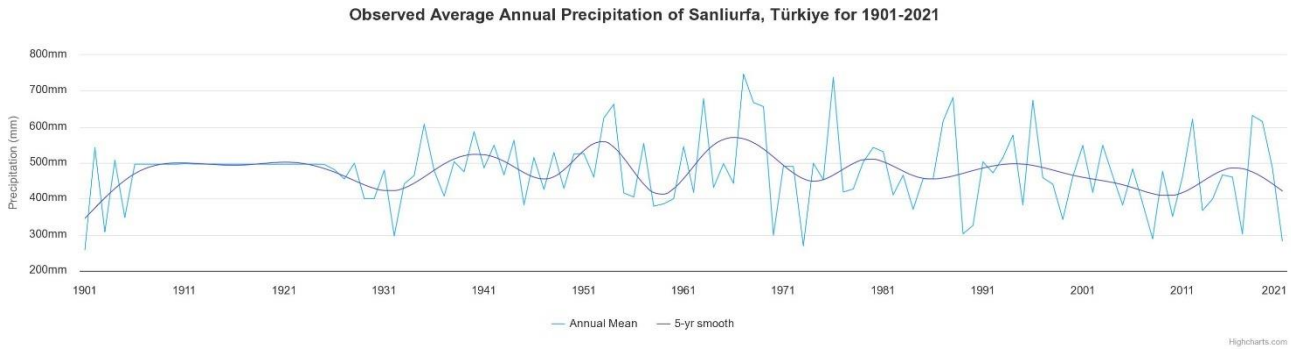


Figure 3: Observed Average Annual Precipitation of Şanlıurfa for 1901-2021

4.2 Climate Projections

World Bank Climate Change Knowledge Portal was used for the climate projections which uses climate projection data refers to modeled data generated by the Coupled Model Inter-comparison Projects (CMIPs) of the World Climate Research Program. The specific data presented here is from CMIP6, which is the Sixth phase of the CMIPs. These CMIPs serve as the fundamental data source for the Intergovernmental Panel on Climate Change (IPCC) Assessment Reports. CMIP6, in particular, supports the IPCC's Sixth Assessment Report.

In analyzing and interpreting climate change projections from multi-model ensembles, outputs are presented as a range, which represents model spread. CCKP identifies the range of 10th and 90th percentiles, as and median (or 50th percentile). The 10th percentile indicates that just 10% of simulation outputs fall below this result. The 90th percentile means that 90% of all simulation outputs fall below this result.

The projection data is provided at a resolution of 1.0º x 1.0º (100 km x 100 km), offering a spatial representation of climate information. The data used are those referring to the Multi model ensemble for the following scenarios:

- SSP1 – 2.6: optimistic scenario in which global CO_2 emissions are drastically reduced reaching net zero after 2050 due to an evolution of societies towards environmental and social sustainability and temperatures stabilize around 1.8°C more by the end of the century;
- SSP2 – 4.5: Intermediate scenario in which CO_2 emissions hover around current levels before starting to decline mid-century but fail to reach net zero by 2100. Socio-economic factors follow their historical trends without significant changes. Progress towards sustainability is slow, with development and income growing unevenly. In this scenario, temperatures rise by 2.7°C by the end of the century;
- SSP5 – 8.5: Scenario where current CO_2 emission levels roughly double by 2050. The global economy is growing rapidly, but this growth is fuelled by fossil fuel exploitation and high-intensive lifestyles energy. By 2100, the global average temperature will be as much as 4.4°C higher.

Since the construction period of the Project is estimated to be 10 months and the total operation period will be 30 years, two time periods which includes this total period (2020-2039 and 2040-2059) were taken into consideration within the scope of the CCRA.

Temperature

In the graph below, black line belongs to the historical refence data of the years 1995-2014, dark blue line corresponds to the projections under SSP1-2.6 and orange line represents SSP2-4.5, while dark red line represents the projections under the SSP5-8.5 scenario. The area above each line presents the 90th percentile while the area below presents the 10th percentile. Significant increase in mean annual temperature is projected for Şanlıurfa, under SSP5-8.5 by the end of the century as can be seen from Figure 4.

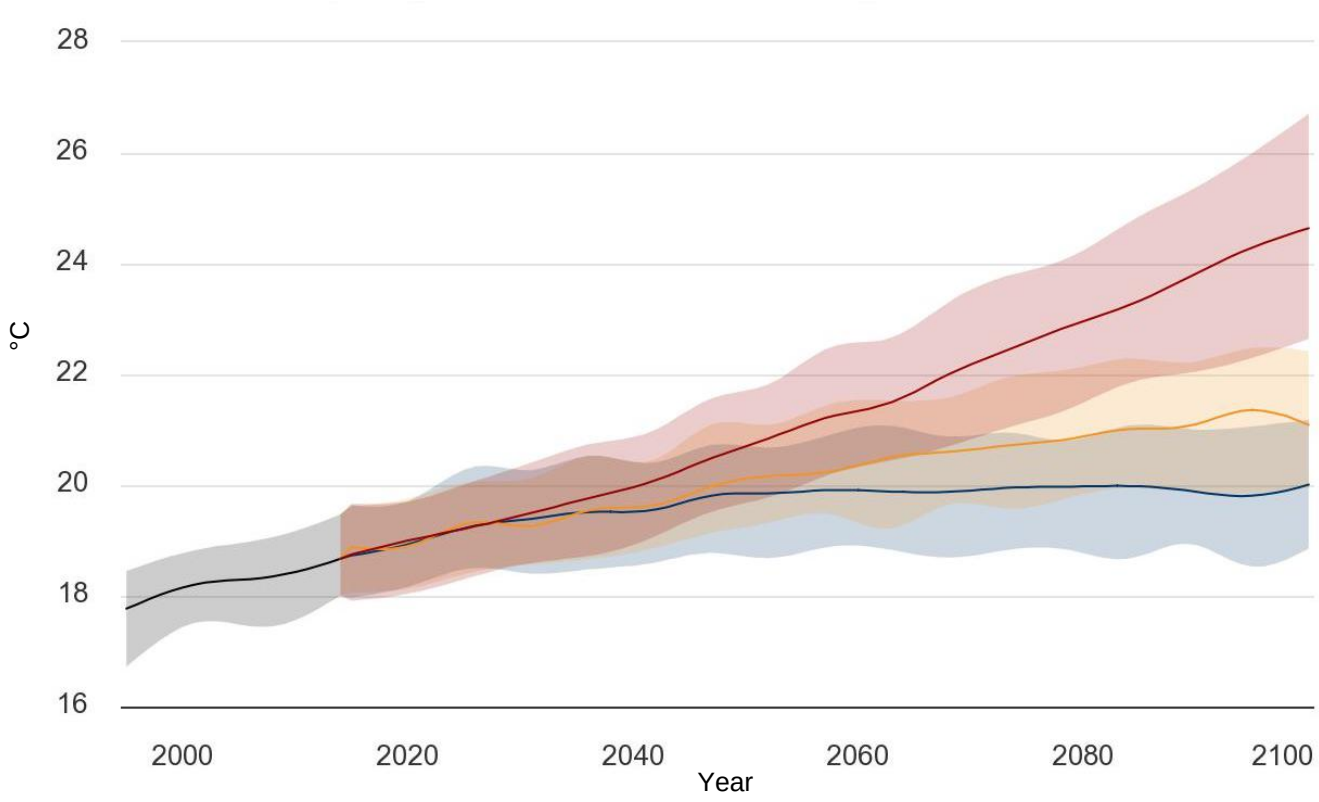


Figure 4: Projected Mean Temperature - Şanlıurfa (Ref. Period: 1995-2014), Multi-Model Ensemble

The projections for the mean temperatures according to the years under all scenarios are given in Table 1.

Table 1: Projected Mean-Temperature for Şanlıurfa

Year	SSP1-2.6		SSP2-4.5		SSP5-8.5	
	50th Percentile (or Median)	10-90th Percentile Range	50th Percentile (or Median)	10-90th Percentile Range	50th Percentile (or Median)	10-90th Percentile Range
2040	19.52°C	18.54 to 20.42°C	19.60°C	18.78 to 20.42°C	19.96°C	18.92 to 20.87°C
2060	19.91°C	18.91 to 21.04°C	20.36°C	19.32 to 21.54°C	21.34°C	20.33 to 22.58°C
2080	19.98°C	18.77 to 20.85°C	20.88°C	19.84 to 22.14°C	22.96°C	21.49 to 24.24°C
2100	20.01°C	18.85 to 21.18°C	21.09°C	19.95 to 22.42°C	24.64°C	22.64 to 26.71°C

The projections for the mean temperature anomaly for each month between the years 2021 and 2100 under each scenario are given in Table 2, Table 3, Table 4.

Table 2: Projected Mean-Temperature Anomaly Şanlıurfa, (SSP1-2.6, Multi Model Assemble)

Year / Month	2021-2030	2031-2040	2041-2050	2051-260	2061-2070	2071-2080	2081-2090	2091-2100
January	0.87°C	1.03°C	1.13°C	1.53°C	1.57°C	1.34°C	1.35°C	1.51°C
February	0.99°C	1.01°C	1.11°C	1.19°C	1.52°C	1.43°C	1.66°C	1.40°C
March	0.59°C	1.04°C	0.88°C	1.15°C	1.05°C	1.20°C	1.39°C	1.51°C
April	0.93°C	0.78°C	0.98°C	1.33°C	1.47°C	1.25°C	1.30°C	1.18°C
May	1.22°C	1.25°C	1.51°C	1.81°C	1.68°C	1.65°C	1.77°C	1.56°C
June	1.00°C	1.22°C	1.59°C	1.64°C	1.80°C	2.00°C	1.68°C	1.52°C
July	1.03°C	1.40°C	1.66°C	1.92°C	1.81°C	1.93°C	2.01°C	1.92°C
August	1.39°C	1.51°C	1.88°C	2.01°C	1.99°C	2.08°C	2.19°C	2.25°C
September	1.11°C	1.34°C	1.95°C	1.84°C	1.91°C	2.18°C	1.87°C	1.58°C
October	0.99°C	1.55°C	1.70°C	1.54°C	1.60°C	1.51°C	1.76°C	1.12°C
November	1.01°C	1.07°C	1.27°C	1.27°C	1.38°C	1.26°C	1.19°C	1.26°C
December	0.94°C	1.17°C	1.19°C	1.44°C	1.41°C	1.64°C	1.32°C	0.94°C

Table 3: Projected Mean-Temperature Anomaly Şanlıurfa, (SSP2-4.5, Multi Model Assemble)

Year / Month	2021-2030	2031-2040	2041-2050	2051-260	2061-2070	2071-2080	2081-2090	2091-2100
January	0.73°C	1.15°C	1.13°C	1.73°C	1.75°C	2.02°C	2.33°C	2.42°C
February	0.94°C	0.97°C	1.35°C	1.67°C	1.98°C	2.14°C	2.40°C	2.47°C
March	0.59°C	0.78°C	1.44°C	1.70°C	1.81°C	2.00°C	2.24°C	2.40°C
April	0.47°C	1.02°C	1.56°C	1.61°C	2.13°C	2.19°C	2.65°C	2.50°C
May	0.99°C	1.40°C	1.67°C	2.02°C	2.59°C	2.68°C	2.72°C	2.82°C
June	0.94°C	1.54°C	1.87°C	2.19°C	2.39°C	2.96°C	2.97°C	3.37°C
July	1.11°C	1.56°C	2.02°C	2.31°C	2.65°C	3.06°C	3.46°C	3.72°C
August	1.28°C	1.58°C	2.07°C	2.54°C	2.95°C	3.34°C	3.69°C	3.80°C
September	1.33°C	1.63°C	2.15°C	2.61°C	2.61°C	2.90°C	3.17°C	3.50°C
October	1.27°C	1.34°C	1.68°C	2.16°C	2.62°C	2.74°C	3.07°C	3.09°C
November	1.04°C	1.10°C	1.26°C	1.90°C	2.19°C	2.42°C	2.37°C	2.59°C
December	0.97°C	1.11°C	1.40°C	1.64°C	1.99°C	1.98°C	2.28°C	2.22°C

Table 4: Projected Mean-Temperature Anomaly Şanlıurfa, (SSP5-8.5, Multi Model Assemble)

Year / Month	2021-2030	2031-2040	2041-2050	2051-260	2061-2070	2071-2080	2081-2090	2091-2100
January	0.55°C	1.19°C	1.41°C	2.12°C	2.90°C	2.91°C	3.82°C	4.50°C
February	0.83°C	0.82°C	1.52°C	2.11°C	2.69°C	3.30°C	3.88°C	4.34°C
March	0.59°C	0.96°C	1.59°C	2.24°C	2.51°C	3.48°C	3.88°C	4.89°C
April	0.74°C	1.07°C	1.76°C	2.34°C	2.73°C	3.83°C	4.36°C	5.22°C
May	0.96°C	1.68°C	2.05°C	2.96°C	3.48°C	4.46°C	5.52°C	6.17°C
June	1.21°C	1.72°C	2.41°C	3.12°C	3.73°C	4.63°C	5.56°C	6.58°C
July	1.10°C	1.80°C	2.62°C	3.35°C	4.10°C	5.23°C	5.87°C	7.20°C
August	1.24°C	1.94°C	2.66°C	3.44°C	4.28°C	5.55°C	6.61°C	7.30°C
September	1.24°C	1.82°C	2.73°C	3.52°C	4.12°C	4.98°C	6.26°C	7.16°C
October	1.26°C	1.63°C	2.30°C	3.07°C	4.19°C	5.03°C	5.49°C	7.02°C
November	0.84°C	1.27°C	1.96°C	2.58°C	3.04°C	3.64°C	4.80°C	5.49°C
December	0.66°C	1.27°C	1.60°C	2.26°C	2.65°C	3.09°C	3.95°C	4.75°C

2020-2039

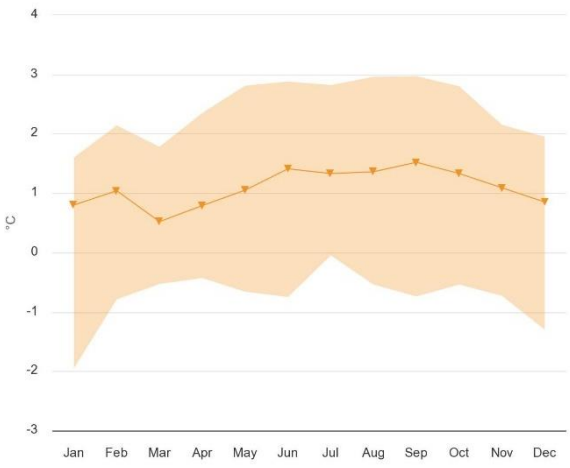
According to SSP1-2.6, SSP2-4.5 and SSP5-8.5 scenarios, Projected Mean-Temperature anomaly for the years 2020-2039 is given in Figures below.

The graph represents monthly temperature anomalies (differences from the long-term average) from January to December for the years 2020 to 2039.

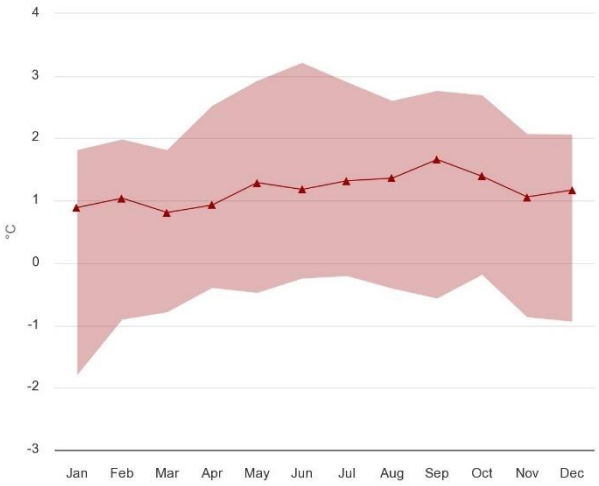
The values above the baseline values that are represented by the line in the middle indicate anomalies which are temperatures that are higher than the long-term average and the values below the baseline negative anomalies indicate the temperatures that are lower than the long-term average.

The highest deviation is expected as an increase of 1.66 ˚C in September under the SSP5-8.5 scenario and -2.40 ˚C as a decrease in January under the SSP1-2.6 scenario as can be seen from the Figure 5 (b) and (a), respectively.

SSP1-2.6 (a)



SSP2-4.5 (b)



SSP5-8.5 (c)

Figure 5: Projected Mean Temperature Anomaly for 2020-2039 - Şanlıurfa (Ref. Period: 1995-2014), Multi-Model Ensemble

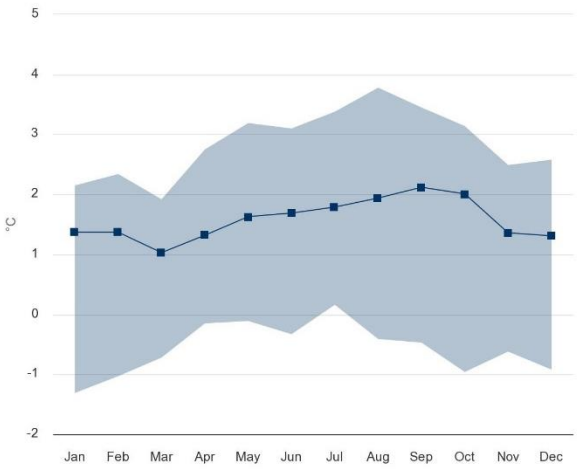
2040-2059

According to SSP1-2.6, SSP2-4.5 and SSP5-8.5 scenarios, Projected Mean-Temperature anomaly for the years 2040-2059 is given in the graphs below.

The graph represents monthly temperature anomalies (differences from the long-term average) from January to December for the years 2040 to 2059.

The values above the baseline values that are represented by the line in the middle indicate anomalies which are temperatures that are higher than the long-term average and the values below the baseline negative anomalies indicate the temperatures that are lower than the long-term average. The highest deviation from the baseline values is expected as an increase of 3.06 ˚C in September under the SSP5-8.5 scenario and -1.31 ˚C as a decrease in January under the SSP1-2.6 scenario as can be seen from the

Figure 6 (c) and (b), respectively.



SSP1-2.6 (a)

SSP2-4.5 (b)

SSP5-8.5 (c)

Figure 6: Projected Mean Temperature Anomaly for 2040-2059 - Şanlıurfa (Ref. Period: 1995-2014), Multi-Model Ensemble

Precipitation

In the graph below, black line belongs to the historical refence data of the years 1995-2014, dark blue line corresponds to the projections under SSP1-2.6 and orange line represents SSP2-4.5, while dark red line represents the projections under the SSP5-8.5 scenario. The area above each line presents the 90th percentile while the area below presents the 10th percentile. Significant decrease in precipitation is projected for Şanlıurfa, under SSP5-8.5 by the end of the century as can be seen from Figure 7.

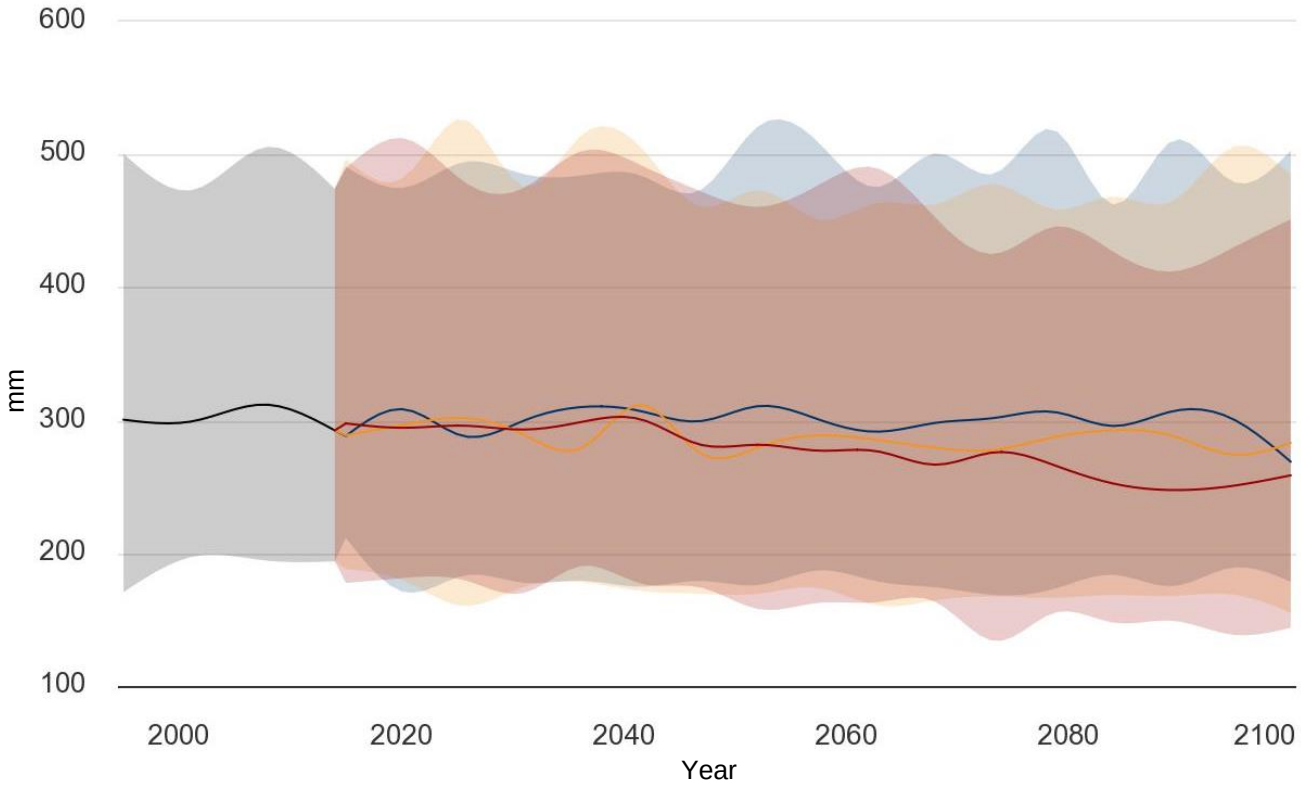


Figure 7: Project Precipitation - Şanlıurfa (Ref. Period: 1995-2014), Multi-Model Ensemble

The projections for the precipitation according to the years under all scenarios are given in Table 5.

Table 5: Projected Precipitation - Şanlıurfa

Year	SSP1-2.6		SSP2-4.5		SSP5-8.5	
	50th Percentile (or Median)	10-90th Percentile Range	50th Percentile (or Median)	10-90th Percentile Range	50th Percentile (or Median)	10-90th Percentile Range
2040	390.20 mm	175.55 to 486.97 mm	306.56 mm	173.36 to 516.44 mm	302.58 mm	181.79 to 498.08 mm
2060	294.38 mm	184.67 to 487.61 mm	287.93 mm	167.80 to 454.63 mm	277.57 mm	162.87 to 487.72 mm
2080	303.94 mm	176.46 to 508.16 mm	289.33 mm	166.78 to 459.13 mm	262.38 mm	156.18 to 445.22 mm
2100	268.80 mm	178.43 to 502.92 mm	283.08 mm	155.23 to 484.64 mm	258.57 mm	143.77 to 451.25 mm

The projections for the projected precipitation anomaly for each month between the years 2021 and 2100 under each scenario are given in Table 6, Table 7, Table 8.

Table 6: Projected Precipitation Anomaly Şanlıurfa, (SSP1-2.6, Multi Model Assemble)

Year / Month	2021-2030	2031-2040	2041-2050	2051-2060	2061-2070	2071-2080	2081-2090	2091-2100
January	2.24 mm	-1.76 mm	-0.82 mm	0.63 mm	1.07 mm	-0.26 mm	-1.17 mm	1.75 mm
February	-0.56mm	-0.24 mm	-1.20 mm	-3.08 mm	-2.13 mm	-0.30 mm	-3.10 mm	-0.68 mm
March	1.31 mm	0.93 mm	0.40 mm	0.40 mm	0.69 mm	0.09 mm	-3.63 mm	-0.55 mm
April	0.29 mm	0.15 mm	0.62 mm	0.22 mm	-2.75 mm	1.99 mm	0.45 mm	0.15 mm
May	0.77 mm	-1.41 mm	0.03 mm	1.03 mm	0.72 mm	-1.88 mm	0.09 mm	0.42 mm
June	0.40 mm	0.15 mm	1.80 mm	0.66 mm	0.22 mm	-0.12 mm	0.86 mm	0.40 mm
July	-0.04 mm	-0.08 mm	-0.04mm	-0.09 mm	-0.23 mm	-0.08 mm	-0.08 mm	-0.10 mm
August	-0.01 mm	0.00 mm	-0.03mm	-0.09 mm	-0.11 mm	-0.07 mm	-0.02 mm	-0.03 mm
September	-0.10 mm	-0.15 mm	-0.19mm	-0.21 mm	-0.15 mm	-0.33 mm	-0.23 mm	-0.59 mm
October	0.20 mm	-1.16 mm	-0.59mm	-1.12 mm	-2.28 mm	0.83 mm	-0.58 mm	-3.13 mm
November	-3.00 mm	-1.20 mm	-3.49 mm	-0.86 mm	1.55 mm	-2.96 mm	4.78 mm	0.52 mm
December	-7.08 mm	-3.69 mm	-2.09 mm	-4.13 mm	-1.37 mm	-3.86 mm	-2.62 mm	-6.16 mm

Table 7: Projected Precipitation Anomaly Şanlıurfa, (SSP2-4.5, Multi Model Assemble)

Year / Month	2021-2030	2031-2040	2041-2050	2051-2060	2061-2070	2071-2080	2081-2090	2091-2100
January	2.55 mm	-4.81mm	-3.86 mm	1.17 mm	-1.81 mm	-1.10 mm	-2.60 mm	-1.14 mm
February	-3.16 mm	-0.89 mm	-0.24 mm	-1.48 mm	-5.39 mm	-4.53 mm	-6.20 mm	-4.59 mm
March	-1.26 mm	-1.92 mm	-1.54 mm	-3.14 mm	-4.11 mm	-0.34 mm	-3.93 mm	-2.59 mm
April	-0.52 mm	-1.30 mm	1.26 mm	-1.20 mm	0.20 mm	-2.08 mm	0.69 mm	-1.11 mm
May	0.37 mm	-2.30 mm	1.45 mm	-1.37 mm	-4.07 mm	-1.21 mm	1.36 mm	-1.40 mm
June	0.44 mm	-0.31 mm	-0.03 mm	0.35 mm	-0.50 mm	0.44 mm	-0.05 mm	0.57 mm
July	-0.10 mm	-0.12 mm	-0.07 mm	-0.14 mm	-0.12 mm	-0.32 mm	-0.20 mm	-0.32 mm
August	-0.04 mm	-0.04 mm	-0.14 mm	-0.05 mm	-0.05 mm	-0.17 mm	-0.10 mm	-0.06 mm
September	-0.02 mm	-0.00 mm	-0.10 mm	-0.36 mm	-0.48 mm	-0.54 mm	-0.52 mm	-0.45 mm
October	-1.18 mm	-0.60 mm	0.63 mm	-1.08 mm	-0.69 mm	-0.56 mm	-1.54 mm	0.48 mm
November	-0.45 mm	-0.14 mm	-4.41 mm	-0.12 mm	-1.21 mm	-5.87 mm	-0.49 mm	0.49 mm
December	-1.06 mm	-3.23 mm	-5.42 mm	-7.20 mm	-5.16 mm	-5.27 mm	-6.37 mm	-7.56 mm

Table 8: Projected Precipitation Anomaly Şanlıurfa, (SSP5-8.5, Multi Model Assemble)

Year / Month	2021-2030	2031-2040	2041-2050	2051-2060	2061-2070	2071-2080	2081-2090	2091-2100
January	3.34 mm	-0.92 mm	-4.39 mm	-2.74 mm	-6.05 mm	-3.36 mm	-6.94 mm	-9.17 mm
February	0.06 mm	-0.61 mm	-2.19 mm	-5.20 mm	-5.40 mm	-8.50 mm	-7.79 mm	-8.31 mm
March	-1.05 mm	-2.66 mm	-2.38 mm	-2.83 mm	-4.66 mm	-7.25 mm	-6.11 mm	-8.87 mm
April	-2.46 mm	0.86 mm	-2.28 mm	-2.60 mm	-3.27 mm	-4.07 mm	-6.14 mm	-9.28 mm
May	-1.78 mm	-1.01 mm	-1.91 mm	-2.75 mm	-4.76 mm	-4.24 mm	-4.52 mm	-5.96 mm
June	0.48 mm	-0.09 mm	-0.02 mm	-0.10 mm	-0.31 mm	0.16 mm	-0.27 mm	-0.27 mm
July	-0.19 mm	0.09 mm	-0.24 mm	-0.10 mm	-0.36 mm	-0.33 mm	-0.13 mm	-0.44 mm
August	-0.08 mm	-0.03 mm	-0.10 mm	-0.09 mm	-0.07 mm	-0.11 mm	-0.28 mm	-0.24 mm
September	-0.22 mm	-0.33 mm	-0.24 mm	-0.37 mm	-0.38 mm	-0.46 mm	-0.63 mm	-0.44 mm
October	0.95 mm	0.02 mm	0.57 mm	-1.92 mm	-0.56 mm	-1.35 mm	-2.31 mm	-3.41 mm
November	-1.08 mm	-1.27 mm	-2.31 mm	-1.42 mm	-1.05 mm	-2.43 mm	-5.06 mm	-2.89 mm

Year / Month	2021-2030	2031-2040	2041-2050	2051-2060	2061-2070	2071-2080	2081-2090	2091-2100
December	-7.90 mm	-2.59 mm	-9.24mm	-10.85 mm	-13.19 mm	-10.79 mm	-14.36 mm	-15.54 mm

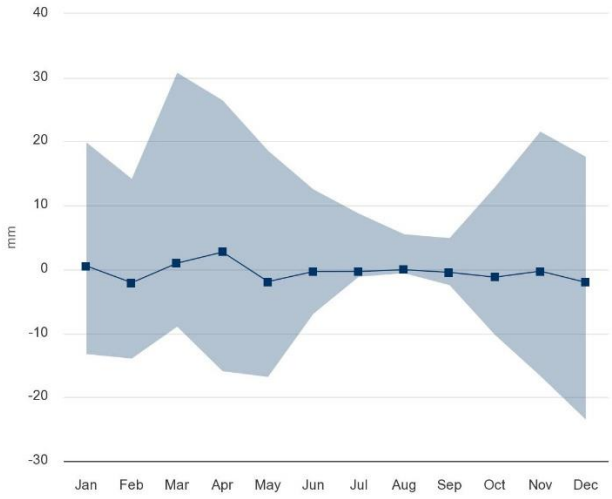
2020-2039

According to SSP1-2.6, SSP2-4.5 and SSP5-8.5 scenarios, Projected Precipitation anomaly for the years 2020-2039 is given in graphs below.

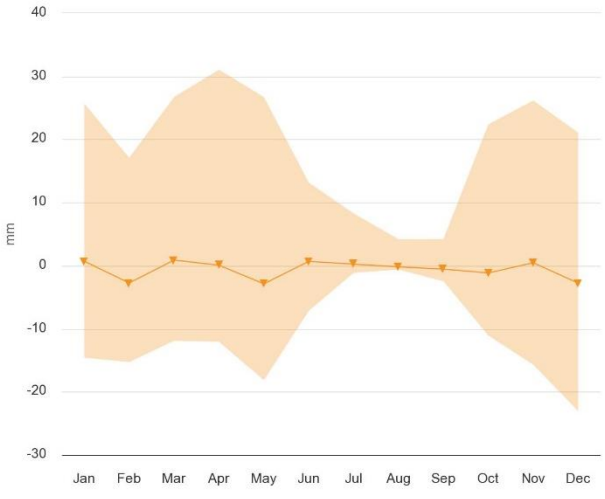
The graph represents projected precipitation anomalies (differences from the long-term average) from January to December for the years 2020 to 2039.

The values above the baseline values that are represented by the line in the middle indicate anomalies which are precipitation values that are higher than the long-term average and the values below the baseline negative anomalies indicate the precipitation values that are lower than the long-term average.

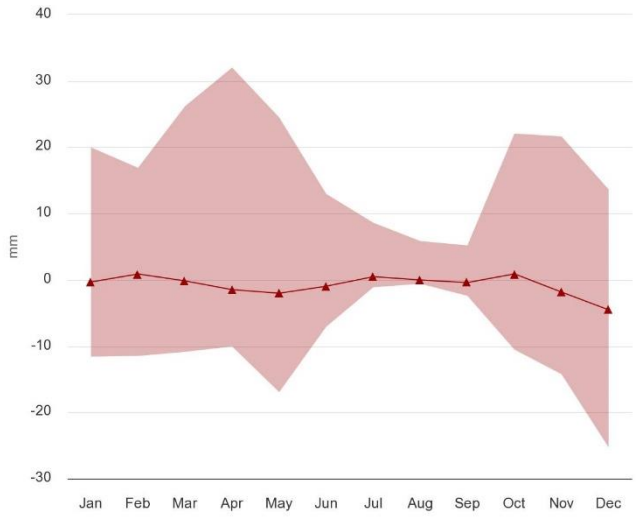
The highest deviation from the baseline values is expected as an increase of 31.05 mm in April under the SSP2-4.5 scenario and -25.28 mm as a decrease in December under the SSP5-8.5 scenario as can be seen from the Figure 8 (b) and (c), respectively.



SSP1-2.6 (a)



SSP2-4.5 (b)



SSP5-8.5 (c)

Figure 8: Projected Precipitation Anomaly for 2020-2039 - Şanlıurfa (Ref. Period: 1995-2014), Multi-Model Ensemble

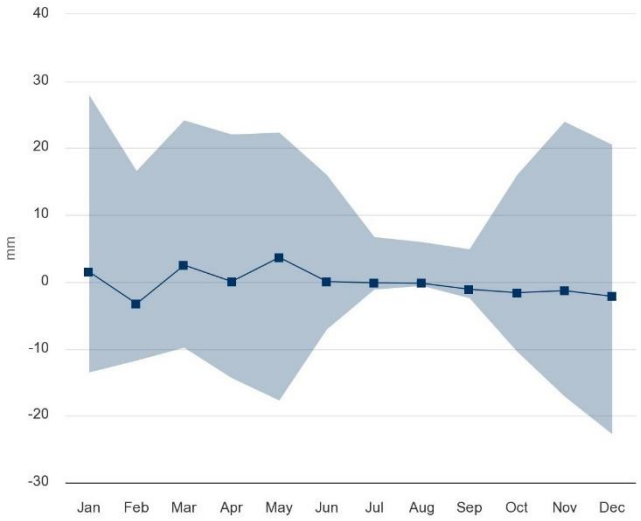
2040-2059

According to According to SSP1-2.6, SSP2-4.5 and SSP5-8.5 scenarios, Projected Precipitation anomaly for the years 2040-2059 is given in graphs below.

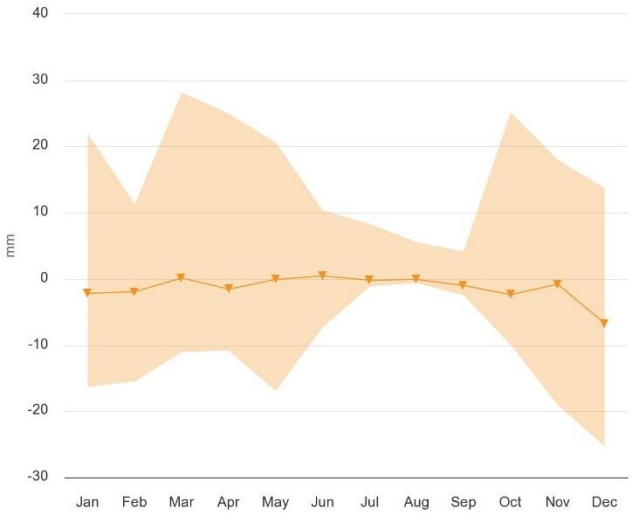
The graph represents projected precipitation anomalies (differences from the long-term average) from January to December for the years 2020 to 2039.

The values above the baseline values that are represented by the line in the middle indicate anomalies which are precipitation values that are higher than the long-term average and the values below the baseline negative anomalies indicate the precipitation values that are lower than the long-term average.

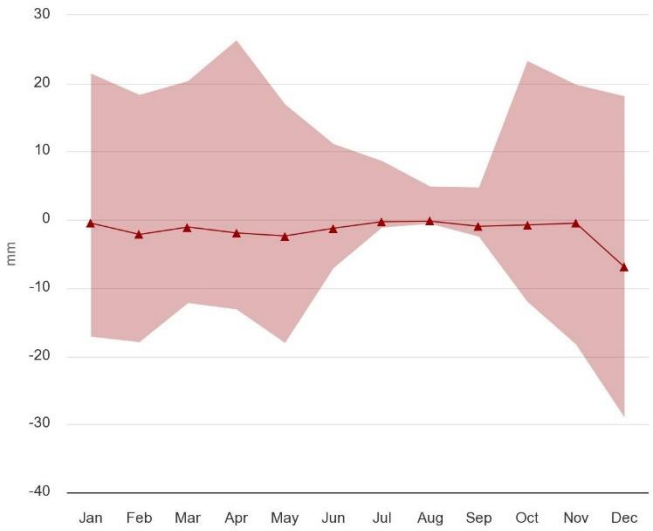
The highest deviation from the baseline values is expected as an increase of 28.25 mm in March under the SSP2-4.5 scenario and -28.98 mm as a decrease in December under the SSP5-8.5 scenario as can be seen from the Figure 9 (a) and (c), respectively.



SSP1-2.6 (a)



SP2-4.5 (b)



SSP5-8.5 (c)

Figure 9: Projected Precipitation Anomaly for 2040-2059 - Şanlıurfa (Ref. Period: 1995-2014), Multi-Model Ensemble

4.3 Assessment of Hazards

4.3.1 Identification and assessment of relevant climate-related hazards

According to ISO 14091, the first step in the CCRA requires to identify the climate-related hazards that may affect the Project site and, among them, those the Project may be exposed to. Additional available literature (i.e., IPCC Report on Impacts, Adaptation and Vulnerability, UNEP Finance Initiative, World Bank National & Policy Climate and Disaster Risk Screening tool) was considered to define a framework and guide the hazard identification process.

Key questions to consider in the hazard identification process are the following:

- Which are the past events and what are the main issues that affected the site and may be related to climate change?
- Which are the climate-related hazards that may become relevant in the future?

Information from World Bank Group – Climate Change Knowledge Portal, Vulnerability section, were consulted to identify the most relevant hazards at the Country level. In addition to this, THINK HAZARD portal (implemented by Global Facility for Disaster Reduction and Recovery (GFDRR) in collaboration with World Bank and providing high level hazard assessment worldwide) was used to refine the investigation at the level of the city of Şanlıurfa.

The outcomes of this processes resulted in the following list of selected hazards. They are listed together with the main justification for their inclusion and assessment (“Highest”, “High”, “Medium”, “Low” or “Lowest) for the the risk assessment. The assessment was qualitatively characterized based on the future projections and selected according to the characteristics of the Project.

- **Flooding Hazard**

Flooding is generally not considered to be a significant climate-related hazard for Şanlıurfa.. The climate pattern of Şanlıurfa is more prone to drought and water scarcity than to flooding. Although Şanlıurfa is not traditionally prone to flooding, climate change may lead to unexpected shifts in rainfall patterns and extreme rainfall events that could increase the risk of localised flooding in the future.

Heavy rains affected the provinces of Adıyaman and Şanlıurfa on 14-15 March 2023, causing floods, resulting in loss of life and damage, 12 people lost their lives in Şanlıurfa which hit by 111 mm of rain in 24 hours.[9]

Therefore, this hazard has been scoped in for the climate change risks assessment and assessed as “MEDIUM”.

- **Extreme Heat Hazard**

The mean annual temperature in Şanlıurfa has increased by 1.5°C temperature since last century. Temperatures are projected to keep rising according to all scenarios. This can have significant implications for extreme heat.

According to Think Hazard portal, in Şanlıurfa Province the extreme heat hazard is classified as high which means that there is greater than a 50% chance of encountering weather that could support a significant wildfire that is likely to result in both life and property loss in any given year.

Therefore, this hazard has been scoped in for the climate change risks assessment and assessed as “HIGH”.

[9] https://reliefweb.int/disaster/fl-2023-000040-tur

- **Extreme Cold Hazard**

In Şanlıurfa Province, in January, which is typically the coldest month of the year, average minimum temperatures moved from 0.24°C for the period 1901-1930 to .1.04° in the period 1991-2020.

According to the 2022 Climate Report of Türkiye General Directorate of Meteorology, there is an increasing trend in extreme meteorological event trends, especially in the last twenty years.[10]

Therefore, this hazard has been scoped in for the climate change risks assessment and assessed as “LOW”.

- **Drought Hazard**

Droughts have large impacts on agricultural production and the population. Şanlıurfa Province has a desertification risk abovemedium level. It is situated at an elevation of about 477 m above sea level.

Şanlıurfa is located in the Euphrates subbasin where 9 months of severe drought and 119 months of moderate to severe drought have occurred between 1984 and 2015 based on the Palmer drought severity index[11]

Therefore, this hazard has been scoped in for the climate change risks assessment and assessed as “HIGH”.

- **Severe Storms Hazard**

According to The European Severe Weather Database (ESWD)[12], severe storms including severe wind, heavy rain, large hail, damaging lightning is a recurring hazard in Şanlıurfa.

Therefore, this hazard has been scoped in for the climate change risks assessment and assessed as “MEDIUM”.

- **Extreme Precipitations Hazard**

Extreme rainfall events can trigger massive mudslides in poorly constructed urban areas and along degraded and deforested slopes. Additionally, increases in the intensity of rains with climate change will have serious implications on agriculture, sedimentation rates, infrastructure, and industry.

The severity of heavy precipitation events is projected to increase, though rainfall events will likely be less frequent.

According to the 2022 Climate Report of Türkiye General Directorate of Meteorology, there is an increasing trend in extreme meteorological event trends, especially in the last twenty years.

In 2022, the majority of the extreme events occurring in Türkiye were recorded as heavy rainfall with 33.6%.

Therefore, this hazard has been scoped in for the climate change risks assessment and assessed as “MEDIUM”.

- **Wildfires Hazard**

According to Think Hazard portal, in Şanlıurfa Province the wildfire hazard is classified as high which means that there is greater than a 50% chance of encountering weather that could support a significant wildfire that is likely to result in both life and property loss in any given year. Based on data available in the Global Forest Watch, Şanlıurfa lost 102 ha overall from all loss factors between 2001 and 2022, including the loss of 9 ha of tree cover due to fires. In this time frame, the year 2002 had the greatest amount of tree cover loss due to fires,

[10] https://www.mgm.gov.tr/FILES/iklim/yillikiklim/2022-iklim-raporu.pdf

[11] https://www.mdpi.com/2073-4441/13/18/2519

[12] https://eswd.eu/

with 2 ha lost to fires accounting for 17% of all tree cover loss for that year. Fires were responsible for 8% of tree cover loss in Şanlıurfa between 2001 and 2015.

In extreme fire weather events, strong winds and winds born debris may weaken the integrity of infrastructures. Future climate projections based on models indicate that there will likely be more instances of fire weather in this area, including higher temperatures and more variable rainfall. Due to longer periods without rain during fire seasons, the length of the fire season and the number of days with weather that could assist fire spread are projected to rise in areas already subject to wildfire hazard.

Therefore, this hazard has been scoped in for the climate change risks assessment and assessed as “HIGH”.

4.3.2 Exposure assessment

Once hazards potentially affecting the Project site were identified, the exposure of the Project to each hazard was addressed. The key question in the exposure assessment is the following:

- In case of any of the selected climate-related hazard hitting the Project site, would the Project be impacted?

The evaluation considered the intrinsic characteristics and features of the Project.

Table 9: Exposure Assessment

HAZARD	ELEMENT EXPOSED	EXPOSURE	JUSTIFICATION
FLOODING	Infrastructures/People	YES	Flooding could cause damages to project components (solar panels, tacker (panel carrier) system, and PV module carrier system, DC Combiner Box, inverter stations and substation) and associated infrastructure and utilities (administrative building, Transformer Center Building), as well as disruptions to access roads and affect people.
EXTREME HEAT	Infrastructures/People	YES	Project components and associated facilities could be affected by extremely hot temperatures. Similarly, people would be impacted by temperatures which are already high and they are expected to increase even further.
DROUGHT	Infrastructures/People	YES	The plant depends on water for its functions.
SEVERE STORMS	Infrastructures/People	YES	Lightings, intense rain accompanied with strong wind and potentially hail would cause disruptions to project components as well as associated facilities and a thread to people. Severe storms could also cause local flooding which could represent an additional disturbance.
EXTREME PRECIPITATIONS	Infrastructures/People	YES	Project components, and access roads would be highly exposed in case of extreme precipitations. People as well would be impacted, in particular in case of flooding due to intense rain.

WILDFIRES	Infrastructures/People	YES	In case of wildfires both people and infrastructures may be affected.

The Project was considered exposed to all relevant climate-related hazards potentially affecting the Project site. Therefore, all of them were scoped in for further assessment.

4.4 Assessment of Sensitivity, Adaptive Capacity and Vulnerability

4.4.1 Sensitivity

For each hazard, the Sensitivity was qualitatively characterized based on a set of indicators, selected according to the characteristics of the Project potentially exposed to that hazard.

The final step was to assign a class of Sensitivity ("High", "Medium" or "Low"), entailing all information collected through the assessment process, also considering their relative importance, reliability and completeness. A conservative approach has been adopted assigning a higher Sensitivity class whenever the assessment was uncertain due to inconsistent indicators.

The Project Sensitivity towards each hazard is presented below with the main considerations that justify the assessment.

Sensitivity to Flooding: overall Sensitivity has been assigned "MEDIUM" The level is justified that all project components would be highly impacted in case of flooding.

Sensitivity to Extreme heat: overall Sensitivity has been assigned "MEDIUM". The plant would be impacted with moderate consequences due to both the nature of the hazard and the typology of the infrastructure.

- No green areas are present in the Project site that may absorb heat in case of hot temperatures.
- Project components could be susceptible to high temperatures. Solar panels can experience reduced efficiency and potential malfunctions in cases of extreme heat.
- Roads are the only gateway to the plant. Extreme heat can particularly damage roads, creating traffic disruptions.

Sensitivity to Extreme cold: overall Sensitivity has been assigned "MEDIUM". The plant would be impacted with moderate consequences due to both the nature of the hazard and the typology of the infrastructure.

- Ice formation on solar panels, cables, and other equipment can disrupt operations and increase the risk of physical damage. Icing on moving parts, such as tracking systems, may cause them to malfunction.
- Snow buildup on solar panels can block sunlight and significantly reduce energy production. The weight of accumulated snow can also strain the mounting structures, potentially causing damage.
- Roads are the only gateway to the plant. Icy and snowy roads can lead to traffic disruptions.

Sensitivity to Drought: overall Sensitivity has been assigned "MEDIUM".

- According to the experience gained from other projects operated by Kalyon Enerji, there has been no need for panel cleaning in the first three years. If panel cleaning with wet cleaning method is required in the following years of operation, the amount of water required per cleaning is calculated as 390 m3 according to the assumption that 2 tons per MWp will be required. The deionized water will be supplied by getting services from a related supplier for wet cleaning.
- Water need for dust suppression during dry periods is estimated to be 50 m3/day and it will be supplied through the effluent of the wastewater treatment plant having advanced treatment. It is planned that

additional water needs will be supplied from drilled well. Until the well is drilled, water will be supplied from Viranşehir Municipality by water tankers.

Sensitivity to Severe storms: overall Sensitivity has been assigned “HIGH”. The level is justified that all project components and other infrastructures would be highly impacted in case of strong wind, lightings and intense precipitations which typically characterize severe storms events.

- Severe storms may be accompanied with lightings that could affect the solar panels and the other components of the Project.

Sensitivity to Extreme precipitation: overall Sensitivity has been assigned “MEDIUM”.

- Extreme precipitation could bring damage to the plant and the operations.
- Run-off waters may affect all Project components.
- Extreme precipitations may bring local flooding, potentially affecting the following more sensitive Project components.

Sensitivity to Wildfires: overall Sensitivity has been assigned “HIGH”.

- There are a few potential fire hazards in the plant:
  - Solar power plants, with their extensive array of panels, are susceptible to lightning strikes. A direct lightning strike or induced surges can cause electrical and fire hazards.
  - Malfunctioning inverters can generate excess heat and pose a fire risk.
  - Electrical faults or malfunctions within the solar panel system, such as faulty wiring or overheating components, can lead to electrical fires.

4.4.2 Adaptive Capacity

Similar to Sensitivity, the Adaptive Capacity was qualitatively assessed through the information provided the Client. The final step was to assign a class of Adaptive Capacity (“High”, “Medium” or “Low”), entailing all information collected through the assessment process, also considering their relative importance, reliability and completeness. A conservative approach has been adopted assigning a lower Adaptive Capacity class whenever the assessment was uncertain due to inconsistent indicators.

The following are considerations related to considerations that apply to all hazards; their evaluation helped with an overall identification of the Adaptive Capacity versus climate change-related events in the Project region:

- In October 2021, Türkiye ratified the Paris Agreement and pledged to achieve net zero emissions by 2053. To strengthen its efforts, Türkiye is establishing new institutional arrangements, including the Ministry of Environment, Urbanization, and Climate Change (MoEUCC), and is updating its National Climate Change Action Plan, which identifies and defines a set of strategic options of mitigation and adaptation for different economic sectors.
- A Country Climate and Development Report for Türkiye was published in June 2022. The report identifies pathways to achieving climate-resilient growth. A robust analysis of the impact of climate science was undertaken, followed by an in-depth analysis of the macroeconomic and sectoral implications of climate impacts on Türkiye's future development prospects. The report was developed by the World Bank, the IFC and Multilateral Investment Guarantee Agency.
- The Project has an active Emergency Preparedness & Response Plan, which was prepared by WSP. It includes also extreme weather events (flooding and lightning).

The following section presents the Adaptive Capacity specific for each hazard at the Project level; this can be achieved through design and engineering solutions or dedicated maintenance that can be introduced at Project level and do not depend on any external factor or elements.

Adaptive Capacity to Flooding: overall Adaptive Capacity has been assigned “HIGH”.

- A reinforced concrete structure was added under the fences which were established to ensure the security of the project site, hence the site was protected from potential flood and surface water.
- The inverter station foundation was raised 60 cm from the ground level against the risk of rising water.
- In case of water intrusion scenario into the inverter station foundation, a water collection reservoir has been designed in the station foundation. There is infrastructure to collect water in the reservoir and discharge it out with the help of a pump.
- The manhole lid at the entrance of the inverter station foundation is selected as impermeable.
- The foundation concrete was waterproofed with insulation materials to prevent water leakage into the foundation.

Adaptive Capacity to Extreme Heat: overall Adaptive Capacity has been assigned “MEDIUM”.

- When air conditioning systems are used, energy efficiency techniques will be considered as much as possible according to the following criteria:
  - Placing air intakes and air-conditioning units in cool, shaded locations;
- Ventilation and air conditioning system is being installed in the switchyard. There will be a self-cooling system in inverters.

Adaptive Capacity to Extreme Cold: overall Adaptive Capacity has been assigned “MEDIUM”.

- PV modules that are selected for the plant can operate up to -40 degree Celsius.

Adaptive Capacity to Drought: there are few Adaptive Capacity measures in place. Overall Adaptive Capacity has been assigned “MEDIUM”.

- Project will reduce, as much as possible, water use for cleaning. The water distribution system at camps and buildings (e.g., taps, toilet flushing) will be periodically checked to ensure that they are working properly and that taps are not left open.
- Soiling of PV modules will be monitored through devices to optimize the time for cleaning which will reduce the water consumption.
- Treated domestic wastewater would be reused for dust control in accordance with the standards defined in the Wastewater Treatment Plants Technical Procedures Communique if it is deemed feasible. In case wastewater reuse would be decided to be applied, a wastewater reuse plan will be prepared during the construction phase describing which types of wastewater are suitable for each reuse application and effective control measures will be implemented to prevent misuse of reused water.

Adaptive Capacity to Severe Storms: overall Adaptive Capacity has been assigned “LOW”. Little Adaptive Capacity seem to be in place to prevent or mitigate potential disruptions caused by severe storms.

- No specific measures are in place according to available information to protect the plant from infiltration due to intense precipitations, or disruption caused by strong wind and lightings which often characterize severe storms events.

Adaptive Capacity to Extreme Precipitations: overall Adaptive Capacity has been assigned “MEDIUM”.

- Assessment of surface water runoff and flooding conditions after heavy rainfall events for efficiency of water conveyance systems will be implemented.
- While adaptive capacity measures stated in the adaptive capacity to flooding part above are determined, extreme precipitation cases are also taken into consideration.

Adaptive Capacity to Wildfires: overall Adaptive Capacity has been assigned “MEDIUM”.

- All personnel will receive a “Training on Actions and Measures to be Taken During Emergencies” annually regarding the established emergencies. Through the competent authorities, it will be ensured that the Fire Fighting, Search, Rescue, Evacuation and First Aid teams receive the necessary training.
- Fire equipment, first aid equipment and alarm systems will be checked monthly to review their efficiencies.

4.4.3 Vulnerability

The magnitude of potential effects and consequences were assessed for each hazard, combining the Sensitivity and the Adaptive Capacity. A qualitative approach has been used, applying the matrix shown below.

VULNERABILITY			
	SENSITIVITY		
ADAPTIVE CAPACITY	Low	Medium	High
High	Lowest	Low	Medium
Medium	Low	Medium	High
Low	Low	High	Highest

Figure 10: Vulnerability Matrix

The Vulnerability of the Project resulted higher for Drought, Severe Storms and Extreme Precipitations. The level of Vulnerability for these hazards is “highest”, meaning that the Project could experience severe damages and consequences in case of any of these extreme events related to climate change.

The Project resulted less vulnerable to Extreme Heat and Wildfires. The level of Vulnerability for Extreme Heat is “medium”, meaning that the Project would be affected in case of such event but consequences would be less severe. Finally, the Project resulted having a “low” vulnerability to Wildfires.

Table 10 shows the details of Vulnerability assessment for all hazards.

Table 10: Vulnerability Assessment

Hazard	Sensitivity	Adaptive Capacity	Vulnerability
FLOODING	MEDIUM	HIGH	LOW
EXTREME HEAT	MEDIUM	MEDIUM	MEDIUM
EXTREME COLD	MEDIUM	MEDIUM	MEDIUM
DROUGHT	MEDIUM	MEDIUM	MEDIUM
SEVERE STORMS	MEDIUM	LOW	HIGH
EXTREME PRECIPITATIONS	MEDIUM	MEDIUM	MEDIUM
WILDFIRES	HIGH	MEDIUM	HIGH

4.5 Physical Risk Assessment

The Climate Change Risk has been assessed combining Vulnerability and Hazard levels, according to qualitative considerations based on the following matrix:

RISK					
	VULNERABILITY				
HAZARDS	Lowest	Low	Medium	High	Highest
Lowest	Lowest	Lowest	Low	Low	Medium
Low	Low	Low	Low	Medium	Medium
Medium	Low	Medium	Medium	High	High
High	Low	Medium	High	High	Highest
Highest	Medium	High	High	Highest	Highest

Figure 11: Risk Matrix

A summary of the outcomes is presented in Table 11.

Table 11: Risk Assessment

Hazard	Vulnerability	Hazard Class	Risk
FLOODING	LOW	MEDIUM	LOW
EXTREME HEAT	MEDIUM	HIGH	HIGH
EXTREME COLD	MEDIUM	LOW	LOW
DROUGHT	MEDIUM	HIGH	HIGH
SEVERE STORMS	HIGH	MEDIUM	HIGH
EXTREME PRECIPITATIONS	MEDIUM	MEDIUM	MEDIUM
WILDFIRES	HIGH	HIGH	HIGH

4.6 Risk Mitigation Actions and Conclusions

The Climate Change Physical Risk Assessment helped identifying the most critical climate-related risks, at present or in the future, according to different emission scenarios and during the lifetime of the Project as a consequence of Climate Change.

Based on these results and the assessment of the Vulnerability, it was possible to identify, for each hazard, a few measures that could be put in place to prevent or to reduce the potential impacts.

The list of measures identified here has not to be considered binding nor exhaustive. However, it should be taken under consideration to try to reduce the Vulnerability of the plant towards climate-related hazards.

All Risks

- The Project Emergency Preparedness & Response Plan should include considerations, procedures and measures to deal with all hazards, such as extreme weather conditions, drought and wildfires. In addition to this, keep updating and revising the existing emergency response plans.
- Making sure all necessary equipment and training are provided along the entire Project lifespan.
- Implement an early warning system and make provision for a direct connection with any existing early warning systems at local or regional level to guarantee information on potential extreme event are monitored and shared on a daily basis.

- Maintain an efficient network connectivity within the Project site, making sure mobile communication and alternative communication systems would be available in case of an emergency due to climate-related extreme events.
- Collaborate with local Authorities to guarantee that roads connecting to the plant are maintained on a regular basis. This would increase the Adaptive Capacity in all hazards, particularly those related to potential flooding.

Risk of Extreme Heat and Cold

- Provide adequate and regular maintenance of cooling and heating systems verifying that the adequacy is guaranteed in the face of the expected increase and decrease in temperatures and heat waves and cold waves.
- Consider using materials for the administrative building and other infrastructures with a lower capacity to absorb heat and higher capacity to maintain their main properties in case of extremely high temperatures.
- Provide proper and regular maintenance to administrative building, infrastructures and equipment to avoid increasing their sensitivity hot and cold temperatures.
- Rescheduling working hours during extremely hot and cold periods to ensure the safety and efficiency of staff working in outdoor areas.

Risk of Droughts

- Improve water efficiency systems and technologies to reduce water consumption.

Risk of Severe Storms and Extreme Precipitations

- Flooding assessment on a regional scale has to be completed to assess the flooding conditions and the necessary changes will be incorporated into the design. A supplemental assessment of stormwater drainage risks to the environment has to be undertaken to verify the stormwater drainage designs' effectiveness in mitigating impacts on surrounding land use, surface and groundwater or sensitive ecological receptors therein.
- Implement measures to protect the plant and its main more sensitive infrastructures from infiltration due to intense precipitations, or disruption caused by strong wind and lightings which often characterize severe storms events.
- Installing lightning rods at the Project site.
- Keep manholes and drainage channels clean to avoid potential flooding in cases of heavy rain associated with intense precipitations.
- Verify that materials potentially subject to displacement in the presence of strong gusts of wind are adequate to cope with more intense and more frequent storms.
- Collaborating with the Municipality of Şanlıurfa and Şanlıurfa Special Provincial Administration to better understand the contents of their plan to mitigate the effects of the rains. Trying to identify shared measures and strategies to reduce and prevent disruptions in case of extreme precipitations.
- Commission more in-depth geotechnical studies to better characterize the stability of the geological formation in the Project area, particularly in the presence of exceptional amount of water, in case of intense precipitations.

Risk of Wildfires

- Organize awareness programs and personnel availability to deal with potential fires, possibly in collaboration with the Fire Department in Şanlıurfa.
- Verify the adequacy of the maintenance program of all prevention and fire emergency systems.

Table of Contents

9.0 CUMULATIVE IMPACT ASSESSMENT

There is no universally accepted methodology or best practice to assess cumulative impacts, although various guidance documents exist (such as the IFC Good Practice Handbook on Cumulative Impacts Assessment and Management). The approach used in this chapter has been adopted based on the principles of the relevant guidance, previous experience, the nature of the Project, and the information obtained from the online EIA platform of Türkiye (for other proposed projects in the AoI).

Cumulative impacts are defined as "… those that result from the successive, incremental, and/or combined impacts of an action, project, or activity when added to other existing, planned, and/or reasonably anticipated future ones." (IFC Good Practice Handbook: Cumulative Impact Assessment and Management).

Cumulative impacts can result from various types of interaction(s) among different impact factors:

- Impacts arising from the accumulation of different impact factors at a specific location or over a specific receptor; as an example, the concurrent presence of the emission of noise and air, visual impact, and water resources during construction and operation at the same location;
- Impacts arising from the same impact factor over the same receptor in a different geographic location; as an example, the degradation of the same habitats in different locations may harm the population of associated species across their entire distribution area.
- Impacts arising from the concurrent presence of impact factors caused by the Project and other development projects; as an example, we can consider the emission of dust from the construction of the Project and the concurrent construction of a new road or construction/operation of an industrial development at the same location.

According to IFC, cumulative impact assessment is the process of:

- analysing the potential impacts and risks of proposed developments in the context of the potential impact of other human activities and natural environmental and social external drivers on the chosen valued environmental and social components (VECs) over time, and
- proposing concrete measures to avoid, reduce, or mitigate such cumulative impacts and risks to the extent possible.

IFC proposes a six-step approach for the CIA study (Figure 9-1) in the CIA Handbook which has been used for the CIA of the Project.

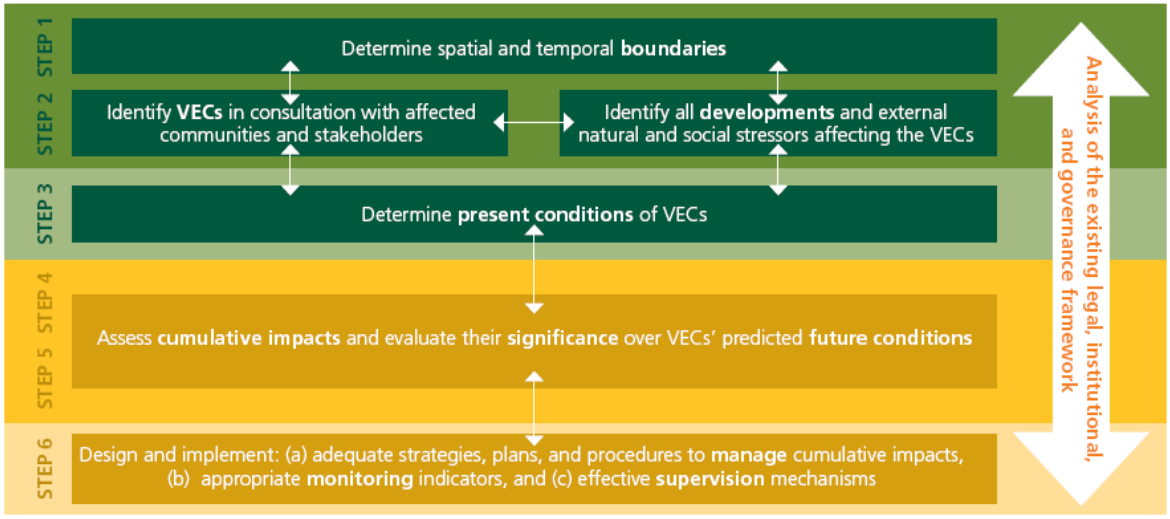


Figure 9-1: Cumulative Impact Assessment Methodology

This chapter presents the implementation of the stepwise methodology detailed in the CIA Handbook and the results of the CIA for Project. Above mentioned steps are listed below:

- Step 1: Scoping Phase I – VECs, Spatial and Temporal Boundaries
- Step 2: Scoping Phase II – Other Activities and Environmental Drivers
- Step 3: Establish Information on the Baseline Status of VECs
- Step 4: Assess Cumulative Impacts on VECs
- Step 5: Assess Significance of Predicted Cumulative Impacts
- Step 6: Management of Cumulative Impacts

9.1 Step 1 – VECs, Spatial and Temporal Boundaries

In the first step of this CIA study, objectives are listed as:

- Identifying and agreeing on VECs in consultation with stakeholders.
- Determining the time frame (temporal boundaries) for the analysis.
- Establishing the geographic scope (spatial boundaries) of the analysis.

9.1.1 Valued Environmental and Social Component (VEC)

VECs are defined as fundamental elements of the physical, biological or socio-economic environment, including the noise, air, terrestrial biodiversity, resettlement and land acquisition, community health and safety, economy and labour influx that may be affected by a proposed project.

In that respect, in this ESIA Report various sensitive receptors, sources and stakeholders have been identified which can be considered as VECs for the CIA. The potential identified VECs for the Project can be listed for construction and operation phases below:

Construction

- Noise
- Air Quality

- Traffic
- Visual Aesthetics
- Terrestrial Biodiversity
- Social (resettlement and land acquisition, community health and safety, labour influx)

Operation

- Visual Aesthetics
- Terrestrial Biodiversity
- Social (community health and safety, economy, labour influx)

9.1.2 Temporal Boundaries

The temporal boundary of the CIA contains the entire Project lifecycle (i.e., from construction until the end of decommissioning and closure). However, the capability of reasonably predicted future actions and tendencies (including the planning/implementation of other relevant projects in the region) limits the CIA process.

Therefore, for this CIA, consideration is given to the scope that is practical for discussion and assessment of cumulative impacts with the other projects for the construction and operation phases.

9.1.3 Spatial Boundaries

The relevant spatial boundaries for this CIA are the same with each specific Area of Influence (AoI) defined in Chapter 5 for each relevant topic (physical, biodiversity, social, etc.).

9.2 Step 2 – Other Activities and Environmental Drivers

Objectives of Step-2 are to:

- Identify other past, existing, or planned activities within the analytical boundaries,
- Assess the potential presence of natural and social external influences and stressors.

9.2.1 Other Activities

In the scope of the CIA study, past, existing, and planned projects and activities that are present in the CIA examination area have been assessed considering the spatial and temporal boundaries explained above. These existing and planned projects and activities have been taken into consideration by the CIA if an ongoing activity has a potential for interaction with the Project.

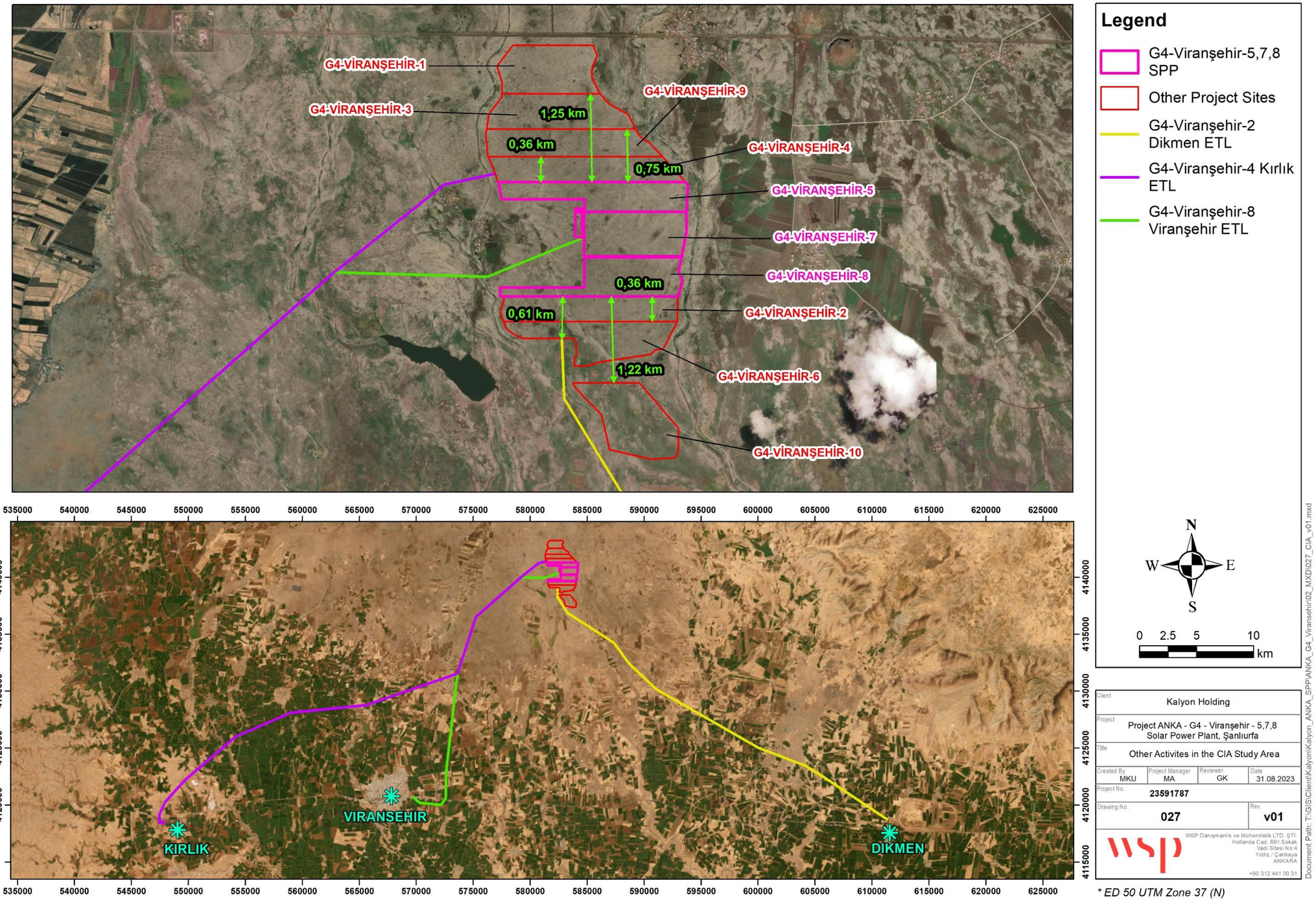
During the determination of the activities, the following sources have been used:

- Online EIA Platform of the Turkish Ministry of Environment, Urbanization and Climate Change
- Google Earth satellite views
- Internet searches especially for the SPP projects

Existing, and reasonably planned projects and activities likely to interact with the Project are given in detail in the table below.

Table 9-1: Existing and Planned Projects (3rd party facilities) and Activities in the CIA Examination Area

No	Project / Activity	Distance to the Project (km)	Capacity	Condition
1	G4-Viranşehir-1 Solar Power Plant Project	1.25	64.99 MWm/50 MWe	Status Unknown
2	G4-Viranşehir-2 Solar Power Plant Project	0.36	62.5 MWm/50 MWe	Status Unknown
3	G4-Viranşehir-3 Solar Power Plant Project	0.75	65 MWm/65 MWp/50 MWe	Status Unknown
4	G4-Viranşehir-4 Solar Power Plant Project	0	65 MWm/50 MWe	Status Unknown
5	G4-Viranşehir-6 Solar Power Plant Project	0.36	62.5 MWm/50 MWe	Status Unknown
6	G4-Viranşehir-9 Solar Power Plant Project	0.36	65 MWm/50 MWe	Status Unknown
7	G4-Viranşehir-10 Solar Power Plant Project	1.22	65 MWm/50 MWe	Status Unknown
8	G4-Viranşehir-2 Dikmen ETL	0.61	154 kV	Status Unknown
9	G4-Viranşehir-4 Kırlık ETL	0.12	154 kV	Status Unknown
10	G4-Viranşehir-8 Viranşehir ETL	0	154 kV	Status Unknown



* ED 50 UTM Zone 37 (N)

Figure 9-2: Other Activities in the CIA Study Area

9.2.2 Environmental Drivers

Environmental drivers are defined as natural drivers and other stressors, such as wildfires, droughts, floods, predator interactions, human migration, and new settlements that may exert an influence on the VEC conditions (IFC, 2013).

Environmental drivers have significant impacts on a variety of environmental and social components. Project impacts that discharge pollutants to lakes or rivers, or that withdraw water for industrial or agricultural purposes are likely to be more significant during periods of drought. The fire regime in forested areas is a major driver that shapes social, ecological, and economic systems. For the purposes of the CIA, identification of such processes is not a question of new research but is based on existing knowledge of the ecology and/or natural dynamics of the selected VECs.

According to the existing information, no major environmental driver that can create a cumulative impact on selected VECs has been identified.

9.3 Step 3 – Establish Information on Baseline Status of VECs

Considering that the existing/planned facilities identified in Step 2 are already in their construction or operation periods at the time of baseline studies conducted of the ESIA, the baseline measurement results presented in Chapter 6 of this ESIA also reflect the impacts of the construction and operation activities of the 3rd party facilities.

9.4 Step 4 – Assess Cumulative Impacts on VECs

Analysis of cumulative impacts on VECs involves estimating the future state of the VECs that may result from the impacts they experience from various past, present, and planned developments. The objective is to estimate the state of VECs as they result from the aggregated stresses that affect them (IFC, 2013).

Whether each present and planned project will have an impact on VECs is presented below. Afterwards, VECs that were affected by at least one more project with the Project were determined for the cumulative impact assessment study.

The significance of these impacts will be presented in the next chapter.

Table 9-2: Cumulative Impact Assessment

Project / Activity	Construction						Operation		
	Noise	Air Quality	Traffic	Visual Aesthetics	Terrestrial Biodiversity	Social	Visual Aesthetics	Terrestrial Biodiversity	Social
G4-Viranşehir-1 Solar Power Plant Project	√	√	√	√	√	√	√	√	√
G4-Viranşehir-2 Solar Power Plant Project	√	√	√	√	√	√	√	√	√
G4-Viranşehir-3 Solar Power Plant Project	√	√	√	√	√	√	√	√	√
G4-Viranşehir-4 Solar Power Plant Project	√	√	√	√	√	√	√	√	√

Project / Activity	Construction						Operation		
	Noise	Air Quality	Traffic	Visual Aesthetics	Terrestrial Biodiversity	Social	Visual Aesthetics	Terrestrial Biodiversity	Social
G4-Viranşehir-6 Solar Power Plant Project	√	√	√	√	√	√	√	√	√
G4-Viranşehir-9 Solar Power Plant Project	√	√	√	√	√	√	√	√	√
G4-Viranşehir-10 Solar Power Plant Project	√	√	√	√	√	√	√	√	√
G4-Viranşehir 2-Dikmen Energy Transmission Line	√	√	√	√	√	√	√	√	√
G4-Viranşehir 4-Kırlık Energy Transmission Line	√	√	√	√	√	√	√	√	√

9.5 Step 5 – Assess Significance of Predicted Cumulative Impacts

In the ESIA process, components of impact significance (magnitude, spatial scale, duration, frequency) are typically factors in deciding whether mitigation is necessary. Consequently, the evaluation of significance and the design of management and/or mitigation are in reality iterative. The significance of a cumulative impact is evaluated not in terms of the amount of change, but in terms of the potential resulting impact on the vulnerability and/or risk to the sustainability of the VECs assessed.

To understand the cumulative impact of the projects on the VECs identified in Table 9-2, their PIF or PTD in Turkish (Project Introductory File prepared for the project which will have smaller scale environmental impacts), EIAs (if any) and some academic articles were taken into account.

Definition of the sensitivity of the environmental and social components

Geology and Geomorphology & Natural Hazard Seismology:

- Presence of faults: Areas with active faults are considered to pose the highest risks to the Project and hence are considered of higher sensitivity;
- Presence of landslides: Areas within the range of landslides are considered to pose the highest risks to the Project and hence are considered of higher sensitivity;
- Other geohazards: (karst areas, slope erosion, liquefaction, stream channels, etc.). The presence of other geohazards in the Project area is considered of higher sensitivity; and
- Seismicity: The location of the Project in areas classified as at seismic risk is considered of higher sensitivity.

Soils:

- Soil agricultural potential: soils with the highest agricultural potential according to local or global assessments are attributed a higher sensitivity;
- Soil erosion potential: Soils with the highest erosion potential according to local or global assessments are attributed a higher sensitivity; and
- Soil pollution potential: soils in areas identified and previously used for industrial, mining, or intensive agriculture are attributed a higher sensitivity.

Surface Water:

- Presence of water bodies in the Project area of influence and level of ecological integrity; the sensitivity increases with the level of ecological integrity;
- Presence of water bodies in the Project area of influence and level of water/sediment pollution; the sensitivity increases in the presence of polluted watercourse; and
- Presence of waterbodies and level of tolerance to hydrological changes; the sensitivity is higher for waterbodies with a low level of tolerance for hydrological changes.

Groundwater:

- Presence of shallow aquifers; the sensitivity increases with the presence of shallow aquifers that could be more easily exposed to contamination sources;
- Productivity of exploited aquifers; Aquifers with low productivity might be depleted in case the Project entails groundwater abstraction. The sensitivity is higher for aquifers with low productivity;
- Presence and extent of existing groundwater exploitation; the sensitivity is higher for aquifers already exploited;
- Rock permeability; The sensitivity increases in case the subsoil is made of rocks with high permeability; and
- Aquifer vulnerability; The sensitivity increases with the vulnerability of the aquifer as determined by accepted methodologies.

Air Quality:

- Presence of settlements and population potentially exposed to air emissions from the Project; the sensitivity increases with the number of people exposed;
- Presence of vulnerable targets (schools, hospitals, retirement houses, etc.) exposed to air emissions from the Project; the sensitivity increases with the number of vulnerable people exposed;
- Air quality levels in the areas affected by the Project; the sensitivity increases in areas already polluted and areas designated for air quality protection; and
- Presence of sensitive ecological receptors like protected or classified areas, protected or endangered habitats and species.

Noise and Vibration:

- Presence of settlements and population potentially exposed to noise and vibration from the Project; the sensitivity increases with the number of people exposed;
- Presence of vulnerable targets (schools, hospitals, retirement houses, etc.) exposed to noise and vibration from the Project; the sensitivity increases with the number of vulnerable people exposed;
- Noise and vibration levels and/or sources in the areas affected by the Project; the sensitivity increases in areas already experiencing high levels of noise and vibrations and in areas designated for protection from noise and vibrations; and
- Presence of sensitive ecological receptors like protected or classified areas, protected or endangered habitats and species.

Landscape and Components with Sensitivity to Visual Quality:

- Presence and number of settlements/people within the visual zone of visual influence.
- Presence of areas of touristic interest within the visual zone of visual influence.
- Presence of roads and volume of traffic within the visual zone of visual influence.
- Presence of archaeological, cultural, and historic areas within the visual zone of visual influence.
- Presence of natural parks protected and classified areas within the visual zone of visual influence.

Habitats and Biodiversity Features:

- The number of species of flora or fauna present in the habitat. The sensitivity increases with the number of species present.
- Presence of threatened species of flora or fauna in the habitat as defined by global (IUCN) or national red lists. The sensitivity increases with the number of threatened species present and the threat level.
- Presence of endemic or restricted range species of flora or fauna in the habitat as defined by global (IUCN) or national red lists. The sensitivity increases with the number of species present and the level of endemicity.
- Presence of protected species or species listed in international conventions for the protection of biodiversity. The sensitivity increases with the number of protected/listed species.
- Presence of invasive alien species. The sensitivity is higher for habitats in areas with a higher number of invasive alien species present.
- Presence of natural habitats; The sensitivity increases with the surface of natural habitats present in the Project area of influence.
- Presence of threatened or protected habitats; The sensitivity increases with the surface of threatened or protected habitats present in the Project area of influence.
- Presence of critical habitats; The sensitivity increases with the surface of critical habitats present in the Project area of influence.
- Presence of relevant nursery, spawning or feeding grounds or migration routes.

Protected Areas:

- Presence of protected areas; The sensitivity increases with the number, extent and level of protection of protected areas present in the Project area of influence.

Local Communities:

- Presence of skilled personnel in the local community; the sensitivity (to positive impacts) is higher the more people with skills relevant to the Project.
- Presence of businesses and economic activities relevant to the Project; The sensitivity to positive impacts is higher for communities with a well-structured business community.
- Level of health care available; The Project could cause a population influx that can put a strain on existing health services if left unmanaged. The sensitivity of communities is higher in areas with an insufficient level of healthcare available.
- Presence of communicable diseases; The spreading of communicable diseases can be exacerbated by the influx of workers due to the Project. The sensitivity of communities is higher for those more prone to be affected due to local conditions.
- The overall health state of the population; the Project might cause increased levels of exposure to environmental health determinants like air pollutants, noise and vibrations, etc. The sensitivity of communities is higher in the presence of existing health issues in the communities potentially affected by the Project.
- The presence of environmental health determinants like air and water pollution, and soil and groundwater contamination increase the community sensitivity.
- Areas with concentrated fisheries activities; areas with an abundance of fishery resources.

Education:

- Presence of education facilities;
- Level of education of the population;

Health:

- Level of health care available; The Project could cause a population influx that can put a strain on existing health services if left unmanaged. The sensitivity is higher in areas with an insufficient level of healthcare available;
- Presence of communicable diseases; The spreading of communicable diseases can be exacerbated by the influx of workers due to the Project. The sensitivity is higher in areas affected by a high level of communicable diseases.
- The overall health state of the population; the Project might cause increased levels of exposure to environmental health determinants like air pollutants, noise and vibrations, etc. The sensitivity is higher in the presence of existing health issues in the communities potentially affected by the Project.
- Presence of existing environmental health determinants. The presence of environmental health determinants like air and water pollution, and soil and groundwater contamination are increasing the sensitivity.

Ecosystem Services:

- Presence of ecosystem services;
- Dependence of the local communities on ecosystem services

Cultural Heritage:

- Presence of protected or recognized sites of archaeological or cultural value; the sensitivity increases with the number, cultural/scientific value and level of protection of sites potentially affected;
- Presence of sites with a high archaeological potential in the absence of specific site information or appropriate protection mechanisms; the sensitivity increases with the archaeological potential as indicated by relevant experts;
- The presence of intangible cultural values like sacred sites, initiation sites, sites used for cultural events, sites recognized in oral traditions, etc. the sensitivity increases with the number of sites and values as recognized by the local communities.

9.5.1 Noise

Cumulative impacts on noise are likely to occur at most sites where construction will be conducted concurrently. During the construction phase of the Project, an increase in ambient noise levels is expected due to the operation of generators, heavy machinery, equipment etc. during:

- General engineering/construction work; and
- Material transportation.

The possible spatial and temporal overlap between the projects construction and operation phases may aggravate some of the impacts identified on the IA. At this stage of the ESIA, the project schedule, excavation amounts, construction technologies, and the number of machinery and equipment of other projects are not certain yet. Due to the lack of detailed information about these projects, it cannot be determined at this stage whether a certain exceedance can be expected in terms of noise. Additionally, due to similarities between projects in terms of both area and construction technologies, the number of machinery and equipment to be used in the infrastructure and superstructure constructions are assumed to be identical to the Project.

The region where the Project is located is topographically mountainous and rugged. Therefore, it can be assumed that these characteristics can provide natural barrier effect for some projects. On the other hand, the impact has been determined according to the worst-case scenario, that is, all projects will be in the construction phase at the same time. However, it is foreseen that projects will not start construction at the same time and there will be limited overlap between construction phase of projects. Besides as the mitigation measures identified in Section 7.1.2, if the construction phases of one or more projects overlap, Kalyon Enerji will plan construction activities (if possible together with the other project companies) to minimise the adverse noise impacts on receptors through measures such as scheduling of noise generating activities. In this context, the expected cumulative impact will be **low**.

9.5.2 Air Quality

Cumulative impacts on air quality are likely to occur at most sites where construction will be conducted concurrently. Heavy construction is a source of dust emissions that may have a substantial temporary impact on local air quality. Emissions during the construction activities are associated with land clearing, ground excavation, cut and fill operations, and construction of the facility. Dust emissions often vary substantially over different phases of the construction process.

Land preparation activities and corresponding dust emissions are calculated based on the assumptions on excavation amounts, bulk density of soil, duration of earthworks, size of the area on which activities will take place, working hours per day, capacity of each truck, etc. The total amount of dust to emerge from the Project construction activities is calculated as 0.601 kg/h which is below the threshold value for the air emission dispersion modelling requirement defined by the Turkish Regulation (i.e., 1 kg/h threshold value for area source defined in Table 2.1 in Annex-2 of the SKHKKY). Therefore, possible impacts on air quality have been assessed without using software models.

On the other hand, the possible spatial and temporal overlap between the projects construction and operation phases may aggravate some of the impacts identified on the IA. At this stage of the ESIA, the project schedule, excavation amounts, construction technologies, and the number of machinery and equipment of other projects are not certain yet. Due to the lack of detailed information about these projects, it cannot be determined at this stage whether a certain exceedance can be expected in terms of air quality. In the context of the worst-case scenario approach, it has been accepted that the machines and equipment used in the construction activities are working simultaneously, in a collective way. Additionally, due to similarities between projects in terms of both area and construction technologies, the number of machinery and equipment to be used in the infrastructure and superstructure constructions are assumed to be identical to the Project.

The prevailing wind direction in the region is WNW and N as specified in Section 6.1.2 Meteorology and Climatology. Considering the prevailing wind direction, there is no settlement at the downwind of the dominant wind direction. In addition, the region is topographically mountainous and rugged. On the other hand, the impact has been determined according to the worst-case scenario, that is, all projects will be in the construction phase at the same time. However, it is foreseen that projects will not start construction at the same time and there will be limited overlap between construction phase of projects. Besides the mitigation measures identified in Section 7.1.1, if the construction phases for the projects overlap, Kalyon Enerji will plan construction activities (if possible together with the other project companies) to minimise the adverse air quality impacts on receptors through measures such as scheduling of dust emission generating activities where both projects may have air emissions at the same area. In this context, the expected cumulative impact will be **low**.

9.5.3 Terrestrial Biodiversity

A total of seven Solar Power Plant (SPP) Projects, in addition to three Transmission Lines, will be located within continental inland salt steppe habitat in Şanlıurfa Province, in Viranşehir District, in south-eastern Türkiye.

Continental inland salt steppes have traditionally been used as livestock pastures and they are less sensitive to overgrazing or abandonment than other types of lowland grasslands, because they are well-adapted to disturbance and have a high resilience, in addition competitive species have limited capacity to spread in saline habitats. However, this habitat is threatened by intensive agriculture. Activities such as ploughing, fertilizing and drainage cause strong alterations, with possible decrease of salt concentration in the soil and conversion of these lands into closed grasslands composed of generalist non-halophytic species.

During construction and operation phases, potential impacts on biological components from the Project will mainly be associated with the following impact factors: vegetation and topsoil disturbance, introduction of buildings/infrastructures, emission of noise, emission of particulate matter, emission of light, increase of vehicular traffic, changes in water quality, potential introduction and dispersal of alien species.

The main impact of the projects on biodiversity will be due to the presence of permanent infrastructures (e.g., inverter stations, substation, administrative buildings, internal roads, etc.), which will cause a loss of available natural habitat during the entire operation phase. This loss will directly and indirectly affect habitats, flora, and fauna species. Flora and vegetation are expected to at least partially recover during the operation phase, due to rehabilitation of the temporary facilities, but also in the areas under the PV panels. In addition, if indirect impacts are not properly mitigated, habitat fragmentation and degradation could also occur.

However, literature shows that the construction of Solar Power Plants in desertic and steppe areas could determine overall positive effects for biodiversity, in terms of increased plant diversity and increased plant biomass (Bai et al., 2022; Graham et al., 2021; Hassanpour et al., 2018) provided that appropriate long-term management and restoration activates are implemented.

Based on these considerations and assuming that propriate mitigation and monitoring measures will be applied in all SPPs and associated powerlines, the expected cumulative impact of this Project at regional scale is expected to be **Low**.

9.5.4 Traffic

The Project activities related to the site preparation and construction works will require the movement of trucks entering and leaving the Project Area for the transportation of machinery, equipment, construction material and staff. During the construction phase, the Project's vehicles will not be on the road at the same time. However, in the worst-case scenario, it is assumed that the vehicles will all be on the road at the same time. Based on that, approximately 0.51 % increase in the Highway traffic could be expected in terms of total vehicle flowrate per hour. It should be noted that since the assessment is based on the maximum traffic load increases at worst-case scenario during rush-hour, the increase in road traffic will be much lower than the estimated value in most of the time during a daily period.

On the other hand, during the operation phase of the Project, the vehicle traffic will be mainly from the maintenance works and staff shuttles/cars entering and leaving the Project Area. In this regard, the expected impacts of the traffic load during the operation phase can be listed below:

- The high speed of vehicles is a concern for local communities.
- Occupational safety risks concerning vehicle/worker accidents

According to the EIAs of other planned SPP projects, in all projects with G4-Vianşehir-,5,7,8 SPP, Şanlıurfa-Mardin D400/E90 Highway will be used and number of vehicles to be used for the Project was determined. Number of vehicles of the projects is given below table. According to traffic volume map developed by General Directorate of Highways, there is 11,598 vehicle traffic on the Şanlıurfa-Mardin D400/E90 Highway.

Table 9-3: The Number of Vehicle to be used for the Projects

Project	Number of Vehicle	% impact on the Highway
G4-Viranşehir-1 SPP*	24	0.21
G4-Viranşehir-2 SPP	11	0.095
G4-Viranşehir-3 SPP	24	0.21
G4-Viranşehir-4 SPP	24	0.21
G4-Viranşehir-6 SPP	11	0.095
G4-Viranşehir-9 SPP	24	0.21
G4-Viranşehir-10 SPP	11	0.095
G4-Viranşehir-5,7,8 SPP	59	0.51
G4-Viranşehir-2 ETL	8	0.07
G4-Viranşehir-4 ETL	8	0.07
Total	**195**	**1.7**

**There is no information about number of vehicles to be used for the project. This number is estimated according to number of vehicles of the other projects due to similarities between projects in terms of both area and construction technologies.*

Considering the traffic load increase amount calculated for the projects and all mitigation measures specified in the ESIA, the management plan and other projects' EIAs, the expected cumulative traffic impact will be at **low** significance even when the worst-case scenario is considered.

9.5.5 Visual

During construction works, construction machinery will be introduced to the site and dust emissions will be of concern. On the other hand, temporary and permanent structures will also be constructed during this phase of the project. During the construction phase, it is also expected to have light emissions around the Project area. Construction vehicles, dust, and equipment will have visual impacts on viewers and general visibility (clarity of air) in the immediate vicinity of the construction site. However, the construction of the projects was temporary and has a short duration.

On the other hand, during the operation phase, permanent structures and solar panels will be present in the Projects area. The PV panels have impacts on visual aesthetics in terms of glint and glare impacts. In the Project, SiO_2 coating will be used. Silica is the most widely used ARC coating material in solar panels. This coating reduces reflections by applying a thin layer of silica on the front surface of the solar panel. However, information on the visual impacts of other projects including material to be used in the project could not be found.

Based on that, considering the worst-case scenario, the expected cumulative impact of this project will be **low**.

9.5.6 Land Occupation

There are total ten SPPs located in Kadıköy village of Viranşehir District of Şanlıurfa province. All Project will be established on a pasture land of that will require the occupation of 910 hectares. Adıyaman-Şanlıurfa-Diyarbakır Planning Region 1/100.000 Scale Environmental Plan Amendment (M44, N42 and N43 Plan Plots, Plan Amendment Explanation Report) was approved on 07.07.2020 in accordance with Article 102 of the Presidential Decree No. 1. This Environmental Layout Plan is located within the borders of "Grassland-Pastureland" as land uses in the 1/100.000 scale N43 Plan. The Project areas are also classified as "Pastureland" in terms of title deed.

The land occupation will result in negative impacts. Before the implementation of the suggested mitigating measures are put into place, all impacts are expected to occur frequently. To properly compensate the PAPs through the implementation of the Community Development Plan, the impact on the occupation of pasturelands is anticipated to decrease to between medium to negligible levels. The land requirements of the SPPs are presented below.

1. Egesa Elektrik İnşaat Enerji Üretim Anonim Şirketi: The area to be used for the project is 894867.65m2 (89.49 ha), and it is planned to establish a Solar Power Plant with a power of 64.99MWm/50 MWe.

2. Eksim Enerji A.Ş. : installed power of the project will be 65 MWp/65 MWm/50 MWe and the planned project area of 90 hectares.

3. Reşitoğlu Enerji Elektrik Üretim A.Ş: installed power of the project will be 65 MWp/65 MWm/50 MWe and the planned project area of 90 hectares.

4. Ral Enerji A.Ş.: installed power of the project will be 65 MWp/65 MWm/50 MWe and the planned project area of 90 hectares.

5. Kalyon Energy: installed power of the project will be 65 MWp/65 MWm/50 MWe and the Project area of 90 hectares.

6. Eksim Enerji A.Ş: installed power of the project will be 62.5 MWp/65 MWm/50 MWe and planned the project area of 90 hectares.

7. Kalyon Enerji: installed power of the project will be 65 MWp/65 MWm/50 MWe and the Project area of 90 hectares.

8. Kalyon Enerji: installed power of the project will be 65 MWp/65 MWm/50 MWe and the Project area of 90 hectares.

9. Ral Enerji A.Ş.: installed power of the project will be 65 MWp/65 MWm/50 MWe and the planned project area of 90 hectares.

10. Eksim Enerji A.Ş: installed power of the project will be 62.5MWp/65 MWm/50 MWe and the planned project area of 100 hectares.

9.5.7 Community Health and Safety

The Project, other projects, and external drivers could contribute to the potential negative impacts on this VEC by increasing, dust and degradation of air quality, noise and population increase due to the general construction activities.

However, according to mitigation measures for both ESIA, the Project´s embedded controls and programs proposed would appropriately mitigate the negative impacts and contribution medium to low.

9.5.8 Employment

During the construction phase of the Projects in total 655 people will be employed, and during the operation phases, 38 people will be employed in total and it will cause population influx especially during the construction phase and the employment opportunities in parallel. The employment requirements of the Projects are given below.

1. Egesa Elektrik İnşaat Enerji Üretim Anonim Şirketi: 25 people will be required during the construction phase and 5 people will be required during the operation phase.

2. Eksim Enerji A.Ş.: 50 people will be required during the construction phase and 5 people will be required during the operation phase.

3. Reşitoğlu Enerji Elektrik 80 people will be required during the construction phase and 3 people will be required during the operation phase.

4. Ral Enerji A.Ş.: 80 people will be required during the construction phase and 3 people will be required during the operation phase.

5. Kalyon Enerji: 80 people will be required during the construction phase and 3 people will be required during the operation phase.

6. Eksim Enerji A.Ş: 50 people will be required during the construction phase and 5 people will be required during the operation phase.

7. Kalyon Enerji: 80 people will be required during the construction phase and 3 people will be required during the operation phase.

8. Kalyon Enerji: 80 people will be required during the construction phase and 3 people will be required during the operation phase.

9. Ral Enerji A.Ş.: 80 people will be required during the construction phase and 3 people will be required during the operation phase.

10. Eksim Enerji A.Ş 50 people will be required during the construction phase and 5 people will be required during the operation phase.

9.5.9 Local Procurement

The Project and other projects including 10 SPPs and three ETLs and external drivers could contribute to the local procurement.

The Projects are expected to create economic contributions to the local economy by purchasing goods and services such as fuel needs of mobile equipment, transportation, foods, passenger automobiles to be used in the Project, electrical energy needs of the Project, maintenance and repair materials, office supplies, vehicle, travel, logistics, food, accommodation, communication, security. Due to these features, the Project will benefit the strengthening of the local economy of the region. However, the main local procurement opportunities of all Projects will be during the construction phases of the Projects which will create short-term economic contributions in the region. Considering the duration this impact has been assessed as low.

9.5.10 National Energy Production

The projects located in Viranşehir will produce 910 MWe. Among renewable energy sources, solar energy is the energy type with the highest potential. Türkiye, which has a high solar energy potential due to its location, has an average annual total sunshine duration of 2,640 hours (daily total of 7.2 hours) and an average total radiation intensity of 1,311 kWh/m²-year (daily total of 3.6 kWh/m²). Considering the possibility of providing uninterrupted energy with energy transmission, the Projects is expected to have a substantial contribution to the national economy of Türkiye.

9.6 Step 6 – Management of Cumulative Impacts – Design and Implementation

The management approach to implementation needs to be adaptive, monitoring both the impacts and the effectiveness of management approaches and adjusting the management to ensure the avoidance of unacceptable cumulative impacts. As with management of impacts identified in ESIA, this works best when management of cumulative impacts is integrated into company business plans and strategies.

The definition of a detailed mitigation strategy for cumulative impacts of the projects would require a set of information and data on the various projects involved that are not currently available, as well as extending the study area significantly beyond the boundaries defined for Project ESIA.

Thus, the preparation of a mitigation strategy for cumulative impacts would require cooperation and coordination among the Project owners. Furthermore, the implementation would also require the cooperation, and consent as applicable, of several related authorities that govern the various VECs, such as the departments of forestry, wildlife, and water resources management. The effectiveness of this coordination/cooperation cannot be guaranteed at this stage and will depend on the mutual preparedness of companies other than Kalyon Enerji and the related authorities to cooperate on this issue during the future phases of these projects.

According to this CIA study, cumulative impacts from the Project and other projects were generally found to be of low intensity or negligible. However, below considerations would be needed to effectively manage the cumulative impacts:

- The management measures needed to prevent cumulative impacts will depend on both the context in which the development impacts occur (i.e., the impacts from other projects and natural drivers that affect the VECs) and the characteristics of the development's impacts. Since cumulative impacts typically result from the actions of multiple stakeholders, the responsibility for their management is collective, requiring individual actions to eliminate or minimize individual development's contributions. For the management of cumulative impacts, multiple stakeholders need to be involved in a collective responsibility to eliminate or minimize the impacts. Therefore, Kalyon Enerji will conduct close engagement and consultation activities

with the projects mentioned in this CIA and government agencies, if necessary. For this, it is recommended for Kalyon Enerji to prepare a specific Stakeholder List for the CIA.

- Kalyon Enerji will ensure that all mitigation measures given in this ESIA, and all management plans are implemented. Since the proposed Project will be one of the largest projects in the region, the specific mitigation and monitoring measures described for each component in Chapter 7 of this ESIA report, will be important to manage the cumulative impacts. To ensure this, the monitoring programs and KPIs provided in the related ESIA chapters will be followed by Kalyon Enerji.
- In case of any grievances about the cumulative impact, Kalyon Enerji will inform the other project owners and joint actions will be taken.
- Kalyon Enerji will conduct close engagement and consultation activities with the projects mentioned in this CIA.
- Collaborative planning/process for protection and enhancement of VECs.

Table of Contents

TABLES

FIGURES

APPENDICES

No table of contents entries found.

10.0 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

10.1 Introduction

This Environmental and Social Management Plan (ESMP) identifies and presents the framework and the strategy for implementing and improving the Environmental and Social Management System (ESMS) of the G4-Viranşehir-5,7,8 Solar Power Plant Project ("the Project"), planned by Kalyon Enerji Yatırımları A.Ş. ("Kalyon Enerji") and Kalyon YEKA GES 3 ve 4 Güneş Enerjisi Yatırımları A.Ş. ("Client") a subsidiary of Kalyon Enerji.

The ESMP is an integral part of the ESIA as it is a system-setting document for the Project and its contractors and represents a commitment towards environmental and social sustainability applied to the Project's entire life cycle. The ESMP is an overarching document developed in accordance with the corporate policies of Kalyon Enerji with the commitments included in the Environmental and Social Impact Assessment (ESIA) and, more broadly, with the Turkish regulatory framework relevant to the Project as well as with the E&S Standards that apply to the Project. These include International Finance Corporation (IFC) Performance Standards (PS), Guidance Documents, IFC General Environmental, Health, and Safety (EHS) Guidelines, Equator Principles (EP), and Organisation for Economic Co-operation and Development (OECD)'s Common Approaches. The Project ESMP consists of several sub-management plans as demonstrated further in Figure 10-1, in which the ESIA mitigation measures are reflected and compliance with applicable Project legislation, standards and limits are ensured.

The ESMS of the Project defined within this ESMP is developed and under continuous improvement to ensure the appropriate management of environmental and social risks to meet the objectives set by existing Kalyon Enerji policies and directives regarding E&S. Environmental and social management system at all phases is required to meet national, international standards, best practices, and Projects' documents and requirements. Referring to the integrated policies, there are targets to achieve the Projects with zero waste, zero incidents, and full respect for humans including vulnerable groups.

Nine elements of ESMS help to assess, control, and continually improve the E&S performance, The Project ESMP has to comply with these elements.

Figure 10-1 Map Showing Nearest Settlements to the Project Site Elements of ESMS (IFC, 2015)

The E&S mitigation measures defined in the ESIA process were transposed into a Commitments Register (Chapter 10.8.8) serving as a tool which informs this ESMP as well as the associated ESMS planning and processes to be implemented at the various levels of the Project organization to ensure that the Project requirements, regulations, and standards are met.

10.2 Objectives of the ESMP

A key objective of the ESMP is to “operationalise” the E&S (including occupational health and safety) commitments and mitigations as identified in the ESIA to ensure that the Project (including construction, operation, and decommissioning) is undertaken in a way to minimise the negative impacts on the physical, biological, and social environments in the Project-affected area.

More specifically, the ESMS defined within this ESMP will:

- Establish environmental and social management standards that comply with or surpass Good International Industrial Practices (GIIP) and reasonable community expectations,
- Adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize and restore E&S impacts,
- Develop and implement policies, plans and procedures to integrate E&S aspects within the overall project management framework throughout its lifecycle,
- Facilitate the implementation of management plans as defined by the ESIA for the avoidance, minimisation, and control of E&S impacts,
- Inform Project personnel about their responsibilities with respect to E&S issues and monitor how those responsibilities are implemented,
- Train project personnel, contractors, and community representatives, as necessary, in relevant environmental and social procedures, actions, and monitoring programmes,
- Establish a monitoring programme to assess the effects of residual impacts on the environment and monitor the ESMS performance and,
- Provide for periodic system audits and identify corrective actions, if necessary, to reach the planned objectives.

The Project ESMP includes a set of associated E&S sub-management plans as listed in Table 10-1, which have been prepared for addressing specific E&S issues. The ESMPs provide details of the actions that will be taken by the Client during the construction phase and, later, during operations to mitigate and manage the Project’s E&S impacts and risks. This ESMP outlines how the Project will monitor, and how external contractors will address and manage E&S risks and impacts generated by their activities in line with the mentioned standards. The Project ESMP also includes tools for auditing and monitoring the Project’s performance and communicating monitoring outcomes to stakeholders.

Additional details related to the operation phase of the Project are expected to be developed in due course. Accordingly, this Project ESMP will be subject to revisions before the start of operations to encompass and consider any new information relevant to the management of E&S impacts and risks. The purpose of this ESMP is to define:

- The scope of the ESMS during the construction and operation phases
- The standards applied to the Project ESMS during the construction and operation phases
- Responsibilities and commitments, for the implementation of the ESMS
- The framework for the definition and implementation of the mitigation measures applicable to the Project
- The framework for the definition, implementation, and management of the monitoring activities and

- The framework for the review of the environmental and social performance and of the adequacy of the ESMPs.

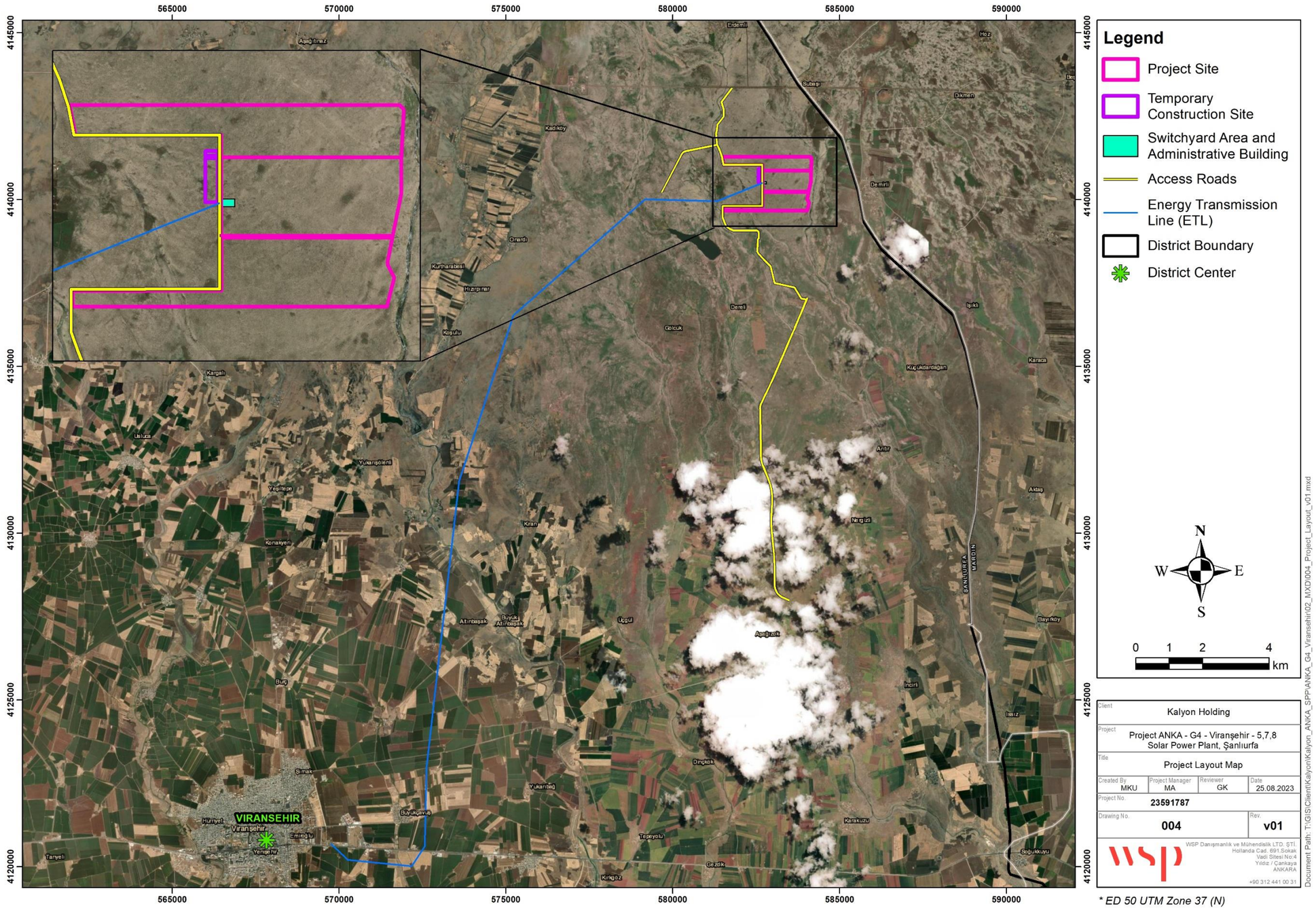
The Project ESMP will apply to normal operating conditions during the construction, operation, and decommissioning activities. Emergency situations resulting from unplanned events will be addressed in a specific Emergency Preparedness and Response Plan (EPRP), also an element of the ESMS.

Although the Client will have full control and ultimate responsibility on the construction, operations and decommissioning of the Project, an EPC and a number of subcontractors will be retained for carrying out different activities that will have to maintain their own ESMS, while incorporating the Project ESMPs into their own Project-specific ESMP aligned with the provisions included in this Project ESMP and the ESIA developed for the entire Project.

10.3 Project Description

The Project having a capacity of 195 MWp/150MWe , is planned by Kalyon Enerji Yatırımları A.Ş. (“Kalyon Enerji”) and this Project will be developed and constructed by Kalyon YEKA GES 3 ve 4 Güneş Enerjisi Yatırımları A.Ş (“Client”), a subsidiary of Kalyon Enerji. The Project will be located in Şanlıurfa Province, in the Viranşehir District, Kadıköy Neighbourhoods in Türkiye. Once the Solar Power Plant is put into operation, it is planned to produce 390000 MWe of electricity annually, and the electricity produced will be connected to the Viranşehir Substation via new ~26.7 km 154 kV OHTL.

The project layout is presented in Figure 10-2.



* ED 50 UTM Zone 37 (N)

Figure 10-2: Project Layout

The Project area was declared an area suitable for the development of a solar project: a Renewable Energy Resource Area. Consequently, it was launched the "Competition Announcement on the Allocation of Renewable Energy Resource Areas and Connection Capacities Based on Solar Energy"; YEKA SPP-4 Erzin-Viranşehir (including G-4-Viranşehir-5,7,8) competitions were held on 28.06.2022. YEKA Right of Use Agreements were signed on 08.08.2022 with Kalyon Enerji Yatırımları A.Ş., which won the competition held by the Ministry of Energy and Natural Resources.

The Project will be established on a pastureland of 270 hectares. Adıyaman-Şanlıurfa-Diyarbakır Planning Region 1/100.000 Scale Environmental Plan Amendment (M44, N42 and N43 Plan Plots, Plan Amendment Explanation Report) was approved on 07.07.2020 in accordance with Article 102 of the Presidential Decree No. 1. This Environmental Layout Plan is located within the borders of "Grassland-Pastureland" as land uses in the 1/100.000 scale N43 Plan. The Project areas are also classified as "Pastureland" in terms of title deed.

The closest settlements to the SPP site are Düzlük Hamlet at 0.57 km, Subaşı Hamlet at 1.82 km, Demirli Village at 1.89 km, Goncuk Village at 2.73 km, and Kadıköy Village at 5.16 km. The nearest settlements to the Project site are shown in Figure 10-3.

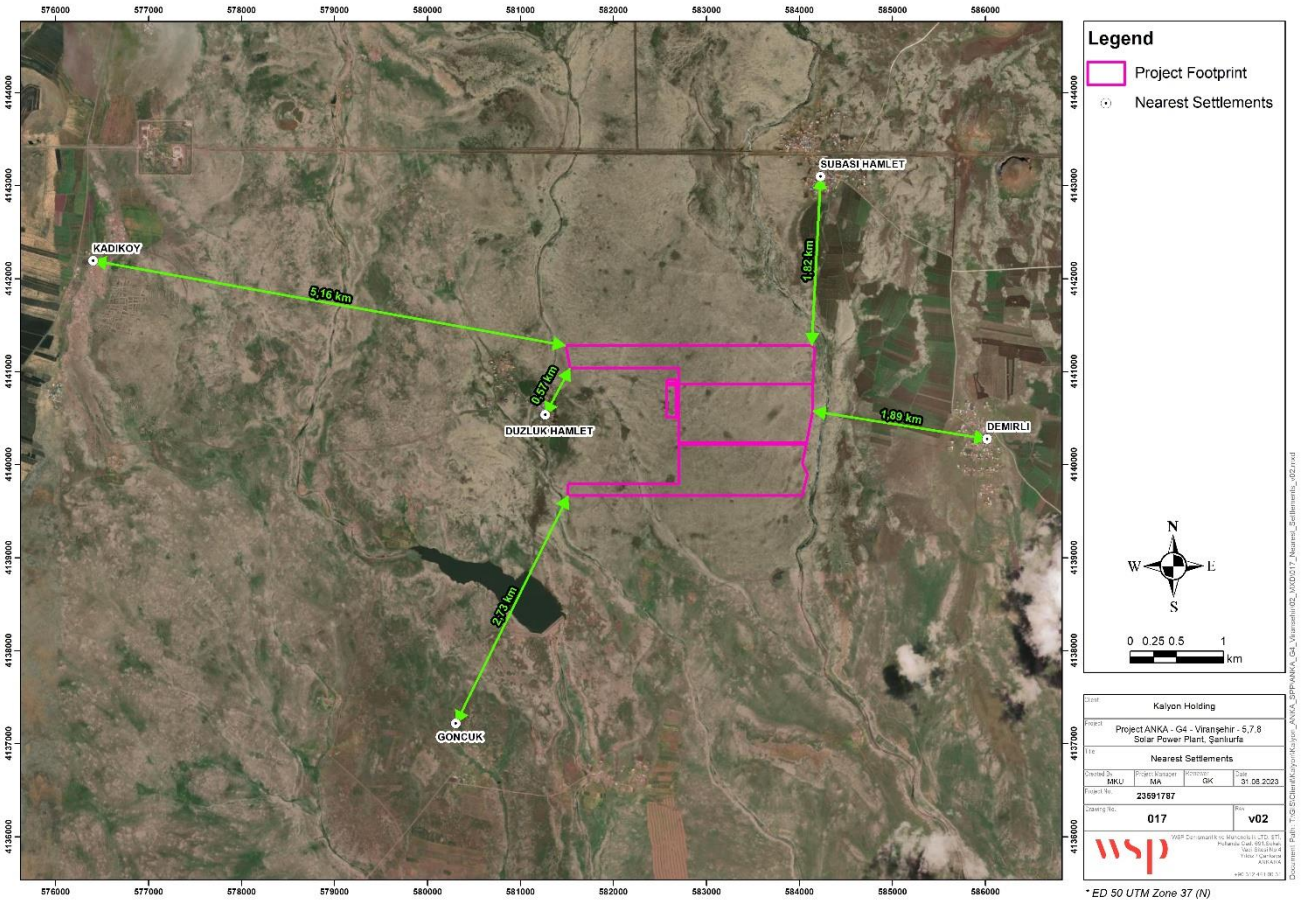


Figure 10-3 Map Showing Nearest Settlements to the Project Site

10.4 Legal, Regulatory and Policy Framework

This section includes policies, standards, and requirements of reference for this Plan that are applicable for, but not limited to, construction, operation, and decommissioning phases of the Project.

It is important to note that the Project will comply with the adopted Project Standards.

Project standards are described in the Project ESIA and are listed below:

- National legislative requirements and all permits, licenses, and approvals
- IFC PSs
- Equator Principles (EPs) IV
- Other good international industry practices (GIIP).
- International Conventions and Protocols Türkiye is a party to
- Kalyon Enerji's IMS Policy, Health&Safety Policy, Environment and Climate Change Policy, Social Impact and Human Rights Policy and related practices and procedures
- EBRD and IFC, Workers' Accommodation: processes and standards

For a detailed breakdown of the project standards regarding air quality, water quality, soil quality, noise and vibration please refer to Appendix A.

10.4.1 Applicable Turkish Legislation

The Turkish legal framework for environmental protection was developed in line with national and international initiatives and standards, and some of them have been revised recently to be harmonized with the European Union (EU) Directives in the scope of pre-accession efforts of Türkiye to the EU. The Turkish Environment Law No. 2872 dated 1983 set the general framework of the environmental requirements for the protection of the environment. It has a comprehensive structure that has a holistic and integrated vision of the environment. "Polluter pays" and "user pays" principles and carrying capacity concepts form the basis of regulatory tools in Environmental Law. The Law is supported by numerous regulations and decrees prepared/updated in the process of alignment with EU legislation.

10.4.2 Applicable International Legislation

Türkiye is a party to many international agreements regarding multiple social and environmental subjects. These are listed in ESIA - Chapter 2 Regulatory and Policy Framework and their applicability are discussed further in the relevant chapters of this ESIA. Türkiye has also ratified several international European, United Nations, and ILO conventions on several topics including labour conditions and human rights.

The following international standards are also applied to the Project:

- Equator Principles IV (2020)
    - Principle 1: Review and Categorization
    - Principle 2: Environmental and Social Assessment
    - Principle 3: Applicable Environmental and Social Standards
    - Principle 4: Environmental and Social Management System and Equator Principles Action Plan
    - Principle 5: Stakeholder Engagement
    - Principle 6: Grievance Mechanism

    - Principle 7: Independent Review
    - Principle 8: Covenants
    - Principle 9: Independent Monitoring and Reporting
    - Principle 10: Reporting and Transparency.
- IFC Performance Standards (2012):
    - Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts
    - Performance Standard 2: Labour and Working Conditions
    - Performance Standard 3: Resource Efficiency and Pollution Prevention
    - Performance Standard 4: Community Health, Safety, and Security
    - Performance Standard 5: Land Acquisition and Involuntary Resettlement
    - Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
    - Performance Standard 7: Indigenous Peoples (not applicable to the Project)
    - Performance Standard 8: Cultural Heritage
- IFC General EHS Guidelines (2007)
- IFC EHS Guidelines for Electric Power Transmission and Distribution (2007)
- Performance Indicators and Monitoring, Documents Pertaining to Human Rights (2012)
- Other IFC Guidelines:
    - IFC's Good Practice Note on Addressing Grievances from Project-Affected Communities (2009)
    - IFC's Good Practice Note on Managing Contractors' Environmental and Social Performance (2017)
    - IFC's Good Practice Handbook on Use of Security Forces: Assessing and Managing Risks and Impacts (2017)
    - IFC's Introduction to Health Impact Assessment (2009)
    - IFC and EBRD's Guidance Note on Workers' Accommodation: Processes and Standards (2009)
    - IFC's Good Practice Handbook on Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets (2013)

10.5 ESMP

The Project ESMP (this document) is structured to present the pillars of the ESMS that the Client has established for the Project, referring to the existing overarching integrated management system documents and consisting of the newly prepared documents:

- Corporate Policies and Directives
- Project-specific HR Policy and Procedure
- Risks and impacts identification process (the ESIA)

- Management of Change (MoC) procedure of the Project
- Environmental and Social Management Plan (ESMP).
- Organisational Capacity and Competency (Figure 10-5)
- Communication to and engagement with stakeholders (Project Stakeholder Engagement Plan (SEP) will be disclosed on the Kalyon Enerji website)
- Emergency Preparedness and Response
- Monitoring and review.

The selected EPC and subcontractors are required to develop their ESMPs incorporating the requirements of the Project ESMPs defined and prepared as per the ESIA requirements. They have to follow these documents, including E&S plans and procedures while working on the Project. Such plans and procedures are reviewed and approved by the Client for construction, operation and decommissioning to assess their alignment with the Project ESMS.

The following sections of this chapter include an overview of the elements that constitute Project ESMS.

10.5.1 Environmental and Social Policies

The Client has IMS Policy, OHS Policy, Environment and Climate Change al Policy, Social Impact, and Human Rights Policy. A Sustainability Policy is being prepared that covers all policies compatible with its vision and mission. Kalyon Enerji will ensure that all employees within the Project organization are acquainted with the policy and its associated procedures. Additionally, EPC and its sub-contractors will be required to adhere to the Policy's requirements through a contractually binding agreement.

10.5.2 Risks and Impacts Identification Process

E&S aspects and impacts associated with the Project have been identified and evaluated as part of the ESIA process as summarized in Figure 10-4. Details on the full impact assessment methodology used are provided in the ESIA Chapter 5 - Methodology.

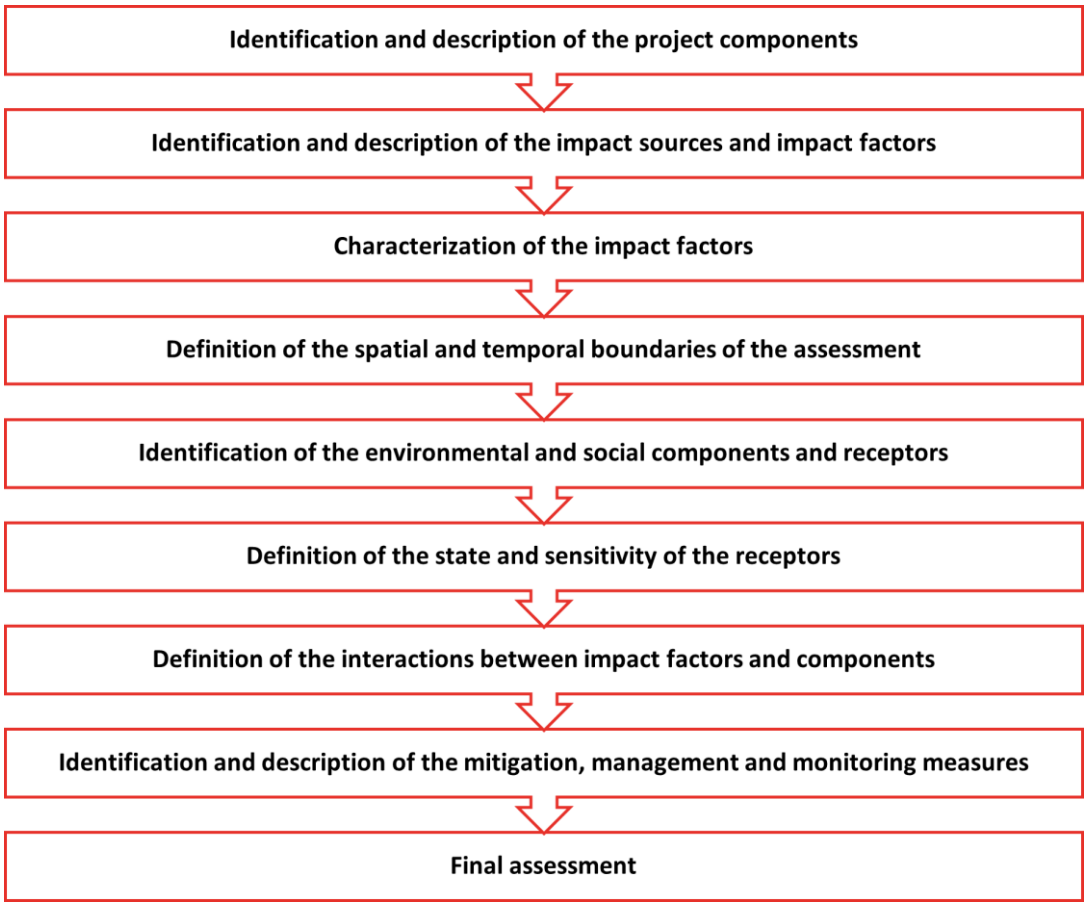


Figure 10-4: Impact Assessment Approach

The ESIA resulted in the identification of E&S risks and potential impact factors for which specific mitigation measures were identified to mitigate the effects of the impact factors. The ESIA was prepared in accordance with both National Regulations and applicable international standards. The ESIA process included the following steps:

- Review of available Project and environmental and social documentation
- Gap Analysis Study with a preliminary independent opinion on the Project's E&S risks/aspects as well as the adequacy of the assessments carried out and the plans and procedures developed to manage the impacts from the Project in compliance with applicable IFIs' E&S Policies and Standards. The results of the initial Gap Analysis Study identified the need for additional baselines and to re-evaluate the outcomes of the national EIA carried out to achieve full compliance with lenders' standards
- Site visits to the Project to see the different project areas and meet/work close with the Client team
- Biological and physical baselines surveys have been performed for physical (air quality, noise and vibration measurements at sensitive receptors, soil, groundwater) and biological (flora, fauna) components to provide an understanding of the environmental context in the Regional Study Area (RSA) and the Area of Influence (AoI) of the Project before its realization
- A Stakeholder Engagement process including community-level surveys, focus group discussions, key informant interviews
- The ESIA report: an ESIA report has been prepared and includes the results of the ESIA process carried out as well as an assessment of the Project's adverse and positive impacts and includes mitigations measures that will be the basis for the preparation of ESMPs, a component of the Project's ESMS. The ESIA report includes a Non-Technical Summary (NTS) prepared for disclosure.

10.5.3 Management of Change

The Project develops a system that includes appropriate tools and procedures to identify future risks and impacts that may arise from Project changes, which may differ or be additional to those already identified in the ESIA. The Client's MoC (Management of Change) process screens are used to manage such risks and impacts. The MoC process assesses risks and impacts related to injury/health, environment, damage, etc., on a scale of 1-5, ranging from insignificant to catastrophic/severe.

Specifically, The Client develops a standalone MoC Procedure that occurs during the Project development and the like. The purpose of the MoC is to evaluate the impacts of changes in the Project and track the necessary information to effectively manage the consequences of the change on environmental and social components inside the Project's area of influence. The key principles of the MoC will include:

Specifically, The Client develops a dedicated MoC Procedure to be implemented during the Project development. The purpose of this procedure is to evaluate the impacts of Project changes and track the necessary information to effectively manage the resulting consequences on environmental and social aspects within the Project's AoI. The key principles of the MoC process include:

- Managing permanent, temporary, and urgent/emergency changes to procedures or process equipment.
- Providing screening tools and procedures to evaluate proposed changes and their consequences in terms of environmental and social risks and impacts within the project's area of influence.
- Implementing procedures to assess the impacts and risks generated by the changes and determine if they may result in additional risks and impacts beyond those identified in the ESIA process. If differences are found, the MoC process should provide additional or enhanced mitigations to be included in the Environmental and Social Management Plans (ESMPs) to address the risks associated with the changes.
- Including provisions for communicating the proposed changes, their consequences, and any new management requirements to personnel whose job tasks may be affected by the changes. These individuals may require training before implementing the changes.
- Ensuring that all critical documentation remains up to date as changes are implemented.

The Client will structure its MoC assessment process using a 1-5 level scale and categorize changes according to their significance as follows:

- **Level III:** Changes of **higher significance** that are reasonably likely to have significant adverse impacts outside the scope or study area of the ESIA and are not mitigated by the existing ESMP and mitigation measures. This may trigger the need for an addendum to the ESIA and a formal submission and approval process. Changes in project standards also fall under this category. Level III changes require revising or updating the ESMP and the ESMS.
- **Level II:** Changes of **moderate significance** that are considered material to the findings of the ESIA and fall within the scope or study area covered by the ESIA. This may require minor modifications to the ESMP and additional surveys or environmental and social assessments, as necessary.
- **Level I:** Changes of **minor significance** that are largely deemed immaterial to the findings of the ESIA and do not affect the project's ability to meet environmental and social performance requirements through the existing ESMP and ESMS. These changes may require limited or no additional environmental or social study or survey activities.

For Level III and II changes that are likely to require an ESMP update, it is important to notify all relevant stakeholders. Workers or other parties involved in implementing measures to manage the effects of the changes should be trained to understand the implications of the changes and their ability to respond accordingly.

10.5.4 Environmental and Social Management Plans

The Client has developed a comprehensive set of Environmental and Social Management Plans (ESMPs) and procedures in alignment with their policies and commitments. These plans specifically address the environmental and social impacts identified in the ESIA for each Project component. The ESMPs include relevant mitigation measures to address these impacts. The table below presents the complete set of ESMPs that has been developed and implemented to fulfil the Project's commitments, along with the corresponding IFC PSs that each plan will contribute to complying with.

Table 10-1: ESMPs

Relevant IFC PS	Plans / Procedures
IFC PS1 5-24: Assessment and Management of Environmental and Social Risks and Impacts	■ ESMP - (this chapter) ■ Stakeholder Engagement Plan
IFC PS2: Labour and Working Conditions	■ Human Rights Management Plan ■ Camp Site and Offsite Accommodation Management Plan ■ Labor Management Plan ■ Contractor Management Plan ■ Supplier Management Plan
IFC PS3: Resource Efficiency and Pollution Prevention IFC EHS Guidelines	■ Resource Efficiency Management Plan ■ Pollution Prevention Plan (e.g., air, noise, wastewater, soil, groundwater contamination, hazardous material management, etc.) ■ Waste Management Plan ■ Soil Management and Erosion Control Plan ■ Hazardous Material Management Plan
IFC PS4: Community Health, Safety, and Security IFC EHS Guidelines	■ Traffic Management Plan ■ Community Health and Safety Management Plan ■ Security Management Plan ■ Emergency Preparedness and Response Plan
IFC PS5: Land Acquisition and Involuntary Resettlement	■ Not applicable
IFC PS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	■ Biodiversity Management Plan
IFC PS7: Indigenous Peoples	■ Not applicable
IFC PS8: Cultural Heritage	■ Cultural Heritage Management Plan and Chance Find Procedure

The ESMPs will be implemented:

- across the Project organization, including, EPC, its sub-contractors, and primary suppliers over which the Client has control or influence.
- inside the Project Area of Influence including the associated facilities (as defined by IFC PS1: “facilities that are not funded as part of the project and that would not have been constructed or expanded if the project did not exist and without which the project would not be viable”).

The ESMPs contain the following components:

- Objectives of the document
- Reference to relevant legal requirements
- Roles and responsibilities for implementation
- Links to other management plans, as necessary
- List of management and mitigation measures
- Monitoring and reporting requirements
- Qualitative or quantitative Key Performance Indicators (KPIs) and measures for assessing the effectiveness of the mitigation measures identified during the impact assessment process
- Training and awareness requirements, as needed
- Inspections, audits, and reviews.

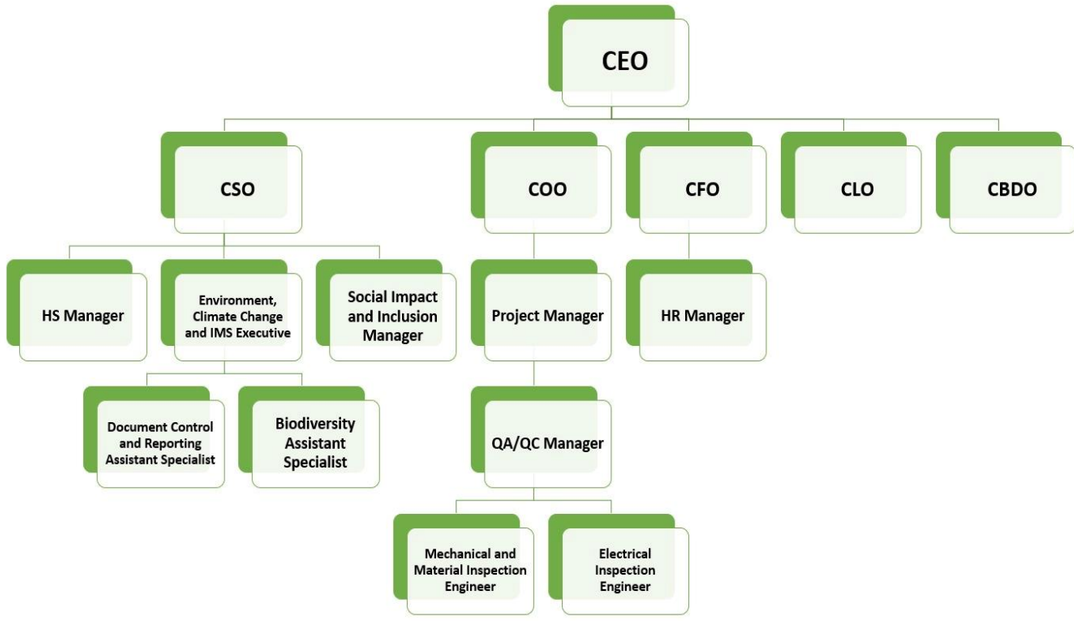
Each management plan has a similar structure, but the level of detail and complexity is appropriate to the expected impacts and risks of the Project identified in the ESIA. The mitigation measures identified in the relevant sections of the ESIA are included in each management plan, which will be disclosed to stakeholders in accordance with the SEP.

The ESMPs will be shared with EPC and subcontractors to ensure they develop their own equivalent management plans, procedures, and work instructions that align with the ESMP. Additional mitigation measures specific to their activities will be included as necessary.

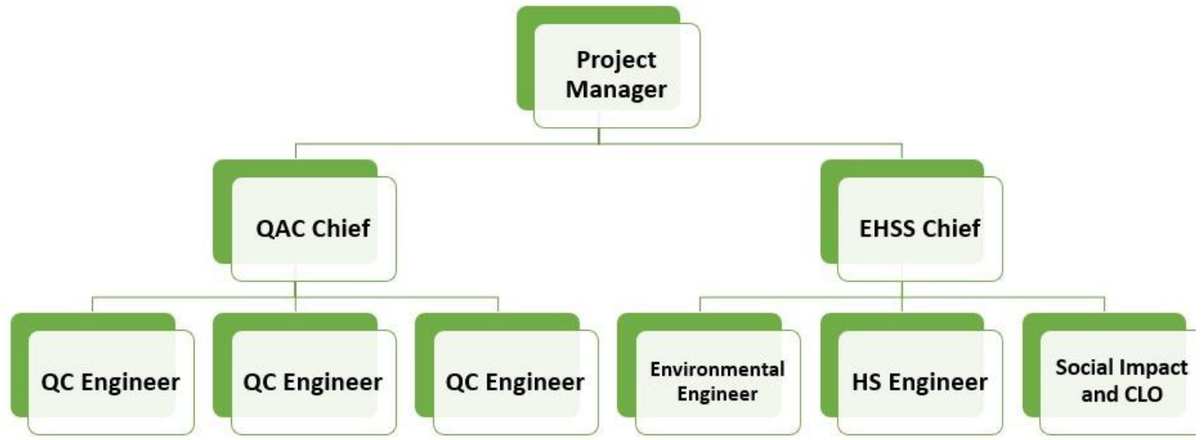
10.6 Organisational Structure and Competency

10.6.1 Resources, Roles, Responsibility and Authority

To effectively implement the Environmental and Social Management System (ESMS), all parties involved in the Project (Client, EPC, and its sub-contractors) need to establish dedicated organizational structures with clearly defined responsibilities for managing environmental and social aspects, including health and safety as per the IFC PSs. Figure 10-5 illustrates the organization chart showing the Project Parties.



CLIENT ORGANIZATION STRUCTURE



EPC ORGANIZATION STRUCTURE

Figure 10-5: Organization Chart

Below are the key roles and positions involved in the Project. These descriptions are intended as a starting point and will be further developed by the Client, specifying the exact number and nature of positions and staff to be employed.

Table 10-2: Roles and Responsibilities

Role	Overall Responsibilities	Specific responsibilities
Client Management	■ Provide strategic E&S direction across the Project. ■ Oversee and monitor the implementation of the ESMPs. ■ Approve EPC's document/plan/procedure prepared and ensure they are aligned with the ESMS requirements. ■ Monitor that sufficient and qualified resources are allocated for the ESMS implementation. ■ Monitor that clear and specific roles and responsibilities are defined at all levels of the organisation involved in the plan implementation.	■ Ensure that sufficient and qualified resources (including financial) are allocated across the different work streams to ensure effective implementation of the mitigation measures included in the ESMPs. ■ Ensure that EPC is qualified to carry out its tasks and have in place effective ESMPs aligned with those developed by the Client. ■ Ensure that qualified specialists are appointed to supervise E&S aspects on the ground. ■ Sign off this ESMP and the related ESMPs as well as those developed by contractors and subcontractors' plans.
Client Site Personnel	■ Monitor that Project ESMP documentation is maintained and implemented. ■ Work with EPC to monitor that their Project specific ESMP is in-line with the Company ESMS and this ESMP and support when gaps are identified. ■ Monitor the implementation of the ESMP of EPC and subcontractors.	■ Provide day-to-day advice and guidance on all Project E&S requirements, including to EPC and subcontractors. ■ Conduct training and awareness programmes with personnel involved in the ESMP implementation, as needed. ■ Monitor that this Plan and related ESMPs are up to date and appropriate to the nature and scale of the Project's activities and ensure they are implemented effectively. ■ Ensure Health, Safety, Security and Environment (HSSE) audits are carried out across the different Project areas to ensure EPC and subcontractors are effectively implementing the mitigation measures identified. Maintain records of all non-conformances raised and take appropriate actions to ensure corrective measures are implemented. ■ Collect and perform QA/QC review of all monitoring data and develop performance monitoring reports (including those provided by specialized contractors) for Management, stakeholders, and Lenders.
EPC and its sub-contractors Management	■ Ensure that each subcontractor has in place an ESMP aligned with the Project ESMP and relevant management plans commensurate	■ Ensure the workforce is trained for the specific tasks assigned and implement the HSSE requirements included in the

Role	Overall Responsibilities	Specific responsibilities
	to the risks associated with the subcontractor's activities. ■ Monitor the ESMP implementation and check performance. ■ Follow up on on-compliance identified until their closure.	ESMPs and line with contractual arrangements. ■ Provide relevant monitoring data and reports of the monitoring activities carried out as requested by the Client. ■ Propose changes and integrations to the monitoring activities included in this manual and the related ESMPs if they do not fit the specific activities carried out.
All employees	■ Be aware of the requirements included in the different management plans as needed by the relevant work task assigned.	■ To comply with environmental management requirements. ■ Report on any activities which represent a deviation from or a non-compliance with the ESMS requirements. ■ Implement the mitigation measures identified in the ESMPs during the execution of the works.

Job-specific roles and positions together with job descriptions and responsibilities have been further described within the individual ESMPs. In alignment with the requirements of IFC PS1, the Client will ensure that job-specific training (see next Chapter 10.6.2 on *Training, Awareness and Competence* for additional details) will be in place to ensure that all employees are qualified and aware of the policies and procedures. Likewise, the Client will require that EPC and subcontractors have appropriate training for all their employees operating on the Project. Such training will include a minimum of the following:

10.6.2 Training, Awareness and Competence

The Client will provide appropriate EHSS training programmes to all their managers and employees based on their assigned tasks. The purpose of this training is to ensure the following:

- All staff is aware of the -EHSS risks associated with the Project and of the need to implement the ESMP, and the requirements therein, and that failure in the implementation of these requirements may lead to significant -EHSS impacts and a breach in the commitments taken by the Project to be aligned to Lenders' requirements
- Staff with direct responsibility for the Project's -EHSS performances have the adequate knowledge, skills, and experience to perform their duties and are familiar with the applicable laws, regulations relevant to their job task
- Staff possess the knowledge, skills, and experience to implement the specific measures and actions required under the ESMPs.

In addition to the above, EPC will be required to develop its training and awareness procedures and a training program for its personnel, including subcontractors. These procedures should identify the training needs, planning, and execution, and should provide specific instructions for developing and maintaining an up-to-date -EHSS training program. The training programs will have different levels of competency and training based on individual personnel's -EHSS responsibilities and involvement. Approval from the Client will be required for EPC training programs to ensure they are suitable for the assigned tasks.

10.7 Stakeholder Engagement

10.7.1 Engagement Process and Disclosure of Information

According to IFC PS1, it is necessary to have effective stakeholder engagement to prevent and reduce social risks and to ensure that the Project maintains a long-term social license to operate. Stakeholder engagement plays a crucial role in establishing strong, positive, and responsive relationships, which are essential for effectively managing the environmental and social risks and impacts associated with a project.

The main objective of effective stakeholder engagement is to provide stakeholders with relevant information about the Project's potential environmental and social impacts through transparent disclosure. This helps ensure that stakeholders have accurate perceptions of the proposed development. It also involves consulting with stakeholders to gather their feedback and opinions, as well as providing a mechanism for addressing any concerns or complaints they may have. Stakeholders can be either external or internal to the Client (presumably the organizations involved in the project) and can include individuals or groups who:

- Directly or indirectly affected by the Project,
- Interested in the Project and its activities,
- Able to influence the Project and the expected results.

The stakeholder engagement process helps to:

- identify and involve all stakeholders potentially affected by the Project,
- ensure a good understanding of the Project activities and potential impacts/benefits,
- identify issues early in the Project cycle that may pose risks to the Project or its stakeholders,
- ensure that mitigation measures are appropriate (implementable, effective, and efficient),
- establish a system for long-term and mutual communication between the Project and stakeholders that benefits all parties.

The stakeholder identification process has been performed by the Client supported by Project consultants during direct meetings with authorities, key stakeholders, and representatives of local communities. Detailed information on stakeholder engagement activities performed and planned are presented in the SEP and included:

- Publication of planned activity (which is the legal definition for the project) through regional and local newspapers and the Project website,
- Public hearings in a frame of public discussion procedure,
- Consultations with public authorities at national, regional, and local levels.

The SEP outlines a systematic approach to stakeholder engagement to support the Client in developing and maintaining strong and constructive relationships with the stakeholders and in addressing their concerns about the Project. The SEP and its implementation fall under the Client’s responsibility. In particular, the SEP for the construction phase includes:

- provisions for the disclosure to the affected communities of relevant information on:
  - The purpose, nature and scale of the Project,
  - The duration of proposed Project activities,
  - Potential risks/impacts and relevant mitigation measures,

  - The stakeholder engagement process envisaged going forward and,
  - A Grievance Mechanism is consistent with IFC PS1 requirements scaled to the risks and impacts of the project.
- Provisions for a stakeholders' consultation and participation process appropriate for the potentially affected communities, their decision-making process and the need to reach/include disadvantaged or vulnerable groups,
- Documents to demonstrate how the feedback from stakeholders' consultation and participation has been included in the Client management decision-making process and used to identify specific mitigation measures, as needed,
- The provision of periodic reports to the potentially affected communities to update them on progresses of the implementation of the ESMPs, also addressing eventual grievances received,
- an internal Grievance Mechanism for all employees and contractors and,
- an external Grievance Mechanism with a procedure providing a framework for receiving, recording, and facilitating the resolution of concerns raised by affected communities.

The SEP is considered a living document and will be regularly monitored, reviewed and updated by the Client throughout all stages of the Project implementation to ensure:

- it remains fit for the purpose at each phase of the Project,
- it addresses the outcomes of stakeholders' consultation activities,
- it addresses the grievances received from stakeholders.

The internal communication amongst the various functions and roles and the different Project parties is addressed in this ESMP.

10.7.2 Internal Grievance Mechanism

An internal grievance mechanism has been developed for the Project. All direct and indirect Project workers will follow this procedure. The procedure defines grievances as a statement of dissatisfaction over any condition that allegedly harms the employee. A grievance may relate to matters involving internal communication, responsibilities abuse, abuse in the authority line, race, colour, ancestry, national origin, religion, age, sex, sexual orientation, gender identity, sexual harassment, or disability status.

In case requested, all grievance holders will have the right to remain anonymous and maintain their confidentiality. The client will not disclose any grievance holder's credentials without ensuring their consent first. If such consent is given, only the managers and personnel related to that specific grievance will be informed.

The employee Request and Grievance Register of the Client used for the ANKA Project is presented in the appendix of the SEP.

10.7.3 External Grievance Mechanism

An external grievance mechanism of the Client has been developed for the Project. The external grievance mechanism is a part of the management system, and it is responsive to any concerns and complaints, particularly from affected stakeholders and communities. Special care will be focused on training the designated staff involved in the management of the grievance mechanism. The overarching aim of this grievance mechanism is to provide all stakeholders with the opportunity to obtain information about the Client's activities and facilities, deliver their complaints and requests in a structured and formal manner and receive prompt, fair and effective responses.

Any comments or concerns will be brought to the Company's attention verbally or in writing (by post or e-mail) or by filling in a grievance form. The grievance form will be made available on the Company website, at the Project site, at the Mukhtar's office, alongside a description of the grievance mechanism. Grievance forms can then be submitted to the contact points. All grievances will be:

- Acknowledged within seven working days after receipt; and
- Responded no later than within 30 working days after receipt.

Specifically, nominated, and trained members of staff will record grievance information in a grievance register the information in the grievance register will include the Stakeholder name and contact details and details of the grievance and how and when it was submitted, acknowledged, responded to and closed out.

The grievance mechanism is widely announced to the public with stakeholder meetings held for project-affected communities. Additional meetings will be organized to target women Project Affected People (PAPs) and vulnerable groups for sharing information on grievance mechanism that also allows anonymous grievances.

Gender equality is observed by the Client. There is a woman environmental engineer in the Project. She will deal with the complaints and demands of women in the Project area. The grievances will be reviewed by the team according to the Project's human rights and grievance mechanism.

10.7.4 Emergency Preparedness and Response

The Client has established an EPRP for the Project, following IFC EHS Guidelines - 3.7 Emergency Preparedness and Response. The purpose of the EPRP is to effectively respond to emergency situations associated with the Project to prevent and mitigate harm to people and the environment. The EPRP addresses various emergency conditions, including:

- Life and fire safety including natural disasters,
- Incidents that may occur at the Project site,
- Leaks or spills of hazardous chemicals/hazardous substances in construction areas,
- Transportation of hazardous chemicals/ waste inside the working areas and off-site on public roads,
- Attacks and sabotage to the construction sites,
- Natural events such as landslides, flooding, etc. and,
- First aid emergency procedures and cases.

The EPRP includes detailed information for the following key elements:

- Applicable legislation requirements and reference and contact details of local government agencies (e.g., police, emergency rescue),
- Identification of emergency situations and scenarios that may arise during routine activities or because of unplanned events, and communities and individuals that may be impacted,
- Definition of emergency response standard operating procedures for specific types of events,
- Roles and responsibilities for the implementation of the EPRP,
- Equipment, tools, and resources to manage emergency preparedness and response,
- Communication procedures, including awareness campaigns to potentially affected communities and local government agencies,
- Training for workers on EPRP requirements to ensure an effective response to emergency situations,

- Minimum requirements for the EPRPs to be developed by contractors and subcontractors for their job-specific needs,
- Periodic emergency drills, involving workers and affected communities as needed to increase awareness and verify the effectiveness of the response to emergency situations.

The EPRP will have to be periodically reviewed and revised, as necessary, to reflect possible changes during the construction, operation, and decommissioning phases.

10.8 ESMS Audit, Monitoring, Review and Performance Reporting

A Monitoring Programme has been developed and integrated into sub-ESMPs to monitor compliance with ESIA, ESMS, ESMPs, and relevant national and international requirements. The main objectives of the monitoring programme will be to:

- Identify any new E&S impacts derived from the Project activities/works and identify proper mitigation measures,
- Follow up on the status of action and performance in managing and mitigating previously identified E&S impacts,
- Follow up on the status of stakeholder grievances and how they were resolved,
- Monitor EHSS activities undertaken by EPC and subcontractors and overall Project EHSS performances.

Monitoring will be performed by qualified staff and EPC. The results of the monitoring will be included in reports that assess the severity of non-compliance and provide recommendations for remedial actions.

10.8.1 Environmental and Social Monitoring

The Project-specific ESMPs contain detailed actions for mitigating and monitoring E&S aspects, aligned with the commitments outlined in the ESIA. The Management Plans provide the necessary information for monitoring and measuring the EHSS performance and compliance with the requirements of the ESMS. The extent of monitoring will be appropriate to the EHSS risks and impacts associated with the Project, as well as the relevant obligations and requirements.

The specific monitoring activities, including their scope, frequency, methodologies, and responsibilities, have been defined in the Management Plans. The allocation of responsibilities between the Client, EPC and its subcontractors has been outlined, considering applicable Project requirements such as ESIA commitments, IFC PSs, and Turkish Regulations. The monitoring process will also take into account any specific requests or requirements from relevant regulatory authorities. The Client will be ultimately responsible for collecting and processing the information related to monitoring activities carried out by EPC and subcontractors and for developing, updating, and managing the tools for data collection and processing.

10.8.2 EHSS Monitoring

The Client will be required to create an EHSS monitoring program that aligns with their activities and the identified relevant risks. The purpose of the EHSS monitoring program is to assess the effectiveness of prevention and control strategies, as well as the Project's EHSS procedures, using a set of Key Performance Indicators (KPIs). EPC's and each sub-contractor's EHSS monitoring program should, at a minimum, include the following:

- Periodical meetings,
- Site inspections, findings and corrective actions reports,
- Internal audits and corrective actions,
- Corrective action reports for the external audits conducted by the Client and the authority

10.8.3 Evaluation of Compliance

The Client will monitor and evaluate compliance with the ESMS through internal auditing to ensure compliance with:

- The regulatory requirements and permits set by the Turkish legislation;
- IFC PSs;
- Commitments undertaken by the Client in the ESIA and other E&S related documents; and
- ESMPs requirements.

establish a similar system to evaluate their compliance with the operation requirements, and the Client will oversee the implementation of this process. Any deviations from these requirements will be classified as "Non-Compliance situations" and ranked accordingly:

- Level 1 Non-Compliance (N-CP): evidence of a complete deviation or non-fulfilment of the requirements that can lead to significant impacts on Client operations (e.g., interruption of operations, serious E&S or OHS consequences, reputational risks, etc.) and whose resolution has to be managed in coordination with external bodies (i.e., authorities). These N-CPs will have to be immediately communicated to Client Project Level's Quality Manager as part of the management review process. The Project Level's Quality Manager will identify the appropriate preventative actions/corrective actions (PA/CAs) and require approval from Client Management. The N-CPs and the PA/CAs implemented will be disclosed to stakeholders during the periodic engagement activities. Level 1 deviations will also require immediate communication with the Lenders,
- Level 2 Non-Compliance (N-CP): evidence of a complete deviation or non-fulfilment of the requirements that can lead to limited impacts on Client operations and whose resolution does not involve external parties and could be managed in coordination with other internal managers (e.g., contractors). These N-CPs will have to be immediately communicated to Client Project Level's Quality Manager as part of the management review process. The Project Level's Quality Manager will identify the appropriate PA/CAs and require approval from Client Management. Level 2 deviations will need to be communicated to the lenders as part of periodic communications,
- Level 3 Non-Compliance (N-CP): partial deviation or non-fulfilment of the requirements with limited impacts on Client operations and whose resolution can be managed directly by the Project Level's Quality Manager These N-CPs will be addressed directly by the Project Level's Quality Manager through appropriate PA/CAs. Progresses will be communicated to Client Management as part of the management review process. No communication with the lenders will be required and,
- Observation (OBS) issues that are not a breach or deviation from requirements may need specific actions to improve performance and achieve full compliance.

N-CPs and OBSs can be identified by the Client during formal audits/site inspections at any time during the construction and operation phases and by reporting the observed EHSS concern to the work lead and the Project Level's Quality Manager who will evaluate and eventually confirm the level of severity assigned and take actions, accordingly.

A PA/CAs process will be established to address each non-compliance situation and identify root causes to prevent recurrence. EPC will be required to implement a similar system for addressing N-CPs relevant to their operations.

10.8.4 EHSS Reporting

The Client will develop EHSS reports in accordance with national, international, and Project reporting requirements. It is the responsibility of the EPC and subcontractors to report periodically to the Client. EPC and subcontractors will submit weekly reports that include inspection findings and corresponding corrective actions.

Additionally, a monthly EHSS statistics report will be prepared, covering KPIs such as OHS incidents, environmental incidents, and social grievances.

All Project personnel are accountable for reporting incidents and hazards to their immediate supervisors. Incidents will undergo investigation, and incident reports will be created in compliance with national and international reporting standards.

In the event of serious incidents, both Client, EPC and each of its sub-contractor will have the responsibility to ensure that injured employees are provided with the following support and services:

- Prompt medical assistance and, if necessary, medical evacuation
- Employee assistance programs
- Notification and contact with their family or next of kin
- Direct access to communications (such as phones).

10.8.5 Performance Records

The Client will maintain records that provide evidence of ESMS performance and adherence to the requirements outlined in the ESMP, as well as national and international regulations. Kalyon Enerji Environment, Climate Change, and IMS Executive, Social Impact and Inclusion Manager and HS Manager will be responsible for maintaining the relevant records. Some examples of these documents include:

- Reports of internal EHSS audits & inspections
- Reports of external EHSS audits
- Non-conformities, corrective/preventive actions form
- Minutes of the management review meetings
- Reports of EHSS monitoring, including analytical certificates
- Records of grievances submitted
- Records of incidents and relevant investigations
- Communication with the authorities
- Communication with stakeholders and stakeholder engagement activities carried out
- Any other relevant document providing evidence of the ESMS performance.

EPC will be required to implement a similar system and provide results to the Client.

10.8.6 Inspection & Audit

The Client will provide an inspection & audit program that includes the audit schedule, frequency, objectives, and responsibilities of auditors. This program will be implemented periodically and effectively for the:

- Proper implementation of EHSS and HR policies, as well as the provisions outlined in the ESMPs.
- Adequate implementation of Contractor's Management Plans, which are derived from the Client's ESMPs requirements.

- Compliance with national regulations, ESIA commitments, and IFC PSs and
- Alignment of contractors with their contractual obligations.

EHSS inspections will be conducted by the Client to verify compliance with EHSS activities at the worksite. EPC and its sub-contractors will perform site EHSS inspections every week during the construction phase.

Internal audits and inspections will be carried out by Client's internal audit teams every month to monitor ESMS performance.

External audits will be conducted by various entities, including National Authorities, Lenders' Environmental & Social Consultants, and Integrated Management System Monitoring. These audits aim to assess the following:

- Project compliance with Turkish regulatory requirements (legislation and relevant permits), ESIA commitments, IFC PS
- Proper implementation of ESMS, including policies, manuals, ESMPs, procedures and conformity to the specified requirements.

10.8.7 Management Review

The Client Management will periodically review the performance of the ESMS (e.g., quarterly during construction and annually during operation) to ensure its adequacy and effectiveness in alignment with the Project activities. The Chief Sustainability Officer will be responsible for organizing management review meetings in the following cases:

- Major Non-Compliances (i.e., Level 1 and Level 2)
- Serious injuries/fatalities involving Project employees, contractors, third parties, project assets, etc.
- Significant changes to the Project design that trigger the management of change procedure
- Grievances with the potential to impact media or to result in a claim and
- Significant changes to the regulatory framework.

Input documentation/information to support the management review process will include at least:

- Internal/external audit reports and records of non-compliance.
- Incident reports and EHSS statistics
- Progress on preventive/corrective actions
- Update on actions from the last management review meeting
- EHSS monitoring reports
- Grievances records/updates on stakeholders' engagement activities.

Kalyon Enerji Environment, Climate Change, and IMS Executive -will issue meeting minutes that outline the agreed actions, measures taken, and the related responsibilities. It may be necessary to make changes to the ESMS documentation, such as policies, procedures, and ESMPs, as required.

EHSS Coordinators from the EPC might be invited to attend these management review meetings if actions needed will affect their operations. EPC will be required to implement a similar management review system concerning their operation and report progresses to the Client.

10.8.8 Commitments Register

All mitigation measures to address potential project impacts identified in the ESIA package have been captured into a Commitments Register (given below) that includes tables with relevant mitigation and monitoring measures for each of the environmental and social components. The Commitments Register is part of the ESIA package and could be used as a tool that consolidates the applicable mitigation measures and monitoring activities defined in the ESIA package during Project construction, operation, and decommissioning phases.

Table 10-3: Mitigation measures and monitoring actions for the social components

Component	Phase	Project action	Mitigation measures	Monitoring measures
Population and Demography	Construction	General engineering/construction works;	■ Camp Site and Offsite Accommodation Management will be implemented. ■ During the workers' accommodation design and planning process, IFC - EBRD Guiding Notes on Workers' Accommodation will be followed to ensure that the document's requirements are met. ■ Accommodation will be fully contained with meals, entertainment, medical clinic. By this way interaction of the workers with local communities will be prevented as much as possible. The potential negative results of the interaction with the community residents will be explained to workers via social induction/trainings. Workers will not need to go into communities and if they pass through communities to get to the site at the beginning and end of their shift, they will be discouraged from interacting negatively with community residents. ■ Priority for the employment opportunities will be given to local residents, where applicable. ■ Workers' accommodations will be designed in compliance with the processes and standards of the IFC and the EBRD (2009), and the basic needs of the workers will be provided within the borders of the accommodation to limit the interaction of the workers with the local communities to prevent the pressure on the local utilities and the services. ■ In case of the recruitment of workers outside the local area, cultural awareness training will be provided to workers to prevent any cultural conflicts with the local communities. ■ Employee Code of Conduct will be prepared and applied. ■ The mukhtars of the villages will be informed about the construction of the workers' accommodation, and the workers that will be accommodated in the camps will be registered in the village system. ■ A grievance mechanism will be applied to record any gender-based complaints, and necessary measures will be taken accordingly.	
	Operation	SPP/infrastructure operation	■ Priority for the employment opportunities will be given to local residents where applicable, ■ In case of the recruitment of workers outside the local area, cultural awareness training will be provided to workers to prevent any cultural conflicts, ■ Employee Code of Conduct will be prepared and applied, ■ A grievance mechanism will be applied to record any gender-based complaints, and necessary measures will be taken accordingly.	

Component	Phase	Project action	Mitigation measures	Monitoring measures
Economy and Employment	Construction	General engineering/construction works	The Project will implement human resource policies and procedures and Labor Management Plan in compliance with the IFC PS-2 on Labour and Working Conditions. Job opportunities provided by the Project will be an essential source of income, especially for unemployed people, households living in poverty and the younger population in the AoI. The following enhancement actions will be implemented in order to improve the opportunities emerging from the Project and to enhance the positive impacts of the Project. ■ The Project will implement human resource policies and procedures in compliance with the IFC PS-2 on Labour and Working Conditions. Such policies are expected to provide more predictable employment opportunities for direct and indirect employees, ■ The Project will enhance local employment, and referential employment will be given to qualified local people. Hiring preference criteria will prioritize settlements directly affected by the current activities of the Project, ■ Individuals whose livelihood sources are affected by the Project impacts will be given priority in the recruitment process of the Project, ■ Formal and transparent recruitment process will be implemented to provide equal opportunity to the applicants, ■ The mukhtars of the villages will be informed about the recruitment opportunities of the Project (announcements, banners) to reduce the requirement of the non-local labour force, ■ Where applicable, vocational training will be provided to local people to maximize the local labour force, ■ Before the procurement, local suppliers will be identified, and priority on purchases will be given to goods and services from local businesses, ■ Capacity development will be applied, including the OHS and HR, ■ Equal procurement opportunities will be provided to local small businesses through the Supplier Management Plan, ■ EPC, subcontractors and suppliers will be monitored to prevent child and forced labour through Contractor Management Plan and Supplier Management Plan, ■ An equal tender process will be applied, ■ Equal pay for equal jobs will be provided to the local and non-local labour forces, ■ Bank accounts will be provided to workers, and payments will be made via these bank accounts, ■ The Worker Grievance mechanism will be implemented	■ Employment agreements made with contractors and subcontractors, ■ Training Records (training materials, participant list, training planning, photos), which will be performance indicators for ESMS, to be prepared for the Project, ■ Employment records (contracts, employee register), which will be performance indicators for ESMS, to be prepared for the Project, ■ Grievance Records in accordance with the grievance mechanism to be produced for the Project.
	Operation	SPP/infrastructure operation	■ To contribute to regional and global energy security, ■ To be a regional trade center in energy, ■ To consider social and environmental impacts in the context of sustainable development in every phase of the energy chain.	■ annual energy production information

Component	Phase	Project action	Mitigation measures	Monitoring measures
Labour and Working Conditions	Construction	General engineering/construction works	■ All workers are required to provide criminal record, Social Security Institution service breakdown, place of residence, family declaration, and health checks, ■ The recruitment processes will be transparent, public, and non-discriminatory, providing equal opportunities with respect to ethnicity, religion, language, gender and sexual orientation. The Contractors will provide information on the recruitment process, with particular emphasis on informing local communities of employment opportunities through different channels such as headmen and local associations,	■ Employment agreements made with contractors and subcontractors, ■ Training Records (training materials, participant list, training planning, photos), ■ records (contracts, employee register, ■ Incident records, ■ Grievance Records, ■ Collective Agreements (if any), ■ Occupational health and safety records.

	Operation	SPP/infrastructure operation SPP/infrastructure operation	■ All workers will have freedom to join an association and union in compliance with Turkish Labour Law, ■ The Client will follow Turkish law, while applying equal opportunities to women in all other branches where law does not prohibit women workers. Further measures will remain and Non-Discrimination and put in place to encourage female participation in non-employee workforce, such as Positive Equal Opportunity providing specific training where required, enabling flexibility and job-sharing opportunities for women with children to participate, ■ The minimum age for the employment will be 18 and any use of child labour will be prohibited, ■ Forced labour will be prohibited by ensuring full compliance with national legislation and the provisions of relevant conventions and other international standards. These measures will be reflected in the Project's Employment Policy Document, ■ The ILO standards ratified by Turkey will be applied, ■ The Client will be responsible of monitoring of the contractors' and supply chain companies, ■ It should be noted that the Project will not cause retrenchment of existing personnel, but collective dismissal of the construction personnel will be required, after the completion of the construction phase. However, contract of limited duration will be used, and the workers will be informed on the duration of their work, ■ The accommodation of the workers will be clean and safe, and it will meet the basic needs of workers, providing minimum amounts of space for each worker; sanitary, laundry and cooking facilities. Overcrowding will be avoided, ■ Heating, air-conditioning, and ventilation will be appropriate for the climatic conditions and provide workers with a comfortable and healthy environment to rest and spend their spare time, ■ Drinking water to be provided to Project workforce and water to be supplied to food preparation, washing and bathing areas will meet the requirements of the Turkish Regulation Concerning Water Intended for Human Consumption, ■ Adequate lavatory facilities (toilets, urinals, washbasins, and showers) will be provided for the number of people expected to work in the facility and allowances will make for indicating whether the toilet facility is "In Use" or "Vacant". Toilet facilities will also be provided with adequate supplies of hot and cold running water, soap, and hand drying devices, ■ First aid and medical facilities as well as provisions for safety against potential hazards (fire, etc.) will be provided at the camp sites, ■ Domestic wastewater and waste to be produced at camp sites will be properly managed and disposed of in line with the requirements of Waste Management Plan, ■ Workers who accommodate in the camps will be made aware of any rules governing the accommodation, ■ Project's Grievance Mechanism will provide means to the Project personnel to lodge their complaints. The Client will ensure that the workers are informed of the grievance mechanism at the time of recruitment and make it easily accessible to them, ■ The following plans will be implemented: ▪ Camp Management Plan and Offsite Accommodation Management Plan ▪ Community Health and Safety Plan ▪ Security Management Plan ▪ Labour Management Plan	

Component	Phase	Project action	Mitigation measures	Monitoring measures
			■ It will be ensured that the employees and any suppliers have access to human resources policies. Workers will be provided with information including, but not be limited to, entitlement to wages, hours of work, overtime arrangements and overtime compensation, and any benefits (such as leave for illness, maternity / paternity, or holiday), ■ Independent audits and inspections should be undertaken. ■ The Client will implement Human Resources policy which observes wage standards, working hour regulation, freedom of association and staff encouragement. The policy will also eliminate child and forced labour, discrimination on the basis of religion, language, gender or social status, bullying and harassment, ■ All workers will be able to join trade unions of their choice and have the right to collective bargaining, ■ Contracts will be verbally explained to all workers where this is necessary to ensure that workers understand their rights prior to any employment contract to be signed, ■ Wages, benefits and conditions of work offered will be comparable to those offered by equivalent employers in Şanlıurfa and the same sector. ■ The Project and all contractors will put in place a formal worker grievance mechanism.	
Land Use (Livelihoods and Land Access Restrictions)	Construction	General engineering/construction works;	■ Economic displacement impacts will be minimized during the design phase of the Project. ■ Community Development Plan will be prepared and implemented to bridge the gaps between Turkish Expropriation Law and IFC PS-	

			5. The following implementations are planned within the scope of the CDP: ▪ Local employment (prioritizing Düzlük hamlet households), ▪ Capacity building/development trainings for this employment, ▪ Local procurement, ▪ Pasture improvement project in coordination with Viranşehir District Directorate of Agriculture, ▪ Equipment supply for animal breeders, ▪ Veterinary support, ▪ Equipment supply for agricultural activities, ▪ Improvement of the village roads ▪ Infrastructure improvements/supports to increase human life quality and welfare. ■ Vulnerable people that will be affected due to Project will be determined and specific assistance will be provided. ■ During the recruitment process priority will be provided to people who lost their livelihoods as a result of the establishment of the Project. ■ All construction works will be continuing within the borders of the designated areas and in case of an unplanned damage, loss of the affected PAPs will be compensated by the contractors. ■ Community Liaison Officer will be hired and collect grievances. ■ If compensation alone is not sufficient to restore livelihoods, implementation of livelihood restoration in accordance with IFC requirements. ■ Grievance mechanism will be established. ■ Impacts to agricultural and pasture lands will be minimized as far as possible by keeping the Project construction footprint as narrow as possible, and efficiently restoring any damaged areas. ■ Any business losses will be compensated at a full replacement value. ■ Any loss of or damage to crops caused by Project activities will be compensated. ■ Hunting and collection of wild animals will be strictly prohibited within the Project area. ■ <u>Kalyon Energy will initiate the Grazing Pilot Project at the site after the construction works are completed. If this project is successful, the site will be opened to controlled grazing.</u> ■ A CDP will be developed and implemented and one of the main target groups will be the ecosystem users. ■ Following assessment and coordination will be undertaken to prevent the impacts on the pastureland based livelihoods; ▪ Baseline Assessment: A baseline assessment will be conducted for the evaluation of the grazing capacity in detail taken into consideration of vegetation type, soil quality, and	

			climate and the number of the animals and the households depended to the affected pastureland. ▪ **Collaboration with Expert Organizations:** Official cooperation will be made with NGOs and universities specialized in pasture management and their expertise will be used to enhance the accuracy of the grazing assessment. ▪ **Grazing Assessment Report:** A comprehensive report will be prepared detailing the findings of the grazing assessment, recommendations for sustainable grazing practices, consideration environmental and ecological factors will be taken into the consideration. ▪ **Grazing Procedure Development:** A detailed grazing procedure will be prepared based on the results of the assessment report that includes guidelines for optimal stocking rates, rotational grazing, and fallowing periods for vegetation recovery. ▪ **Government Collaboration:** The outcomes of the cooperation with the NGOs and the universities will be shared with the Ministry of Agriculture in a transparent way and further communication will be developed for their endorsement and support for widespread implementation. ▪ **Shepherd Recruitment and Training:** Shepherds who have received training in sustainable grazing practices will be hired to prevent over usage on the ecosystem services, to protect the life of the animals, and to prevent any damage on the power plant, ▪ **Livestock Development:** Mitigation measures will be implemented to increase the number of sheep in the area, considering factors such as breeding programs, veterinary care, and access to quality feed. ▪ **Monitoring and Adaptive Management:** Continuous monitoring of grazing activities and livestock development will be conducted throughout the project lifespan of the Project. The results will be discussed with the PAPs and the relevant stakeholders to identify areas for improvement and take necessary actions. The grazing procedure and livestock development strategies will be updated if required. ▪ **Construction Phase Mitigation:**To mitigate the impact of construction on grazing land and livestock: – Alternative feeding options will be provided. – Animal feed seeds will be distributed to promote vegetation growth and compensate for potential losses during the construction phase. ▪ **Community Engagement:** PAPs will be engaged continuously during the implementation phase to ensure their understanding and cooperation. The awareness programs will be implemented to convey the on the benefits of sustainable grazing practices and the economic potential of increased sheep farming. ▪ **Documentation and Reporting:** Detailed records of grazing activities, livestock development initiatives, monitoring results, and any implemented measures will be recorded and regular reports will be submitted rto the	

Component	Phase	Project action	Mitigation measures	Monitoring measures
			Ministry of Agriculture to keep them informed of project progress. ▪ **Project Dissemination:** Work with the Ministry of Agriculture to disseminate successful practices to other regions. Facilitate workshops and knowledge-sharing sessions for farmers and stakeholders. ▪ **Project Evaluation:** Conduct a comprehensive evaluation of the project's impact on the field's ecosystem, grazing capacity, livestock development, and community livelihoods. Use the results to refine future projects and contribute to the broader understanding of sustainable grazing management and livestock development and include the results in the annual Environmental and Social Report.	

Community Health and Safety	Construction	General engineering/construction works	A Traffic Management Plan have been prepared within the scope of the Project to maintain traffic safety on the roads to be used and to prevent the risks which may outcome due to Project activities ensuring a “safe site, safe vehicle and safe driver” at all times. The following points will be considered as a minimum regarding traffic management:
			■ Referring to the Stakeholder Engagement section of this ESIA Report, a continuous stakeholder engagement process and grievance mechanism will be in place:
			  ▪ To exchange information on the Project with the local community and other stakeholders; and
			  ▪ To record and respond to complaints and concerns from the local community members and other stakeholders.
			■ Considerations will be given to traffic volumes at the rush hours of the day, and transportation of equipment and materials will be utilized at quieter periods to avoid increased congestion on the roads used by the local communities,
			■ It will be ensured that the roads will be made suitable for heavy vehicle use by taking necessary permits and making necessary arrangements. In case of any road damage, necessary maintenance works will be undertaken,
			■ Project site will be equipped with suitable and sufficient lighting to ensure sufficient visibility,
			■ Community Health and Safety Plan (CHSP) will be implemented,
			■ Village roads will be improved,
			■ In case construction activities are required on the existing roads will only start after the relevant permits are obtained; all necessary precautions will be taken as signage, barrier, fence, lighting,
			■ Vulnerable and critical points will be identified in the Project site (including sensitive receptors such as hospitals and schools) to envisage the access routes for construction traffic,
			■ Construction vehicles will only operate in the defined routes; vehicles will be monitored via an In Vehicle Monitoring System,
			■ Cameras will be placed in appropriate places on the roads so that construction vehicles belong to different projects can be distinguished and monitored,
			■ At all times, vehicles will be kept on designated site roads where established. Off-road driving is prohibited except in emergencies or if no roads have been established,
			■ If reversing cannot be avoided in the work areas, necessary reversing procedures will be identified, including installing reversing aids on vehicles, reversing sensors etc. Trained banksman will be used when reversing cannot be avoided,
			■ Parking areas will be designated with signs, and reverse parking will be implemented for emergencies,
			■ The routes to be used by pedestrians will be segregated from heavy vehicle routes where possible,
			■ Appropriate traffic signs, signals, lights and markings will be placed in the required areas to prevent potential accidents/incidents. Barriers will be placed in the required areas to protect human health and assets,
			■ The speed limits will be implemented. Vehicle speeds will be monitored randomly through speed gun tools,
				■ Record of the number of traffic-related incidents involving contractor workers, subcontractor workers and external persons,
				■ Investigation of the incidents and accidents and use of lessons learned to improve traffic mitigations,
				■ Record of and tracking Training Records of Drivers and Training Records on Community Health and Safety,
				■ The licenses and medical surveillance of the operators to ensure they are up to date,
				■ Visual inspections
				■ Environmental monitoring records
				■ Record of the number of total road closures caused by the Project activities,
				■ Maintenance records of the vehicles to ensure regular maintenance activities take place,
				■ Weather forecast monitoring to ensure the safety of the operators,
				■ Keeping a record of and tracking the traffic accident/emergency response actions,
				■ Keeping a record of the number of grievances related to the traffic received and the percentage of grievances resolved positively,
				■ Please See Air Quality Chapter of the table
				■ Please see Noise Chapter of the table.
				■ Community grievances registers by the grievance mechanism to be formed for the Project,
				■ Stakeholder Engagement and consultation registers and records by the Stakeholder Engagement Plan to be produced for the Project,
				■ Percentages of the local employees (which will be a performance indicator for ESMS to be prepared for the Project),
				■ Population figures of the settlements according to TURKSAT data.
				■ Training records on community health and safety,
				■ Records of communicable diseases.
				■ Licenses and permits of quarries and excavation material storage/recycling facilities will be recorded,
				■ Document review (e.g., permits, waste recycling/disposal agreements) and visual checks at the work sites.
				■ Training records of the security personnel.

			■ Seatbelts will be worn in vehicles and machinery when being operated, ■ No vehicle/equipment/material will be allowed to enter work areas before obtaining approval from security, ■ Loading areas will be designed appropriately to prevent/minimize vehicle/pedestrian contact and property damages, ■ All operators will be licensed/certified for the type of vehicle being driven and will undergo medical surveillance, ■ Repair and maintenance of vehicles will be done by the authorized bodies, ■ Changes in the condition of the roads will be monitored regularly, and road improvement works will be carried out, when necessary, ■ Fatigue and distraction procedures will be established considering the local legal requirements and the nature of the work, ■ Project disclosure activities will include informing communities about the project traffic management controls, planned road closures, blasting activities and grievance mechanisms. Collaboration with local communities and responsible authorities will be ensured to improve signage, visibility, and road safety conditions, especially near the roads and other locations where children may be present., ■ In SEP of the Project, these information-sharing methods and schedules will be defined. In order to minimize the particulate matter emission and noise that will occur within the scope of the Project: ■ The transportation routes to be used will be watered regularly with water sprinklers, ■ The removal and laying operations of the materials will be carried out without tossing as much as possible. ■ Pollution Prevention Plan will be followed. ■ All machines to be used under normal operating conditions will not run simultaneously, ■ Monthly and annual maintenance of machinery and equipment will be done periodically, ■ Pollution Prevention Plan will be followed. ■ Quality spare parts and lubrication products will be used. Considering the expected population influx and the insufficient infrastructure system in some of the settlements in the AoI identified in the socioeconomic baseline, mitigation measures have been defined to prevent the pressure and negative impact on infrastructure and services caused by the population influx, especially during the construction phase. Certain negative impacts related to the population influx due to the Project on infrastructure and services are as follows: ■ The inability of vulnerable groups to equally access social and health services due to supply-demand imbalance, ■ Population influx due to the Project intensifying health services and decreasing the quality of service, ■ Delays in responding to emergencies on time, ■ The emergence of inadequacies due to increased demand for drugs and medical needs.	

Component	Phase	Project action	Mitigation measures	Monitoring measures
			The population increase may lead increase in communicable and infectious diseases in the Project Area of Influence. The following are the essential control measures to be implemented to avoid the spread of communicable diseases: ■ Pre-employment health screening and regular medical checks of workers per Turkish regulatory requirements, ■ Regular cleaning principles to be applied in the Project site, ■ Community Health and Safety Management Plan should be implemented for the Project that includes medical surveillance, ■ Awareness-raising on healthy lifestyles for workers and community-level training. ■ All waste or excess material that may be remained due to the activities in the Project area will be disposed of under laws and regulations. ■ Measures defined in Chapter 7.1 of the ESIA Report and Waste Management Plan and Pollution Prevention Plan will be followed. A Security Management Plan have been prepared in line with the national (Private Security Services Law No: 5188, 2004) and international (e.g., IFC PS4) standards within the scope of the Project to manage the security-related impacts and ensure the security of the activities, assets, work premises at the Project and avoid potential impacts on workers and the local community. The following measures will be considered as a minimum regarding security arrangements: ■ Security will be provided at the Project area by third-party company or in-house security personnel with no criminal histories or history of abuse, ■ Security personnel will be trained adequately in their envisaged roles and responsibilities, the use of force (and, where applicable, firearms), and appropriate conduct toward workers and affected communities and the applicable law, ■ Security patrols will be done at regular intervals, ■ Entry of unauthorized persons will be prevented by using appropriate tools and gadgets. Warning signs about unauthorized entry will be available at various locations at the Project crossings, ■ Entry and removal of equipment/material will be controlled at the control points; the movement of equipment/material will be allowed after the approval of the relevant department, ■ A grievance mechanism will be in place for the affected communities to express their concerns about the security arrangements and acts of the security personnel, ■ Relevant Project officials will continuously accompany the visitors during their stay on the Project site, and all visitors will be recorded, ■ All visitors will be given brochures explaining the Project area, site rules and what to do in case of emergencies, ■ Personal Protective Equipment will be provided to visitors coming to the Project site, ■ All areas that may be dangerous to visitors will be locked, ■ All areas that pose a danger at the Project area will be marked with appropriate signs.	

Component	Phase	Project action	Mitigation measures	Monitoring measures

	Operation	Plant/infrastructure operation	■ Referring to Stakeholder Engagement section of this ESIA Report, a continuous stakeholder engagement process and grievance mechanism will be in place:
			  ▪ to exchange information on the Project with the local community and other stakeholders; and
			  ▪ to record and respond any complaints and concerns raised by the local community members and other stakeholders.
			■ Project site will be equipped with suitable and sufficient lighting to ensure sufficient visibility.
			■ At all times vehicles will be kept on designated site roads where established. Off-road driving will not be permitted other than emergency situations, or if no roads have been established yet.
			■ Parking areas will be designated with signs and reverse parking will be implemented for emergency situations.
			■ The routes to be used by pedestrians will be segregated from vehicle routes where possible.
			■ The speed limits will be implemented.
			■ Project disclosure activities will include informing communities about the project traffic management controls, planned road closures, blasting activities and grievance mechanism. Collaboration with local communities and responsible authorities will be ensured to improve signage, visibility, road safety conditions especially near the roads and other locations where children may be present.
			■ Appropriate traffic signs, signals, lights and markings will be placed at the required areas to prevent potential accidents/incidents. Barriers will be placed at the required areas to protect both human health and assets.
				■ The record of the number of traffic-related incidents involving contractor workers, subcontractor workers and external persons,
				■ The record of the number of full road closures caused by Project activities,
				■ The record of the number of grievances received and percentage of grievances resolved positively,
				■ The record Stakeholder engagements,
				■ Traffic accident /emergency response actions,
				■ Training Records of Drivers.

Infrastructure, Utilities and Services	Construction	General engineering/construction works	■ An Emergency Preparedness and Response Plan will be prepared and implemented during the construction phase of the Project, ■ A Traffic Management Plan will be prepared and implemented, ■ Before the establishment of the construction and the workers' accommodations, an engagement with the local authorities, including the Municipalities, will be held, and energy, transportation and water demand of the Project will be shared, ■ Workers' accommodation will provide health services to the Project workers to not create pressure on the health services of the local communities, ■ At minimum first aid and the medical unit will be established, ■ District or province government hospitals will be used when required, ■ In case of damage to the local infrastructure, including but not limited to telecommunication, electricity, road and water sources, immediate maintenance will be applied, ■ A Project-specific Grievance Mechanism will be used to record, avoid, and solve the incident caused by the Project on the local infrastructure.	■ The record of the number of traffic-related incidents involving contractor workers, subcontractor workers and external persons, ■ The record of the number of full road closures caused by Project activities, ■ The record of the number of grievances related to access to education and health received from the external stakeholders and percentage of grievances resolved positively, ■ The record of emergency response actions, ■ The usage of water sources affecting the local communities.

Component	Phase	Project action	Mitigation measures	Monitoring measures
	Operation	Plant/infrastructure operation	■ An Emergency Preparedness and Response Plan will be prepared and implemented during the construction phase of the Project, ■ A Traffic Management Plan will be prepared and implemented, ■ Before the establishment of the construction and the workers' accommodations, an engagement with the local authorities, including the Municipalities, will be held, and energy, transportation and water demand of the Project will be shared, ■ Workers' accommodation will provide health services to the Project workers to not create pressure on the health services of the local communities, ■ At minimum first aid and the medical unit will be established, ■ District or province government hospitals will be used when required, ■ In case of damage to the local infrastructure, including but not limited to telecommunication, electricity, road and water sources, immediate maintenance will be applied, ■ A Project-specific Grievance Mechanism will be used to record, avoid, and solve the incident caused by the Project on the local infrastructure.	
Gender Issues	Construction	General engineering/construction works	Since these inequalities in the existing social structure are at risk of emerging in the activities originating from the Project and in the opportunities offered by the Project, necessary measures will be developed and implemented. In addition to the measures to be taken	

Component	Phase	Project action	Mitigation measures	Monitoring measures
	Operation	Plant/infrastructure operation	by the Project, enhancement measures will be implemented to increase women's use of the Project opportunities. ■ For the job opportunities and benefits created within the scope of the Project to be equally beneficial, it will be ensured that the vulnerable groups, especially those affected by the Project, and women are informed at a sufficient level, ■ Priority will be given to women when for the local employment and procurement opportunities. ■ The Project will ensure that women of the local communities are informed about the Project on a sufficient level; women-only participation meetings will be held, when necessary, It is recommended to develop and implement the Gender-Based Violence and Sexual Harassment contractor procedure to eliminate the risks of Gender-Based Violence and Sexual Harassment that may arise within the scope of the project. This procedure will include and define the following topics: ■ Contractor policy prohibiting sexual harassment, ■ Sexual harassment incident referral and reporting plan, ■ Notice to employees of the policy against sexual harassment, ■ Orientation training on policy against sexual harassment and gender-based violence, ■ Monitoring and reporting of employee participation in orientation training, ■ Contractor participation in sexual harassment meetings and workshops, ■ Zero tolerance policy against violence and harassment, ■ Mechanisms for reporting prohibited behaviour, consequences of violations, and suspected violations, ■ Planning not to leave dark areas and blind spots during the operation and construction process, ■ Effective Use of the Grievance Mechanism for these measures is one of the most important tools to detect and prevent risks early. The Project-specific GRM Procedure for the effective use of the grievance mechanism is included in the Project SEP document. ■ In parallel with the actions included in this document, support will be provided to ensure that women have access to the Project's GRM. The Minimum Requirements defined above against Sexual Harassment and gender-based violence will be implemented at all Phases of the Project.	■ The record of women's participation in public information disclosure meetings, ■ The record of the number of grievances related to gender-based violence and sexual harassment received percentage of grievances resolved positively, ■ The record of Project workers' training on gender-based violence and sexual harassment, ■ The usage of water sources affecting the local communities.

Component	Phase	Project action	Mitigation measures	Monitoring measures
Cultural Heritage	Construction	General engineering/construction works	■ Cultural Heritage Management Plan and Chance Find Procedure, which are necessary for the management of the “chance finds”, prepared in compliance with the project organization will be implemented. All operators, who are to be engaged in the soil works, and project workers should receive training related to “project requirements, protection of cultural and archaeological heritage, laws and legislations related with the archaeological and cultural heritage and cultural heritage management plan and chance find procedures”. ■ In case any chance find is encountered during the construction activities, the further steps should be taken in accordance with the plans and procedures and the relevant bodies and the Directorate of the Museum will be notified immediately. In cases where any find or information associated with archaeological potential of the site is already discovered, relevant instructions about the sensitivity of the site will be shared with all construction teams a few days before the construction activities. The construction activities will be conducted with appropriate equipment and methods. The appropriate equipment will be identified together with the directorate of the museum and the construction teams. ■ Protection of site: chance find should not be moved, removed or further disturbed ■ In particular, all operators and Project workers assigned to land preparation works should receive training on project requirements, protection of cultural and archaeological heritage, laws and regulations regarding archaeological and cultural heritage, Cultural Heritage Management Plan and Chance Find Procedure;	■ Presence of two settlements within four km of Project Area. ■ Absence of areas of touristic interest within the visual zone of visual influence. ■ Presence of roads and volume of traffic within the visual zone of visual influence.
Visual Aesthetics	Construction	General engineering/construction works	There are no industry standards or best practice guidance regarding with landscape mitigation and management within the scope of the national legislation. The proposed mitigation measures associated with the Project comprises of professional judgement. ■ After the completion of construction, the areas used as construction area will be returned to their original use. ■ During the construction phase, restricted hours of working will be proposed especially for built up areas. Using machinery during those hours should be avoided in residential properties. ■ The housekeeping of the entire Project Area will be given importance throughout the life of the Project. ■ To minimize light spillage from the site, every effort should be made to minimize the number of lights consistent with health and safety standards. In a similar way, all lights should be shielded and as much as possible pointed to the ground to avoid direct light effects on sensitive receptors around the Project Area. ■ Regular monitoring of the affected people’s grievances with regard to visual impacts. For this, the external grievance mechanism should be implemented properly, and all stakeholders should have access to this mechanism. ■ Implementation of dust suppression during construction.	■ Grievance records

Component	Phase	Project action	Mitigation measures	Monitoring measures
	Operation	Plant/infrastructure operation	There are no industry standards or best practice guidance regarding with landscape mitigation and management within the scope of the national legislation. The proposed mitigation measures associated with the Project comprises of professional judgement. ■ The housekeeping of the entire Project Area will be given importance throughout the life of the Project. ■ To minimize light spillage from the site, every effort should be made to minimize the number of lights consistent with health and safety standards. In a similar way, all lights should be shielded and as much as possible pointed to the ground to avoid direct light effects on sensitive receptors around the Project Area. ■ Regular monitoring of the affected people's grievances with regard to visual impacts. For this, the external grievance mechanism should be implemented properly, and all stakeholders should have access to this mechanism.	■ Grievance records

Table 10-4: Mitigation measures and monitoring actions for the Physical components

Component	Phase	Project action	Mitigation measures	Monitoring measures
Air Quality	Construction	General engineering/construction works (i.e., land clearing, ground excavation, cut and fill operations, camp site operations) Material transportation	■ Dust will be supressed by spraying water at construction sites and transportation routes, especially in hot-dry seasons and in windy conditions; ■ Loads in all trucks transporting dust-generating materials will be sprayed with water to suppress dust (keeping the material moist) and trucks carrying fine material (excavation soil or fine material, etc.) will be covered with tarpaulin to prevent dust emissions; ■ Skidding will be avoided during loading and unloading; ■ Completed earthworks will be covered and sealed - as soon as reasonably practicable after completion; ■ In case alternative roads are present, construction traffic will avoid passing through the settlements. If roads through settlements cannot be avoided, necessary measures (i.e., speed limits) will be taken to prevent/minimise transportation related emissions and communities will be informed about the activities and schedule; ■ Speed limits will be enforced, vehicle movements will be limited and idling will be prohibited;; ■ Campfires or burning materials will be prohibited; ■ Activities will be conducted trying to use the minimum required number of means at the same time; ■ Transportation distances will be minimized where possible; ■ Vehicle engines and other machinery will be idled for short periods during duty, to avoid unnecessary emissions by turning the vehicles off and on frequently; ■ Machinery and equipment will be periodically checked and maintained to ensure their good working condition and for compliance with standards and technical regulations for the protection of the environment and have appropriate certifications; ■ Emergency generator working hours will be recorded and necessary emission measurements will be conducted in case of exceeding 500 working hours in a year. Monthly operating hours of the previous year and the records regarding the amount of gas/fuel consumed in emergency situations and the frequency of the	■ Grievances records ■ Air quality monitoring results ■ Regular (daily) visual monitoring ■ Maintenance records of vehicles and equipment ■ Warnings/penalties given by public authorities

Component	Phase	Project action	Mitigation measures	Monitoring measures
			emergency (year/day) will be reported to Provincial Directorate of Environment, Urbanization and Climate Change (PDEUCC) until January 31st of each year; ■ Exhaust gas emission arising from the engine land vehicles in traffic will comply with the Regulation on Control of Exhaust Gas Emissions. Vehicles will be subjected to appropriate routine maintenance programs and emission measurements as required by the regulation. The use of vehicles that do not comply with the emission limits will not be permitted until such vehicles will be serviced and re-tested. Emission measurements of heating centers in the construction camps (if any) will be conducted according to Regulation on Control of Air Pollution from Heating if the thermal power is below 1000 kW and Regulation on Control of Industrial Air Pollution if the thermal power is above 1000 kW; ■ Stockpiles will be kept for the shortest possible time; ■ Consider the prevailing wind direction when siting stockpiles to reduce the likelihood of affecting sensitive receptors; ■ Slow down or cease the dust generating work under strong winds, such as reducing work activities or using water spray to reduce dust dispersion; ■ Minimize material handling and avoid double handling; ■ Electric small-scale mechanization and technical tools will be used when available and feasible; ■ Provide dust masks to workers on site where dust levels are likely to be excessive; ■ During the second half of the August 2023, ▪ additional dust water suppression methods will be applied, such as increasing the water spraying; ▪ the number of the vehicles in this period will be kept at a minimum, as much as possible.	
	Operation	Plant/infrastructure operation	■ Vehicle engines and other machinery will be kept turned on only if necessary, avoiding any unnecessary emission; ■ Vehicles will be periodically checked and maintained to ensure their good working condition; ■ Number of vehicles operating simultaneously will be kept at a minimum.	■ Maintenance records of vehicles and equipment
Noise and Vibration	Construction	General engineering/construction works Material transportation.	The following control measures will be applied where possible: ■ Selection of equipment with lower sound power levels; ■ Installing silencers for fans; ■ Installing suitable mufflers on engine exhausts and compressor components; ■ Installing acoustic enclosures for equipment casting radiating noise; ■ Limiting the hours of operation for specific pieces of equipment or operations, especially mobile sources operating through community areas; ■ Speed limits applied throughout site for the Project vehicles that will transport construction materials / equipment;	■ Grievances records ■ Noise monitoring results ■ Maintenance records of vehicles and equipment ■ Warnings/penalties given by public authorities

Component	Phase	Project action	Mitigation measures	Monitoring measures
			■ Properly refurbished and/or new machinery, equipment and vehicles will be used to the extent possible; ■ Any component of machinery or equipment, which is thought to generate excessive noise (e.g., a defective muffler, broken or loosely placed engine hood) will be discarded if said components cannot be maintained/repaired and they will be replaced as appropriate; ■ Engine covers will be kept closed when the equipment is in operation to minimize noise; ■ Workers will be trained in noise abatement best practices, including avoiding unnecessary operation of engines and switching off equipment when it is not required; ■ Idling of construction vehicles will be avoided; ■ Best management practices (e.g., selection of equipment and work methods) will be used to limit vibration impacts, particularly nuisance vibration. Heightened attention to vibration control will occur when working within 50 meters of residences and other sensitive receptors with high vibration creating equipment. Significant changes to the vibration levels can occur based on the soil conditions and the driving energy of the hammer; ■ Re-locating noise sources to less sensitive areas to take advantage of distance and shielding; ■ Reducing the Project traffic routing through community areas wherever possible; ■ Developing a grievance mechanism to record and respond to complaints; ■ Carrying out the regular maintenance of the construction equipment in order to minimize the possible high noise levels generated by the equipment; and ■ Performing quarterly monitoring campaigns at the baseline noise measurement locations during the construction phase. ■ In case of any Project related noise grievance, noise measurement campaign will be carried out immediately at the area where noise related grievance is received. If monitoring results indicate that noise levels are above the defined limits, at the first stage construction schedule in order to limit the hours of operation or to limit the number of equipment to be operated simultaneously will be reviewed and revised accordingly, if possible. Secondly, if it is not possible to revise the construction schedule, noise barriers without any gaps and with a continuous minimum surface density of 10 kg/m2 could be installed as a second option, in order to minimize the transmission of sound through the barrier. Barriers should be located close to the source or to the receptor location to be effective. The exact specifications, location and number of the noise barriers will be determined, if deemed necessary.	
	Operation	Plant/infrastructure operation	■ In case of any noise related grievance, noise measurement campaign will be carried out immediately at the area where noise related grievance is received; ■ Noise levels will be monitored at the receptors where the defined noise limit values are exceeded, at least for a year on monthly basis; and	■ Maintenance records of vehicles and equipment ■ Noise monitoring results ■ Grievances records

Component	Phase	Project action	Mitigation measures	Monitoring measures
			■ In cases when monitoring results indicate that noise levels are above the defined limits, then noise abatement measures will be implemented (e.g. noise barriers at the source, soundproofing, etc.).	
Soil and Subsoil	Construction	General engineering/construction works; Material Storage Accommodation and management of the workforce	■ Project Soil Management and Erosion Control Plan will be developed and implemented. ■ Land preparation and construction activities will be re-scheduled during extreme weather conditions, when possible, to avoid erosion risk. ■ Erosion control measures, including installation of drainage channels will be implemented as necessary, to prevent movement of sediment off-site, prior to the start of construction operations. ■ Drainage channels and dikes will be installed to prevent runoff to adjacent lands and loss of soil around the temporary excavated material storage areas and bedding, padding, back filling, and aggregate materials. ■ Topsoil management will be prioritized and in case vegetated/uncontaminated land is expected to be permanently removed, the topsoil will be properly stored in accordance with the Regulation on Excavation, Construction and Demolition Wastes issued on March 18, 2004, at Official Gazette no.25406 and re-used for reclamation as necessary. In addition, Kalyon Enerji will ensure that topsoil management will be carried out in line with international standard as well as national standards. ■ Subsoil removal will be completed in compliance with the Regulation on Control of Excavated Soil, Construction and Demolition Wastes issued on March 18, 2004, at Official Gazette no: 25406. ■ Loss of subsoil will be minimized through use of suitable equipment, planning, development of procedures and schedules. ■ Soil stripping will not be carried out during construction activities, unless necessary, to minimize disturbance to vegetation, ground species and soils. ■ Licensed quarries will be used to purchase bedding, padding, backfilling, and aggregate materials. ■ Any excess excavated material will be disposed at licensed storage/recycling facilities as required by the Regulation on Excavation, Construction and Demolition Wastes issued on March 18, 2004 at Official Gazette no.25406. ■ In case a licensed disposal facility is not available, Kalyon Enerji will identify parcels, for which usage rights will be obtained from the respective right holders as per the requirements of the applicable legislation. Environmental and social assessment studies as per Management of Change Procedure will be implemented during selection and entry to the off-site excavated material storage sites. Criteria such as selecting brownfields, that are not used for agricultural or grazing purposes and having a sufficient distance to settlement areas and will be considered in the selection of excavated material storage sites. ■ The Project will comply with relevant legal and project safety requirements to avoid leakages from hazardous materials (chemicals, liquids etc.) storage facilities on-site; ■ The areas, where the hazardous materials (chemicals, liquids etc.) storage tanks are located (i.e., hazardous material storage areas), will be designed and constructed to avoid potential contamination into the soil (paved areas with sufficient secondary containment,	■ Visual Site inspection ■ Monitoring report results ■ Maintenance records of vehicles and equipment ■ Grievances records ■ Waste disposal records ■ Records of the contractual agreements for disposal of wastes

Component	Phase	Project action	Mitigation measures	Monitoring measures
			proper drainage systems, storage as per Safety Data Sheet (SDS) requirements etc.). ■ Project Pollution Prevention Plan and Waste Management Plan will be developed and implemented to ensure that the amount of release and spills are avoided or managed in a timely manner before reaching substantial amounts that may potentially affect the soil quality. ■ The temporary waste storage areas will be constructed in accordance with the Regulation on Waste Management issued on April 02, 2015, Official Gazette no: 29314 and GIIP. ▪ The area will away from any traffic, the facilities, or the buildings. ▪ There will be a designated area for the licensed vehicles to receive the wastes. ▪ Hazardous wastes and non-hazardous wastes will be stored separately, with separate access. ▪ Precautions against possible fires and spills (fire extinguisher, spill kit, etc.) will be available at the storage area. ▪ The waste storage areas will be covered at the top and on four sides, shielded from precipitation and the elements. Adequate containment and drainage systems will be installed. ▪ Storage area will be closed and locked at all times. ▪ The contact information of the personnel in charge of the waste storage area and warning signs will be posted at the temporary storage areas. ▪ The floor will be concrete, the edges of the floor will be raised with concrete walls/parapets for hazardous waste containment. ▪ To ensure impermeability; cured concrete with a minimum thickness of 25 cm will be applied, where the concrete meets C30 (STS) standard. If this condition is not met, impermeability will be ensured by laying a of impermeable layer at least 1 mm between the concrete and the soil floor. ▪ All wastes will be stored separately from each other, in tanks and containers. Labels indicating the type of waste will be placed for each type of waste. ▪ Disposal of wastes at sufficient frequencies will be scheduled in order not to exceed the storage capacities at the temporary waste storage areas/storage compartments. ▪ Hazardous wastes (except for the medical waste) will be temporarily stored at the waste storage areas for a maximum of 6 months and non-hazardous waste for a maximum of one year. ■ Industrial Waste Management Plans for all temporary waste storage areas established by contractors (including hazardous and non-hazardous waste) will be submitted to the relevant Provincial Directorate of MoEUCC as per the format defined by the MoEUCC and will be renewed prior to expiry of the approvals. ■ Temporary Waste Storage Permit will be obtained from the related Provincial Directorate of MoEUCC for temporary waste storage sites at the site generating hazardous waste of more than 1,000 kg per month. ■ Waste reuse/recycling/recovery/disposal agreements with the Municipality and licensed recovery/disposal -companies will be	

Component	Phase	Project action	Mitigation measures	Monitoring measures
			executed for the management of hazardous and non-hazardous waste. ■ Hazardous Materials and Hazardous Waste Compulsory Liability Insurance will be available as per the relevant provisions of the Regulation on Waste Management for the hazardous waste temporary storage areas/containers regardless of the amount of hazardous waste stored; ■ Official waste declarations for all waste generated will be submitted to the online system of MoEUCC, starting from January each year until the March of each year at the latest. ■ Waste storage outside the designated storage areas will be prohibited. Wastes stored in the interim storage areas will be transferred to the temporary storage area daily; ■ Regular maintenance of vehicles and machinery/equipment will be undertaken to ensure that leakages of oil/fuel or any other hazardous material is prevented; ■ Impervious (concrete etc.) surfaces will be designated for the refuelling and maintenance of the machinery/vehicles. If it is not possible according to the nature of the Project, all refuelling tankers and all heavy machinery used at the site will have drip trays, and these trays will be placed under the pipe connection points to prevent accidental leakage to the soil during refuelling operations; ■ Secondary containments, ponds and drip trays will be checked regularly, especially during extreme weather conditions; ■ Generators will be equipped with drip trays and will be checked regularly to prevent spills; ■ Portable spill containment and clean-up materials (spill kits) with instructions will be made available and easily accessible at the construction site; ■ Training on spill response, use of containment and clean-up material (spill kits) will be provided to all workers; ■ Accidental spills and leakages will be managed through implementation of the Emergency Preparedness and Response Plan. Procedure for management of contamination will be prepared and in case of any spill/leakage, sampling and analyses will be conducted by accredited laboratories. Provisions of the Soil Pollution Control and Point Source Contaminated Sites Regulation will be implemented for investigation, management and reporting of any contamination.; ■ Any equipment, machinery, pumps and trans mixers will be washed only at designated concrete plants, concrete slurry will not be discharged into environment; ■ Project-specific Pollution Prevention Plan will be implemented for the management of sewage wastewater and implemented during the construction and operation phases of the Project. ■ Leakproof report of the septic tanks will be ensured and necessary measures will be taken to prevent them from deforming in extreme weather conditions; ■ No untreated wastewater discharges of any type to land will be allowed. Polluted water (if any generated as a result of accidental leakages) will be properly collected or managed to prevent the soil pollution; ■ Discharge of wastewater will be in compliance with the applicable regulatory requirements given in Appendix B.	

Component	Phase	Project action	Mitigation measures	Monitoring measures
	Operation	Plant/infrastructure operation	■ Project Pollution Prevention Plan and Waste Management Plan will be developed and implemented to ensure that the amount of release and spills are avoided or managed in a timely manner before reaching substantial amounts that may potentially affect the soil quality. ■ The areas, where the hazardous materials (chemicals, liquids etc.) storage tanks are located (i.e., hazardous material storage areas), will be designed and constructed to avoid potential contamination into the soil (paved areas with sufficient secondary containment, proper drainage systems, storage as per Safety Data Sheet (SDS) requirements etc.). ■ The temporary waste storage areas will be constructed in accordance with the Regulation on Waste Management issued on April 02, 2015, Official Gazette no: 29314 and GIIP. ▪ The area will away from any traffic, the facilities or the buildings. ▪ There will be a designated area for the licensed vehicles to receive the wastes. ▪ Hazardous wastes and non-hazardous wastes will be stored separately, with separate access. ▪ Precautions against possible fires and spills (fire extinguisher, spill kit, etc.) will be available at the storage area. ▪ The waste storage areas will be covered at the top and on four sides, shielded from precipitation and the elements. Adequate containment and drainage systems will be installed. ▪ Storage area will be closed and locked at all times. ▪ The contact information of the personnel in charge of the waste storage area and warning signs will be posted at the temporary storage areas. ▪ The floor will be concrete, the edges of the floor will be raised with concrete walls/parapets for hazardous waste containment. ▪ To ensure impermeability; cured concrete with a minimum thickness of 25 cm will be applied, where the concrete meets C30 (STS) standard. If this condition is not met, impermeability will be ensured by laying a of impermeable layer at least 1 mm between the concrete and the soil floor. ▪ All wastes will be stored separately from each other, in tanks and containers. Labels indicating the type of waste will be placed for each type of waste. ▪ Disposal of wastes at sufficient frequencies will be scheduled in order not to exceed the storage capacities at the temporary waste storage areas/storage compartments. ▪ Hazardous wastes (except for the medical waste) will be temporarily stored at the waste storage areas for a maximum of 6 months and non-hazardous waste for a maximum of one year. ■ Industrial Waste Management Plans for all temporary waste storage areas established by contractors (including hazardous and non-hazardous waste) will be submitted to the relevant Provincial Directorate of MoEUCC as per the format defined by the MoEUCC and will be renewed prior to expiry of the approvals. ■ Temporary Waste Storage Permit will be obtained from the related Provincial Directorate of MoEUCC for temporary waste storage sites	■ Visual Site inspection ■ Monitoring report results ■ Maintenance records of vehicles and equipment ■ Grievances records ■ Waste disposal records ■ Records of the contractual agreements for disposal of wastes

Component	Phase	Project action	Mitigation measures	Monitoring measures
			at the site generating hazardous waste of more than 1,000 kg per month. ■ Hazardous Materials and Hazardous Waste Compulsory Liability Insurance will be available as per the relevant provisions of the Regulation on Waste Management for the hazardous waste temporary storage areas/containers regardless of the amount of hazardous waste stored. ■ Waste reuse/recycling/recovery/disposal agreements with the Municipality and licensed recovery/disposal firms will be executed for the management of hazardous and non-hazardous waste. ■ Official waste declarations for all waste generated will be submitted to the online system of MoEUCC, starting from January each year until the March at least. ■ Waste storage out of the designated storage areas will be prohibited. Wastes generated in the interim storage areas will be transferred to the temporary storage area; ■ Regular maintenance of vehicles and machinery/equipment will be undertaken to ensure that leakages of oil/fuel or any other hazardous material is prevented; ■ Impervious (concrete etc.) surfaces will be designated for the refueling and maintenance of the machinery/vehicles. If it is not possible according to the nature of the Project, all refueling tankers and all heavy machinery used at the facility will have drip trays, and these trays will be placed under the pipe connection points to prevent accidental leakage to the soil during refueling operations; ■ Generators and any equipment containing chemicals will be placed in localised bunded & kerbed areas for containment of drainage, spillages and leaks in order to minimise contaminated water routed to the drains; ■ Secondary containments, ponds and drip trays will be checked regularly, especially during extreme weather conditions; ■ Portable spill containment and clean-up materials (spill kits) will be made available and easily accessible at the facility, instructions on how to use spill containment and clean-up materials will be included in the kits; ■ Training on spill response, use of containment and clean-up material (spill kits) will be provided to works; ■ In case of a spill/leakage incident on-site, contamination levels will be identified by means of sampling and analyses studies to be conducted by accredited laboratories and the results will be compared with baseline concentrations of the related parameters to plan corrective actions where necessary; ■ Accidental spills and leakages will be managed through implementation of the Emergency Preparedness and Response Plan. ■ Project-specific Pollution Prevention Plan will be implemented for the management of sewage wastewater and backwash wastewater resulting from potable water treatment plant and implemented during the operation phase of the Project. ■ If deemed necessary, leakproof of the septic tanks will be ensured, and necessary measures will be taken to prevent them from deforming in extreme weather conditions; ■ No untreated wastewater discharges of any type to land will be allowed. Polluted water (if any generated as a result of accidental leakages) will be properly collected or managed to prevent the soil pollution;	

Component	Phase	Project action	Mitigation measures	Monitoring measures
Geology and Geomorphology	Construction	General engineering/construction works;	■ Detailed studies on geological and geotechnical components (including seismicity) have already been completed for the Project before the construction phase within the scope of the local EIA. Recommendations in these studies should be implemented. ■ Worksite will be minimized to the smallest extent possible in order to meet Project's works and activities. ■ Construction site will be minimized to the smallest extent possible in order to meet Project's works and activities. ■ The foundations' footprints and depths have been properly dimensioned; hence the excavations and the consequent physical-mechanical disturbances will be minimized. ■ The flattening and excavation operation will be minimized to the extent possible in order to limit the morphological disturbances. ■ Part of the removed material will be re-used as a fill material at the Project Area, if it presents the suitable geotechnical characteristics, in order to limit the use of raw material.	■ Visual Site inspection ■ Monitoring report results ■ Grievances records
Seismicity	Construction	General engineering/construction works; Material Storage Accommodation and management of the workforce	■ Before and during the construction activities in the study area, the provisions of "Türkiye Building Earthquake Regulation" (OG Number: 30364 Date: 18.03.2018) will be complied with. ■ Detailed investigations will be conducted for assessing the stability conditions for the structural elements for both normal operation loads and under seismic loads. Türkiye Building Earthquake Regulation requires certain parameters to be determined prior to the construction. These parameters were determined by the geological and geotechnical investigations for the Project Area. ■ Several structures will be developed as part of the Project and these will all be designed according to Turkish and international design standards requiring specific structural characteristics related to slopes of cuts and fills, footing sizes and many other considerations. ■	■ Prepared geological, geotechnical, and hydrological studies, flood risk assessments ■ Warnings/penalties given by public authorities
	Operation	Plant/infrastructure operation		
Hydrology and Surface Water	Construction	General engineering/construction works; Accommodation and management of the workforce	■ The Project will comply with safety requirements to avoid leakages from hazardous chemicals/materials and liquids (diesel fuel, oil etc.) stored on-site. ■ The areas where the diesel/fuel storage tanks are located (can be named hazardous material storage areas), will be designed and constructed to avoid potential contamination of the soil (paved areas with sufficient secondary containment, proper drainage systems, collection ponds etc.). ■ The temporary waste storage areas will be constructed based on the requirements listed in "Regulation on Regular Storage of Wastes" issued on *Official Gazette* No:27533, Dated: 26/03/2010 (Amended: OG-24/06/2022-31876) and "Regulation on Waste Management" issued on *Official Gazette*, Dated: 02/04/2015, No: 29314 (Amended: OG-23/03/2017-30016). ■ Considering the flooding risk, the following engineering studies were taken into account during the Project design phase. ▪ By adding the reinforced concrete structure under the fences, the safety of the work site improved by increasing the height of the security fence, and the site was protected from flood and surface water. ▪ The foundation of the inverter station was raised 60 cm from the ground level against the risk of water rising. ▪ The infrastructure of the inverter station is designed in such a way that the surface and storm water infiltration will be prevented, and water is collected in the water collection -pit -	■ Incident/accident reports ■ Monitoring report results ■ Visual Site inspection ■ Warnings/penalties given by public authorities ■ Training records

Component	Phase	Project action	Mitigation measures	Monitoring measures
			constructed -on the ground level of the station and discharged with the help of a pump. ▪ The manhole cover located at the entrance of the foundation of the inverter station is manufactured as leakproof. ▪ Waterproofing is provided with XPS Board and Membrane insulation materials inside the concrete foundation. ■ The General Directorate of State Hydraulic Works (abbreviated as DSI in Turkish), and General Directorate of Water Management (abbreviated as SYGM in Turkish) will be consulted regarding hydrological studies and surface water quality and any additional studies will be conducted upon their opinions prior to the construction phase based on the opinions of these institutions. ■ Safe Fueling and Gasoline Handling Guidelines will be developed in the construction areas. No fueling of vehicles or equipment will take place within excavated areas. If heavy equipment cannot be moved to appropriate fueling points, an impervious surface (such as a drip-tray) will be used for refueling this equipment to prevent accidental releases to groundwater aquifers. ■ Hazardous materials will not be stored in excavated areas and all handling of all hazardous materials will be in accordance with the Control of Substances Hazardous to Health Procedure. These procedures will be in line with Environmental, Health, and Safety (EHS) Guidelines: Environmental Hazardous Material Management (IFC, 2007). ■ Procedure for management of the construction site during periods of heavy rainfall will be developed. Exposed surfaces and stored materials will be covered if necessary to reduce the erosion of sediments into surface waters. ■ Treated domestic wastewater would be reused for local watering of vegetation, dust control or as a fire-fighting reserve in accordance with the standards defined in the Wastewater Treatment Plants Technical Procedures Communique if it is deemed feasible. In case it is decided to reuse wastewater, a Wastewater Reuse Plan will be prepared during the construction phase describing which types of wastewater are suitable for each reuse application and effective control measures will be implemented to prevent misuse of reused water. ■ The specific items in the management plans will address the measures below related to surface water and protection: ▪ Design and management of spoil and soil storage areas and opening stores of construction materials to control sediment loss into runoff by minimizing the length and angle of slopes. ▪ Schemes to prevent new ground surface eruptions from rainfall erosion or to avoid construction activities during periods of heavy rainfall. ▪ Diversion of external ‘clean’ runoff around the construction area to prevent mixing of ‘clean’ and ‘dirty’ runoff and reduce the size of the required sediment basins. ▪ Conveyance of all 'dirty' runoff to the proposed sediment basins. ▪ Establishment of barrier fences and/or markings to determine the extent of the structure/work area that may be damaged. ▪ Limitation of exposure to the soil and the minimum amount of deterioration required for the construction. ▪ Covering and protection of degraded fertile ground with soil, vegetation, mulch or erosion-resistant material.	

Component	Phase	Project action	Mitigation measures	Monitoring measures
			▪ Collection and management of polluted water (if any generated by accidental leakages) in order to prevent mixing with any water body. ▪ Protection of existing drainage and irrigation channels, sediment barriers, green areas, protection strips, such as drains, and drainage and erosion control pits by taking appropriate measures. ▪ Collection and settlement of drainage from excavations to remove suspended materials prior to discharge in accordance with required permits. Construction of local perimeter drains around working areas to collect suspended runoff and direct it to a system of settlement basins before discharge following required permits, where practicable. ▪ Regular inspection and maintenance of all structures and facilities to ensure proper and efficient operation, especially after heavy rainfall. Removing sediment deposits and disposing of them either by spreading them on site (if uncontaminated) or at a suitably licensed facility. ▪ Training workers (including subcontractor workers) on spill response, use of containment and clean-up materials (spill kits).	
	Operation	Plant/infrastructure operation	▪ The project will comply with safety requirements to avoid leakages from hazardous chemicals/materials and liquids stored on-site. ▪ The temporary waste storage areas will be constructed based on the requirements listed in “Regulation on Regular Storage of Wastes” issued on *Official Gazette* No:27533, Dated: 26/03/2010 (Amended: OG-24/06/2022-31876) and “Regulation on Waste Management” issued on *Official Gazette*, Dated: 02/04/2015, No: 29314 (Amended: OG-23/03/2017-30016). ▪ Leak-proof quality septic tanks will be provided for the collection of the generated domestic wastewater. Collected wastewater will either be collected by vacuum trucks and disposed of at the nearest licensed WWTP as per the agreements/protocols to be executed with the related municipalities/licensed companies or to the main campsite package WWTPs.	▪ Incident/accident reports ▪ Monitoring report results ▪ Visual Site inspection ▪ Warnings/penalties given by public authorities
Hydrogeology and Groundwater	Construction	Groundwater Usage General engineering/construction works; Material Storage Accommodation and management of the workforce	▪ Safe Fuelling and Gasoline Handling Guidelines will be developed in the construction areas. No fuelling of vehicles or equipment will take place within excavated areas. If heavy equipment cannot be moved to appropriate fuelling points, an impervious surface (such as a drip-tray) will be used for refuelling this equipment to prevent accidental releases to groundwater aquifers. ▪ Hazardous materials will not be stored in excavated areas and all handling of all hazardous materials will be in accordance with the Control of Substances Hazardous to Health Procedure. These procedures will be in line with Environmental, Health, and Safety (EHS) Guidelines: Environmental Hazardous Material Management (IFC, 2007). As an example, secondary containment structures will consist of berms, dikes, or walls capable of containing the larger 110 percent of the largest tank or 25 percent of the combined tank volumes in areas where hazardous materials are handled (e.g., fuel stores and loading areas, concrete mixing, hazardous material stores) to prevent hazardous materials entering the site drainage. ▪ An Emergency Response Plan (ERP) will be developed in line with Environmental, Health, and Safety (EHS) Guidelines: General EHS guidelines (IFC, 2007) for handling spills of hazardous materials including fuels that will be handled during construction works.	▪ Incident/accident reports ▪ Monitoring report results ▪ Visual Site inspection ▪ Warnings/penalties given by public authorities

Component	Phase	Project action	Mitigation measures	Monitoring measures
			■ The specific items in the management plans will address the measures below related to groundwater and protection: ■ Preventing the discharge of untreated wastewater, residues or other waste into groundwater or surface water. ■ Controlling and avoiding wastewater flows from any field activities (i.e., excavations, and vehicle/equipment washing). ■ Collecting and managing contaminated water (if any generated as a result of accidental leakages) in order to prevent mixing with any water body and topsoil/soil pollution. ■ Assuring the maintenance of vehicles and equipment (if necessary) in designated areas with impermeable surfaces (concrete floors, etc.) and if necessary, secondary containment systems. ■ Making portable spill containment and clean-up materials (spill kits) available and easily accessible at the construction site, including instructions on how to use spill containment and clean-up materials. ■ Training workers (including subcontractor workers) on spill response, use of containment and clean-up materials (spill kits). ■ Providing adequate and properly maintained tanks, paved ground, spill containment materials and proper secondary containment systems with sufficient volume for fuel/oil storage and for the storage of other fluids and hazardous substances to prevent loss to the soil.	
	Operation	Plant/infrastructure operation	■ The Project will comply with safety requirements to avoid leakages from hazardous chemicals/materials and liquids stored on-site. ■ The temporary waste storage areas will be constructed based on the requirements listed in “Regulation on Regular Storage of Wastes” issued on *Official Gazette* No:27533, Dated: 26/03/2010 (Amended: OG-24/06/2022-31876) and “Regulation on Waste Management” issued on *Official Gazette*, Dated: 02/04/2015, No: 29314 (Amended: OG-23/03/2017-30016). ■ Leak-proof quality septic tanks will be provided for the collection of the generated domestic wastewater. Collected wastewater will either be collected by vacuum trucks and disposed of at the nearest licensed WWTP as per the agreements/protocols to be executed with the related municipalities/licensed companies or to the main campsite package WWTPs.	■ Incident/accident reports ■ Monitoring report results ■ Visual Site inspection
Traffic	Construction	General engineering/construction works	A Traffic Management Plan will be prepared within the scope of the Project to maintain traffic safety on the roads to be used and to prevent the risks which may outcome due to Project activities ensuring “safe site, safe vehicle and safe driver” at all times. Following points will be considered as a minimum regarding traffic management: ■ Referring to Stakeholder Engagement section of this ESIA Report, a continuous stakeholder engagement process and grievance mechanism will be in place: ■ to exchange information on the Project with the local community and other stakeholders; and ■ to record and respond any complaints and concerns raised by the local community members and other stakeholders.	■ Visual inspection ■ Monitoring report results ■ Maintenance records of vehicles and equipment ■ Grievances records ■ Traffic accident records ■ Training records on drivers

Component	Phase	Project action	Mitigation measures	Monitoring measures
			■ Considerations will be given to traffic volumes at the rush hours of the day and transportation of equipment and materials will be utilized at quieter periods to avoid increased congestion on the roads used by the local communities. ■ It will be ensured that the roads will be made suitable for the heavy vehicle use by taking necessary permits and making necessary arrangements. In case of any damage on the roads, necessary maintenance works will be undertaken. ■ Project site will be equipped with suitable and sufficient lighting to ensure sufficient visibility. ■ At all times vehicles will be kept on designated site roads where established. Off-road driving will not be permitted other than emergency situations, or if no roads have been established yet. ■ If reversing cannot be avoided at the work areas, necessary reversing procedures will be identified including installing reversing aids on vehicles, reversing sensors etc. Trained banksman will be used when reversing cannot be avoided. ■ Parking areas will be designated with signs and reverse parking will be implemented for emergency situations. ■ The routes to be used by pedestrians will be segregated from heavy vehicle routes where possible. ■ The speed limits will be implemented. ■ Seatbelts will be worn in vehicles and machinery when being operated. ■ No vehicle/equipment/material will be allowed to enter work areas before obtaining approval from the security. ■ Loading areas will be designed appropriately to prevent/minimize vehicle/pedestrian contact and property damages. ■ All operators will be licensed/certified for the type of vehicle being driven and will undergo medical surveillance. ■ Repair and maintenance of vehicles will be done by the authorized bodies. ■ Fatigue and distraction procedures will be established considering the local legal requirements and the nature of the work. ■ Project disclosure activities will include informing communities about the project traffic management controls, planned road closures, blasting activities and grievance mechanism. Collaboration with local communities and responsible authorities will be ensured to improve signage, visibility, road safety conditions especially near the roads and other locations where children may be present. ■ Appropriate traffic signs, signals, lights and markings will be placed at the required areas to prevent potential accidents/incidents. Barriers will be placed at the required areas to protect both human health and assets.	
	Operation	Plant/infrastructure operation	A Traffic Management Plan will be prepared within the scope of the Project to maintain traffic safety on the roads to be used and to prevent the risks which may outcome due to Project activities ensuring “safe site, safe vehicle and safe driver” at all times. Following points will be considered as a minimum regarding traffic management: ■ Referring to Stakeholder Engagement section of this ESIA Report, a continuous stakeholder engagement process and grievance mechanism will be in place:	■ Visual inspection ■ Monitoring report results ■ Maintenance records of vehicles and equipment ■ Grievances records ■ Traffic accident records ■ Training records on drivers

Component	Phase	Project action	Mitigation measures	Monitoring measures
			▪ to exchange information on the Project with the local community and other stakeholders; and ▪ to record and respond any complaints and concerns raised by the local community members and other stakeholders. ■ Project site will be equipped with suitable and sufficient lighting to ensure sufficient visibility. ■ At all times vehicles will be kept on designated site roads where established. Off-road driving will not be permitted other than emergency situations, or if no roads have been established yet. ■ Parking areas will be designated with signs and reverse parking will be implemented for emergency situations. ■ The routes to be used by pedestrians will be segregated from vehicle routes where possible. ■ The speed limits will be implemented. ■ Seatbelts will be worn in vehicles and machinery when being operated. ■ No vehicle/equipment/material will be allowed to enter work areas before obtaining approval from the security. ■ All operators will be licensed/certified for the type of vehicle being driven and will undergo medical surveillance. ■ Repair and maintenance of vehicles will be done by the authorized bodies. ■ Project disclosure activities will include informing communities about the project traffic management controls, planned road closures, blasting activities and grievance mechanism. Collaboration with local communities and responsible authorities will be ensured to improve signage, visibility, road safety conditions especially near the roads and other locations where children may be present. ■ Appropriate traffic signs, signals, lights and markings will be placed at the required areas to prevent potential accidents/incidents. Barriers will be placed at the required areas to protect both human health and assets.	
Greenhouse Gas (GHG) Emissions	Construction	General engineering/construction works;	■ The Best Available Techniques should be taken into consideration in Project design as much as possible. The applicability of the Best Available Techniques (BATs) developed within the European regulatory framework [i.e., Integrated Pollution Prevention and Control, “IPPC”, BAT Reference Documents (BREFs) according to the European Directive 2010/75/EU (IED)] should be evaluated and integrated into the Project design. ■ All employees will be provided climate, resource and energy efficiency awareness training. ■ The most efficient equipment in terms of fuel usage and effective operation will be chosen. Maintenance of all machinery and equipment will be periodically conducted to ensure efficient fuel use and effective operation as well. ■ Efficient resource and material use will be promoted through the development and implementation of a management plans to reduce direct and indirect GHG emissions due to the Project. Other aspects of resource efficiency regarding water usage are covered in Project Description and related impact assessment section. ■ No idling and out-of-scope operation of the machinery and equipment will be allowed. ■ Vegetation cover will not be disturbed if not necessary	■ Resource consumption records ■ Records on data resources invoices ■ Training records ■ Records on amount of generated wastes ■ Maintenance records of machinery and equipment
	Operation	Plant/infrastructure operation		

Component	Phase	Project action	Mitigation measures	Monitoring measures
			■ In order to reduce the GHG emissions resulting from waste disposal processes, amount of wastes generated as a result of project actions will be minimized and generated wastes will be recycled accordingly. ■ During the closure phase, rehabilitation of land will help to recover lost carbon sink by converting the disturbed land to its original state as much as possible, which will act as a long-term mitigation measure.	

Table 10-5: Mitigation measures and monitoring actions for the Biological components

Component	Phase	Project action	Mitigation measures	Monitoring measures
Biological Components	Construction	General engineering/construction works Material transportation Material storage	Avoidance measures have been considered particularly during the design of the facilities and include: ▪ minimisation of the footprint of individual facilities; ▪ utilization of the existing modified habitat for placement of temporary facilities was prioritized as much as possible. 1) vegetation and topsoil disturbance: ▪ limiting natural vegetation disturbance to the minimum necessary during construction works. For this purpose, limits of temporary and permanent facilities will be clearly signed in order to reduce the risk of footprint creep; ▪ in order to minimize the mortality of wildlife species, biological surveys (pre-construction surveys) will be implemented to identify and eventually relocate fauna species. Company's Biodiversity Assistant Specialist will perform pre-construction surveys in the areas where temporary and permanent facilities will be located (not earlier than 7 days before). The survey will focus on fauna species with limited mobility (e.g., mammals and reptiles) that cannot move ahead of construction. If any of these species are observed, they will be collected by the -Company's Biodiversity Assistant Specialist and translocated to undisturbed but similar sites within the AoI. – Reptiles will be caught and moved to a suitable receptor site, no smaller than the capture site and containing the same habitat characteristics and prey availability, at a minimum distance of 50 m from the Project footprint during construction phase. If essential works are required in winter, when tortoise are hibernating, then the works area should be checked carefully for hibernation burrows. If a reptile is found during such works and it is hibernating, it should be carefully moved to an alternative part of the site that will remain undisturbed. If this is not possible, then the animal should be taken in to care until it can be released on site, the following spring. – The monitoring of the activity of the identified species of conservation concern Marbled Polecat (*Vormela peregusna*, VU) will be performed, through the use of endoscopic cameras located within the burrows. If any living specimen is observed and essential works that involve breaking ground are required in the areas where burrows are present, a gradual increase of the level of disturbance over a few days (at least 4 consecutive days) will be implemented, in order to allow for the animal to autonomously leave the burrow before it is fully excavated (e.g., day 1 machinery and equipment bought to the working area, day 2 manual excavation, day 3 mechanical excavation in the vicinity of the borrow). ▪ vehicle movement will be restricted to the Project Site and the existing roads that connect the construction sites with the surrounding areas. Off road driving will be prohibited in order to avoid any unnecessary disturbance of natural vegetation. 2) emission of noise:	▪ Monitoring reports results of invasive flora species within and around the construction site ▪ Observations records of fauna species, and in particular of the identified reptile species of conservation concern within and around the AoI ▪ Records of accidents involving wildlife ▪ Records of observation of live animal or carcasses along the access road or on the construction site ▪ Weekly monitoring results of the riverbank

Component	Phase	Project action	Mitigation measures	Monitoring measures
			▪ night works will be avoided to reduce impacts on nocturnal fauna species; ▪ limiting the number and the speed of vehicle movements along the existing access roads. 3) emission of particulate matter: ▪ Dust deriving from construction material handling will be minimized by using covers and/or control equipment (water suppression, bag house, or cyclone) and increasing the moisture content by water spraying. ▪ Speed limit for all vehicles will be implemented so as not to generate dust emissions, and all trucks will be properly maintained at all times. ▪ Internal roads will be adequately compacted, maintained, and sprayed with water if needed, to minimize dust from vehicle movements. If water spraying is deemed insufficient, other means of surface treatment (e.g., hygroscopic media, such as calcium chloride, and soil natural–chemical binding agents) for unpaved internal roads will be implemented, by using a sprinkler system or a “water-mist cannon”. 4) increase of traffic: ▪ install speed limits and animal crossing signs on the access roads. ▪ avoid the accumulation of stagnant water and organic waste within the construction site and on the roads, that could attract wildlife. ▪ if fauna species are encountered employees and contractors will wait until it moves on by itself or they will ask the assistance of the - authorized personnel trained in reptile transport and/or Company’s Biodiversity Assistant Specialist for its safe removal and relocation in a suitable environment. ▪ awareness among employees and contractors working on site about the protected species/habitats potentially present in the area will be developed, in order to ensure constant monitoring and promote actions to be taken if wildlife is encountered. 5) accidental introduction and spreading of alien species: ▪ the use of non-native flora species, and especially of species classified as invasive alien species must be avoided during rehabilitation/restoration works. ▪ if the spreading of invasive species is observed, an appropriate eradication program will be developed and implemented. Areas cleared during construction for temporary use will be restored, as soon as possible, with the goal of producing a stable vegetative cover to minimize erosion, dust deposition and spreading of invasive alien species, and the aim of re-establish the original habitat with a positive impact on biodiversity. Only plants that are native to the region will be used for restoration and habitat rehabilitation. Seeding and planting of grass and shrub species typical of the local flora will be implemented to ensure optimal ground cover. The use of autochthonous adult plants and/or of seeds collected	

Component	Phase	Project action	Mitigation measures	Monitoring measures
			at the shortest distance possible from the restoration sites will be of fundamental importance in order to maximize the success of the translocation operations (Abeli & Dixon, 2016[1]).	
	Operation	Plant/infrastructure operation	Avoidance measures have been considered particularly during the design of the facilities and include: ▪ minimisation of the footprint of individual facilities. ▪ utilization of the existing modified habitat for placement of temporary facilities was prioritized as much as possible. 1) <u>Presence of permanent infrastructures</u>: ▪ The areas occupied by the new permanent infrastructures will be fenced but modification to fencing will be made in order to minimize the barrier effect. Modifications to fencing can involve maintaining gaps between the base of the fence and the These gaps will occur at regular intervals along the fence line, with a frequency of 1 gap every 100 m. In addition, each single gap could have a height of 10 cm and a width of 1 m. ▪ Non-reflective coating are applied to the panels to minimize reflection, which can attract aquatic insects and possibly birds, as it mimics reflective surfaces of waterbodies. ▪ Flora and fauna specific monitoring campaigns within and without the areas occupied by the new permanent infrastructures will be implemented (see section **Error! R eference source not found.**). ▪ Vehicle movement will be restricted to the existing roads that connect the operation sites with the surrounding areas. Off road driving will be prohibited in order to avoid any unnecessary disturbance of natural vegetation. 2) <u>Emission of noise</u>: No additional minimization measures are deemed necessary in addition to those included in Chapter 7.1.2. 3) <u>Emission of light</u>: ▪ it is recommended to keep the number of light sources to the minimum; ▪ preferred types of light in exterior lighting (e.g.: lights on site due to security reasons) applications are: - low pressure sodium lamps (SOX); - light emitting diodes (LEDs): light source of choice, emitted more directional, warmer colour temperatures (closer to 3000°K); - light triggered by presence detectors, and lights oriented to the ground. ▪ these types of lights should be avoided:	▪ Floristic and vegetational monitoring report results. ▪ Monitoring results of invasive flora species in the areas under the photovoltaic panels ▪ Terrestrial fauna monitoring results ▪ Records of accidents involving wildlife or the observation of live animal or carcasses along the permanent access roads or in the areas occupied by permanent infrastructures

[1] Abeli T. & Dixon K. (2016). Translocation ecology: the role of ecological sciences in plant translocation. Plant Ecology. 217. 10.1007/s11258-016-0575-z.

Component	Phase	Project action	Mitigation measures	Monitoring measures
			– mercury lamps (MBF): bluish-white lamps (attract insects and tolerant bat species); – high pressure sodium lamps (SON): brighter pinkish-yellow lamps, used as road lighting. 4) <u>Introduction of alien species</u> ▪ the use of non-native flora species, and especially of species classified as invasive alien species must be avoided during rehabilitation/restoration works. ▪ if the spreading of invasive species is observed, an appropriate eradication program will be developed and implemented. Areas cleared of vegetation under the PV panels will be restored, as soon as possible, with the goal of recreating the original natural habitat and possibly enhancing flora species richness and diversity. The restoration will be based on a long-term plan, with the aim of producing a stable vegetative cover to minimize erosion, dust deposition and spreading of invasive alien species. Only plants that are native to the region will be used for restoration and habitat rehabilitation. Seeding and planting of grass and shrub species typical of the local flora will be implemented to ensure optimal ground cover. The use of autochthonous adult plants and/or of seeds collected at the shortest distance possible from the restoration sites will be of fundamental importance in order to maximize the success of the translocation operations (Abeli & Dixon, 2016[1]). Literature shows that the construction of Solar Power Plants (SPPs) in desertic and steppe areas, which are often chosen because of their insolation rates and subsequent great potential for producing solar power, could determine positive effects for biodiversity, in terms of increased plant diversity and increased plant biomass (Bai *et al.*, 2022[2]; Graham *et al.*, 2021[3]; Hassanpour *et al.*, 2018[4]). The positive effects derive primarily from the shade offered by the PV panels, which determines a decrease in temperature and in increase in soil moisture in the areas under the panels (Tanner *et al.*, 2020[5]). There could be beneficial effects also per terrestrial fauna species, in particular for small-sized mammals, reptiles and birds, which could find protection from predators offered by the fence and the PV panels themselves.	

[2] Bai Z., Jia A., Bai Z., Qu S., Zhang M., Kong L., Sun R., Wang M. (2022). Photovoltaic panels have altered grassland plant biodiversity and soil microbial diversity. Front Microbiol. 2022 Dec 15;13:1065899. doi: 10.3389/fmicb.2022.1065899. PMID: 36590393; PMCID: PMC9797687.

[3] Graham M., Ates S., Melathopoulos A., Moldenke A., DeBano S., Best L. and Higgins C. (2021). Partial shading by solar panels delays bloom, increases floral abundance during the late-season for pollinators in a dryland, agrivoltaic ecosystem. Scientific Reports. 11. 7452. 10.1038/s41598-021-86756-4.

[4] Hassanpour E., Selker J. and Higgins C. (2018). Remarkable agrivoltaic influence on soil moisture, micrometeorology and water-use efficiency. PLOS ONE. 13. e0203256. 10.1371/journal.pone.0203256.

[5] Tanner K. E., K. A. Moore-O'Leary, I. M. Parker, B. M. Pavlik, and R. R. Hernandez. (2020). Simulated solar panels create altered microhabitats in desert landforms. Ecosphere 11(4):e03089. 10.1002/ecs2.3089.

Table of Contents

TABLES

No table of figures entries found.

FIGURES

No table of figures entries found.

APPENDICES

No table of contents entries found.

11.0 CONCLUSION

The ESIA for the Project has been conducted following a series of phases including:

- Gap Analysis
- Baseline studies
- Impact assessment
- Stakeholder engagement
- Environmental and Social Management System Plans

The ESIA complies with the specified Turkish Legislation regulations and it is aligned with the 2012 IFC Performance Standards and General EHS Guidelines. The various activities have been carried out by a working group including Turkish and International experts in environmental and social disciplines.

Several environmental and social surveys, modelling work and assessments have been conducted within the scope of the ESIA. These are:

- Baseline surveys of environmental, biological and social components;
- Baseline measurements for physical components (soil, groundwater, air, noise and vibration)
- Impact assessments of the physical, biological and social components

The general methodology for the impact assessment is based on the definition of Valued Environmental and Social Components (VECs), that are aspects of the physical, biological and social environment that are considered worthy of protection by the relevant legislation or by international standards, and of Assessment Endpoints, that are specific and measurable aspects of the VECs that allow for the assessment of impacts (both positive and negative).

The process of assessing impacts has been based on the following steps:

- The identification of Project Components, as individual elements of the Project that are characterized by similar features and construction, operation and decommissioning procedures;
- The identification of Impact Factors, or factors that can change the environmental and social quality of the VECs like air emissions, water discharge etc.;
- The definition of the sensitivity of the VECs to the Impact Factors identified, based on the environmental and social data collected during baseline; and
- The definition of the Impacts as a result of the interaction between Impact Factors and Sensitivity of the VECs for each of the identified Assessment Endpoints.

Each of the Project components has been associated to one or more impact factor for each of the phases of construction, operation and decommissioning.

Impacts have been assessed considering the correct application of a set of standard mitigation measures that are drawn from good industry practice. Additional site or issue specific mitigation measures have been identified to address areas where high residual impacts are likely to occur, in order to ensure the impacts after additional mitigation measure are kept at an acceptable level.

Impacts have been assessed separately for the three phases of construction, operation and decommissioning, as the nature and extent of the impacts in the three phases is substantially different.

As a result of the Environmental and Social Assessment Study the following conclusion have been driven:

1) Continuous stakeholder engagement is necessary to manage the social risks of the Project. Stakeholder Engagement Plan including the internal and external grievance mechanisms will be prepared for the Project.

2) Air and noise monitoring programmes will be in place for the Project to be in compliance with regulatory requirements applicable to the Project.

3) For the biodiversity components, a list of mitigation measures is defined for Project phases within the scope of ESIA including additional field studies for data collection.

4) The Project will develop an Environmental and Social Management System in line with both corporate requirements and the requirements that are defined as part of the ESIA study.

The mitigation measures developed, to minimise the environmental and social impacts of the Project are detailed in relevant sections of this report.

The requirements of an Environmental and Social Management System are also provided as part of the Environmental and Social Impact Study focusing on:

- Environmental and Social Management System Structure
- Environmental and Social Management Plan(s)
- Labour Issues and Health & Safety Management Plan(s)
  - Labour Conditions
  - Occupational Health and Safety
  - Community Health and Safety

Residual Impacts

The surveys, studies and the impact assessments have allowed the Client to develop robust mitigation measures for residual impacts. As discussed in Section 5.7, the Residual Impact Value (RIV) results from the impact value and the effectiveness of the mitigation measure put in place to reduce the negative outcomes generated by the Project Actions/Impact Factors (or to maximize the positive ones). The RIVs contribute to the overall impact on each component. Overall impact is a synthesis of the residual impacts on a component from all the impact factors generated by the Project actions.

Relying on the assessment conducted in Section 7, the overall residual impact value on each component is summarized in the following sections.

Physical

The overall residual impact is assessed to be **low** for *Noise and Vibration* components since the actual impact corresponds mainly in construction phase (very limited period). During the construction phase of the Project, a monitoring program of noise at the baseline noise measurement locations and at the receptors where the defined noise limit values are exceeded, will be in place. During the operation phase of the Project, in case the measurements are above the limit values, an annual measurement will be carried out to stay on the safe side.

Air Quality components were assessed as **negligible** and **low** during construction and operation phases. In order to mitigate these residual impacts, detailed measures have been developed as presented in Section 7.1.1.

Removal of topsoil/soil, minor leakage of contaminants into soil, occupation of land and discharge of wastewater are potential impact factors to the soil and subsoil components. For mitigating these impact factors, detailed

measures have been developed as presented in Section 7.1.3. These residual impacts of *Soil and Subsoil components were* assessed as **negligible** and **low** during construction and operation phases.

The overall residual impacts for *Hydrogeology and Groundwater and Hydrology and Surface Water* and *Traffic* -were assessed as **negligible** during construction and operation phases. The monitoring program to be used for surface water and groundwater quality will be based on site-specific risk assessments as well as specific guidelines for water quality standards.

Mitigation measures listed -in Section 7.1.6.1.2 and Section 7.1.6.2.2 will be strictly followed in order to prevent any harm to workers and the community related to traffic. Continuous stakeholder engagement process and grievance mechanism will be in place. There will be **positive** impact of the traffic based on the decreased road traffic load on provincial level.

Biological

For the biological components the overall residual impact was assessed to be negligible, low and medium for during construction phase. For operation phase, overall low residual impact has been assessed.

Detailed mitigation measures for biological components presented in Section 7.3.1.2 and Section 7.3.2.2 and these mitigation measures will be strictly followed. Areas cleared during construction for temporary use, such as camp areas, and storage areas, will be restored, as soon as possible, with the goal of producing a stable vegetative cover to minimize erosion, dust and spreading of invasive alien species, and the aim of recreating the original natural habitat and possibly enhancing flora species richness and diversity.

Monitoring and additional site survey will be implemented for biological components in accordance with the recommendations listed in the Section 7.3.1.4 and Section 7.3.1.4 of the ESIA.

Social

The possible social impacts of the Project will be both positive and negative. It is seen that the impacts on *Population and Demography* were **negligible** and **low** with the proposed mitigation measures. Unlike other Project components, the *Economy and Employment* are expected to have **medium and very high positive** impact on both the construction and operation periods with the implementation of the mitigation measures defined in Section 7.1.4.1.2 and Section 7.1.4.2.2. The monitoring program to be used for auditing working conditions will be based on site-specific risk assessments as well as specific guidelines for workers' accommodation standards.

The overall residual impacts for *Land Use* will result in negative impacts. Before the implementation of the suggested mitigating measures are put into place, all impacts are expected to occur continuous. In order to properly compensate the PAPs through the implementation of Community Development Plan, the impact on occupation of pasturelands is anticipated to decrease to between **very high** to **low**.

Cultural Heritage and *Visual Aesthetics* were assessed as **negligible** during construction and operation phases, while the residual impacts for *Gender Issues, Community Health and Safety* and *Infrastructure, Utilities and Services* are assessed as both **negligible**, **low,** and **medium** for all phases of the Project.

In order to mitigate these overall social residual impacts several mechanisms will be put in place, such as Stakeholder Engagement Plan (including Grievance Redress Mechanism), and specific management plans such as Contractor Management Plan, Community Health and Safety Plan, Camp Site and Offsite Accommodation Management Plan.

Signature Page

WSP Danışmanlık ve Mühendislik Ltd. Şti.

Tilbe Seda Şendağ
Environmental Engineer

Merve Acırlı
Project Manager

Team Member	Duty
WSP Türkiye	
Beyza Kozak	Project Director
Merve Acırlı	Project Manager
Eylül Kırbaç	Senior Environmental Specialist
Tilbe Seda Şendağ	Environmental Specialist
Ahmet Kerem Koç	Geological Engineer and Senior HSE Specialist
Çağrı Tekatlı	Senior Biologist
İpek Karasu	Geological Engineer
Necati Erdem Kalaycıoğlu	Hydrogeological Engineer
Elçin Kaya	Senior Sociologist
Esra Güven	Sociologist
Cecilia Amosso	Senior Ecologist

Registered in Türkiye Registration No. 53/3069

Vat No. 396 056 79 79

c:\users\trek104383\desktop\23591787_viranşehirspp_esia_chapter_9_cia_r2_clean.docx

wsp.com

APPENDIX A

List of Applicable National Legislation and International Agreements Ratified by Türkiye

Table 7: Current Relevant Environmental Laws and Regulations in Türkiye

Law/Regulation
Permitting
Regulation on Environmental Impact Assessment
Regulation on Environmental Auditing
Regulation on Environmental Permit and License
Communique on the Administrative Fines to be implemented in accordance with the first section (k) of article 20 of the Environmental Law numbered 2872 (and annual updates of the Communique)
Regulation on Electric Power Current Facilities
Industrial Zones Law No. 4737
Air Quality
Regulation on Control of Industrial Air Pollution
Regulation on Control of Air Pollution caused by Heating
Regulation on Assessment and Management of Air Quality
Regulation on Ozone Layer Depleting Materials
Regulation on Monitoring of Greenhouse Gas Emissions
Communique on Monitoring and Reporting of Greenhouse Gases
Regulation on Exhaust Gas Emission Control
Communique on Continuous Emission Monitoring Systems
Regulation on the Reduction in the Sulphur Content of Some Fuel Types
Regulation on Control of Odour-Generating Emissions
Water Quality
Law on Groundwater, No. 167
Regulation on Water Pollution Control
Regulation on Protection of Groundwater against Pollution and Deterioration
Regulation on Control of Pollution Caused by Hazardous Substances in Water and its Environment

Law/Regulation
Regulation on Surface Water Quality
Regulation on the Protection of Drinking-Utility Water Basins
Regulation on Flood and Sedimentation Control
Regulation on Preparation, Implementation and Follow-up of Basin Management Plans
Regulation on Water Intended for Human Consumption
Communique on Turkish Water Pollution Control Regulation Sampling and Analysis Methodology
Communique on Turkish Water Pollution Control Regulation Administrative Procedures
Soil Quality
Regulation on Control of Soil Pollution and Contaminated Lands by Point Sources
Technical Guidelines for the Regulation on Soil Pollution Control and Contaminated Sites by Point Sources -Polluted Sites, Management System, Technical Document -Polluted Site, Investigation Technical Guidance Document -Polluted Site, Risk Assessment Technical Guidance Document -Polluted Site, Clean-Up and Monitoring Technical Guidance Document
Law on Protection of Soil and Land Use (No: 5403)
Law on Pasture
Waste Management
Regulation on Waste Management
Regulation on Zero Waste
Regulation on Control of Excavation Soil and Demolition Waste
Regulation on Control of Waste Batteries and Accumulators
Regulation on Control of End-of-Life Tires
Regulation on Control of Polychlorinated biphenyls (PCBs) and Polychlorinated terphenyls (PCT)s
Regulation on Management of Waste Oils
Regulation on Control of End-of-Life Vehicles

Law/Regulation
Regulation on Control of Waste Vegetative Oils
Regulation on Control of Medical Wastes
Regulation on Landfills
Regulation on the Control of Packaging Wastes
Regulation on the Control of Waste Electrical and Electronic Equipment
Regulation on the General Principles of Waste Pre-Treatment and Recovery Facilities
Regulation on Incineration of Wastes
Hazardous Materials
Law on Principles of Emergency Response and Compensation for Damages in Pollution of Marine Environment by Oil and Other Hazardous Materials
Implementation Regulation of The Law on Law on Principles of Emergency Response and Compensation for Damages in Pollution of Marine Environment by Oil and Other Hazardous Materials
Regulation on Radiation Safety
Regulation on the Safe Transportation of Radioactive Materials
Regulation on the Transportation of Hazardous Goods by Road
Regulation on the Classification, Packaging, and Labelling of Materials and Mixtures
Regulation on Safety Data Sheets on Hazardous Materials and Mixtures
Noise Management
Regulation on Environmental Noise Control
Regulation on Noise Emission in the Environment Generated by the Equipment Used in the Open Space
TS ISO 1996-1- Acoustics - Description, measurement and assessment of environmental noise -Part 1: Basic quantities and assessment procedures
TS ISO 1996-2- Acoustics - Description, measurement and assessment of environmental noise - Part 2: Determination of sound pressure levels
Nature Conservation and Biodiversity
Regulation on Wildlife Protection and Wildlife Enhancement Areas

Law/Regulation
Law on Forestry (No: 6831)
Law on National Parks
Law on Fisheries
Law on Animal Protection
Decree-Law Establishing the Special Environmental Protection Agency
Terrestrial Hunting Law
Coastal Law
Regulation for Implementing the Convention on International Trade in Endangered Species of Wild Fauna and Flora
Regulation on the Protection of Wetlands
Regulation on Fisheries
Communiqué About Export of Natural Floral Onions in 2021 List
Regulation on Collection, Production and Export of Natural Floral Onions from Nature
Energy Efficiency
Law on Energy Efficiency, No. 5627
Regulation on the Improvement of the Energy Sources and the Efficiency in the Energy Usage
Cultural Heritage
Law on Protection of Cultural and Natural Heritage (No: 2863)
Regulation on Research, Drilling and Excavation of Cultural and Natural Assets
Principal Decision No. 658 issued on 5 November 1999
Law No. 5448 on 19/01/2006 on the Law on the Approval of the Convention for the Protection of the Intangible Cultural Heritage
Other Applicable Legislation
Türkiye Building Earthquake Regulation
Regulation on Buildings to be Constructed in Earthquake Zones

Law/Regulation
Regulation on Buildings to be Constructed in Disaster Areas
Disaster Regulation for Highway Roadside Engineering Structures
Road Transport Regulation
Highway Traffic Regulation
Turkish Petroleum Law
Industry Registry Law
Agriculture Law
Law on Industrial Zones
Regulation on Industrial Zones
Law on Military Restricted Zones and Security Zones
Regulation on Opening a Business and Working Licenses
Wastewater Treatment/Deep Sea Discharge Facility Project Approval Circular" numbered 2018/4 and dated 20.11.2018
Energy Production
Electricity Market Connection and System Use Regulation
Electricity Market License Regulation
Electricity Market Distribution Regulation
Law on Utilization of Renewable Energy Resources for Electricity Generation (Law No: 5346)
Regulation on Competitions Regarding Preliminary License Applications Made for Installation of Energy Generation Facilities Based on Wind and Solar Power
Regulation on Electric Power Current Facilities

Table 8: Existing Labour and H&S Laws and Regulations in Türkiye

Existing Labour and H&S Law and Regulations
The Labour Law – No.4857 (Aims to regulate the working conditions and work-related rights and obligations of employers and employees working within the confines of an employment contract.)
Law on Occupational Health and Safety – Law No. 6331
Regulation on Occupational Health and Safety Services
Regulation on Machine Guards
Regulation on Machinery Safety
Regulation on Safety and Health Requirements Working with Display Screen Equipment
Regulation on Protection of Workers from the Risks of Vibration
Regulation on Prevention of Workers from Risks Created from Noise
Regulation of Fighting with Dust
Regulation on Health and Safety Signs
Regulation on Health and Safety at Construction Sites
Regulation on Protection of Workers from the Risk of Explosive Media
Regulation on Health and Safety Precautions Regarding Working with Asbestos
Regulation on Manual Handling Works
Regulation on Principles and Procedures for Health and Safety Training of Employees
Regulation on Health and Safety Precautions Regarding Workplace Buildings and Their Annexes
Regulation on Use of Personnel Protective Equipment in Workplaces
Regulation on Health and Safety Conditions Regarding Use of Work Equipment
Regulation on Health and Safety Regarding Temporary or Fixed-Term Works
Personnel Protective Equipment Regulation
Regulation on Health and Safety Precautions Regarding Working with Chemicals
Regulation on Subcontractor

Existing Labour and H&S Law and Regulations
Regulation on Protection of Buildings Against Fire
Regulations on the Prevention of Biological Exposure Risks
Regulation on the Employment of Pregnant or Lactating Women, Children's Care Homes and Breastfeeding Rooms
Regulation on Health and Safety Precautions Regarding Working with Cancerogenic and Mutagenic Substances
Regulation on the Procedures and Principles of the Employment of Children's and Young Workers
Regulation on Working Hours as per the Labour Law
Regulation on Overtime and Overtime Hours as per the Labour Law
Regulation on Working Hours that Cannot Be Divided into Weekly Working Days
Regulation on Health and Safety Committees
Regulation on Supporting Health and Safety Services
Regulation on Health and Safety Risk Assessment
Regulation on First Aid
Regulation on Work Stoppage in Workplaces
Regulation on Emergency Cases in Workplaces
Regulation on the Prevention of Major Industrial Accidents and Reducing Their Effects
Law on General Sanitation

Table 9: International Conventions/Protocols Türkiye Has Signed

International Convention / Protocol	
European Cultural Convention; 19.12.1954	17/06/1957, 9635
International Convention for the Establishment of the European and Mediterranean Plant Protection Organization; Paris, 1951	10/04/1965, 11976
The Agreement for the Establishment of the General Fisheries Commission for the Mediterranean (GFCM); Rome, 1949	19/03/1954, 8662

International Convention / Protocol	
Agreement on an International Energy Program; Paris, 1974	23/01/1981
The Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention); Barcelona, adopted on 16.02.1976, entered into force 12.02.1978	12/06/1981, 17368
Convention on Long-Range Transboundary Air Pollution; Geneva, 1979	23/03/1983,17996
The Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention); Bern, opened for signature on 19.09.1979, entered into force on 01.06.1982	20/02/1984, 18318
Protocol to the Convention on Long-Range Transboundary Air Pollution on the Financing of the Co-operative Program for Monitoring and Evaluation of the Long-Range Transmission of Air Pollutants in Europe; Geneva, 1984	23/07/1985, 18820
Protocol for the Protection of the Mediterranean Sea against Pollution from the Land-Based Sources; Athens, 1980	18/03/1987, 19404
Protocol Concerning Specially Protected Areas in the Mediterranean; Geneva, 1982 (date of signature 06.11.1986)	23/10/1988, 19968
Convention on the Control of Transboundary Movements of Hazardous Waste and Disposal; Basel, 22.03.1989	15/05/1994, 21935
Convention on the Protection of the Black Sea against Pollution (Bucharest Convention); Bucharest, entered into force 21.04.1994	14/12/1993, 21788
United Nations Convention to Combat Desertification; Paris, 17.6.1994, entered into force in December 1996	16/05/1998, 23344
Biodiversity Convention; opened for signature at the Earth Summit in Rio de Janeiro on 5.6.1992, entered into force on 29.12.1993	27/12/1996, 22860
United Nations Framework Convention on Climate Change; 2004, and Kyoto Protocol on Global Warming; 2008 The general principle of Kyoto is the signatory parties should decrease their GHG emissions by 5.2% of the 2009 amount till the end of 2012. After 2012, a new agreement and new emission limits will come into the picture.	Turkish Parliament accepted to be a signatory of the Kyoto Protocol in February 2009. However, Türkiye was not a party to the Protocol, and thus had no commitment, until the end of 2012.
The International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) dated 1973, amended by the 1978 Protocol	24/06/1990, 20558

International Convention / Protocol	
International Convention for the Safety of Life at Sea (SOLAS 1974/1988)	25/5/1980, 16998 / 31/01/2013, 28545
United Nations Educational, Scientific, and Cultural Organisation (UNESCO), Convention on the Protection and Promotion of the Diversity of Cultural Expressions. Paris, 20 October 2005	
United Nations Educational, Scientific, and Cultural Organisation (UNESCO), Convention for the Safeguarding of the Intangible Cultural Heritage. Paris, 17 October 2003.	17 October 2003
United Nations Educational, Scientific, and Cultural Organisation (UNESCO), Convention concerning the Protection of the World Cultural and Natural Heritage. Paris, 16 November 1972	16 November 1972
United Nations Framework Convention on Climate Change., Paris Climate Agreement. Paris, 4 November 2016	The Law Regarding the Approval of the Paris Agreement was published in the Official Gazette dated 7 October 2021 and numbered 31621

APPENDIX B

Applicable Environmental Limits

AIR QUALITY

This section has been developed considering the national legislation and international standards detailed above. Legislation and standards used mainly to develop this chapter are listed below.

- Regulation on Control of Industrial Air Pollution (Dated 03.07.2009 and Numbered 27277)
- Regulation on Assessment and Management of Air Quality (Dated 06.06.2008 and Numbered 26898)
- IFC General Environmental, Health, and Safety (EHS) Guidelines (WHO stands for World Health Organization) (Dated 30 April 2007)

Ambient Air Quality Standards

Limit values for stack gas emissions and standards for ambient air quality have been set in “Regulation on Control of Industrial Air Pollution”.

According to the Article 6 of the Regulation:

- *In new establishments, stack gas emissions of the facilities should be determined as mass flow rate and concentration, and emissions except for stacks to atmosphere should be determined as hourly mass flow rate.*
- *For all of the facilities in the new establishment; If the mass flows in Annex-2 Table-2.1 are exceeded, by the operating company; In the impact area of the facilities, it is necessary to calculate the contribution value to air pollution by performing a dispersion model to evaluate the pollution of the establishment.*
- *The air quality limit values given in Annex 2.2 should not be exceeded in the facility impact area.*

The below table presents the limit values specified in Annex-2 requirements and other international standards.

Table 10: Ambient Air Quality Standards

Pollutant	Time/ Averaging Period	Maximum Allowable Limit		
		Turkish Regulation on Control of Industrial Air Pollution[1]	Turkish Regulation on Assessment and Management of Air Quality[2]	IFC / WHO[3]
SO_2 (µg/m^3)	Hourly (Cannot be exceeded more than 24 times in a year)	350 (for 2019-2023) **350 (for 2024 and after)**	**350**	-
	24-hour (Cannot be exceeded more than 3 times in a year)	125 (for 2019-2023) 125 (for 2024 and after)	125	125 (Interim target-1) 50 (Interim target-2) **20 (guideline)**
	10-minute	-	-	**500 (guideline)**
	Long-term limit	60 (for 2019-2023) **60 (for 2024 and after)**	**60**	-
	Yearly and winter season (Oct 1st – March 31st) (for wildlife and ecosystem)	20 (for 2019-2023) **20 (for 2024 and after)**	**20**	-
NO_2 (µg/m^3)	Hourly (Cannot be exceeded more than 18 times in a year)	250 (for 2019-2023) **200 (for 2024 and after)**	**200**	**200 (guideline)**
	Yearly	40 (for 2019-2023) **40 (for 2024 and after)**	**40** **30 (NO_X)**	**40 (guideline)**
PM10 (µg/m^3)	24-hour (Cannot be exceeded more than 35 times in a year)	50 (for 2019-2023) **50 (for 2024 and after)**	**50**	150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) **50 (guideline)**

Pollutant	Time/ Averaging Period	Maximum Allowable Limit		
		Turkish Regulation on Control of Industrial Air Pollution[1]	Turkish Regulation on Assessment and Management of Air Quality[2]	IFC / WHO[3]
	Yearly	40 (for 2019-2023) 40 (for 2024 and after)	40	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) **20 (guideline)**
Fine particles (PM2.5, µg/m^3)	24-hour	-	-	75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) **25 (guideline)**
	Yearly	-	-	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) **10 (guideline)**
CO (mg/m^3)	Maximum daily 8-hour mean	10 (for 2019-2023) **10 (for 2024 and after)**	**10**	-
H_2S	Hourly	**100**	-	-
	Short-term limit	**20**	-	-
TOC (µg/m^3)	Hourly	280 (for 2019-2023) 280 (for 2024 and after)	-	-
	Short-term limit	70 (for 2019-2023) **70 (for 2024 and after)**	-	-
Settled Dust (mg/m^2/day)	Short-term limit	390 (for 2019-2023) **390 (for 2024 and after)**	-	-
	Long-term limit	210 (for 2019-2023) **210 (for 2024 and after)**	-	-

Pollutant		Time/ Averaging Period	Maximum Allowable Limit		
			Turkish Regulation on Control of Industrial Air Pollution[1]	Turkish Regulation on Assessment and Management of Air Quality[2]	IFC / WHO[3]
In Settled Dust (mg/m^2/day)	Pb and Compounds	Long-term limit	250 (for 2019-2023) **250 (for 2024 and after)**	-	-
	Cd and Compounds	Long-term limit	3.75 (for 2019-2023) **3.75 (for 2024 and after)**	-	-
Ozone µg/m^3		Maximum daily 8-hour mean	-	120	160 (Interim target-1) **100 (guideline)**

1 Regulation on Control of Industrial Air Pollution (Dated 03.07.2009 and Numbered 27277)
2 Regulation on Assessment and Management of Air Quality (Dated 06.06.2008 and Numbered 26898)
3 IFC General Environmental, Health, and Safety (EHS) Guidelines (WHO stands for World Health Organization) (Dated 30 April 2007)
Note: Project Standards, which are determined as the most stringent values among given limits, are indicated in **red** colour.

WASTEWATER QUALITY

DOMESTIC WASTEWATER

As per The Water Pollution Control Regulation (WPCR), the facilities having a worker population of less than 2000 will take the opinion of the Provincial Directorate of Environmental, Urbanization and Climate Change regarding the disposal of the wastewater. The Provincial Directorate will consider the environmental status of the area and the nature of the project, and decide on the disposal method (i.e. wastewater treatment plant, impermeable septic tank etc.). In case the Provincial Directorate decides for the establishment of the wastewater treatment plant, the following limits will be applied.

Table 11: Effluent Discharge Limits for Domestic Wastewater to the Receiving Environment*

PARAMETER	Unit	Water Pollution Control Regulation Table 21.1: Sector: Domestic Wastewaters 2 hr Composite Sample	IFC General EHS Guideline: Wastewater and Ambient Water Quality, Table 1.3.1 Indicative Values for Treated Sanitary Sewage Discharges
Biological Oxygen Demand (BOD)	(mg/L)	50	**30**
Chemical Oxygen Demand (COD)	(mg/L)	160	**125**
Total Suspended Solids (TSS)	(mg/L)	**60**	**50**
pH	-	**6-9**	**6-9**
Total Nitrogen	(mg/L)	-	**10**
Total Phosphorus	(mg/L)	-	**2**
Oil and Grease	(mg/L)	-	**10**
Total Coliform Bacteria	MPN1[1] / 100 ml	-	**400**

1 MPN = Most Probable Number

* Receiving environment: The near or distant environment, such as lakes, streams, coastal and sea waters and underground waters, where wastewater is discharged or indirectly mixed,

Note: Project Standards, which are determined as the most stringent values among given limits, are indicated in **red** colour.

INDUSTRIAL WASTEWATER

Treatment of groundwater will lead to the generation of industrial wastewater (backwash wastewater from filters) in the potable water treatment plant. Effluent limits as per WPCR are given below.

Table 12: Effluent Discharge Limits to Receiving Body for Backwash Wastewater of Drinking Water Filters

PARAMETER	unit	Water Pollution Control Regulation Table 20.5: Other Industrial Wastewater (Backwashing of Drinking Water Filters and Similar)	Water Pollution Control Regulation Table 20.7: Water Softening, Demineralization and Regeneration, Activated Carbon Washing and Regeneration Facilities
		2 hr Composite Sample	2 hr Composite Sample
Chemical Oxygen Demand (COD)	(mg/L)	70	-
Total Suspended Solids (TSS)	(mg/L)	150	-
pH	-	6-9	6-9
Chloride (Cl^-)	(mg/L)	-	2000
Sulphate (SO4-2)	(mg/L)	-	3000
Iron (Fe)	(mg/L)	-	10
Fish Bioassay (ZSF)	-	-	10

DRINKING WATER QUALITY

Table 13: Drinking Water Quality Standards

Parameter	Unit	Turkish[1]	WHO[2]
Acrylamide	µg/L	**0.1**	0.5
Aluminium	µg/L	**200****	-
Ammonium	mg/L	**0.5****	-
Antimony	µg/L	**5**	20
Arsenic	µg/L	**10**	**10**
Barium	mg/L	-	**1.3**
Benzene	µg/L	**1**	10
Benzo(a)pyrene	µg/L	**0.01**	0.7
Boron	mg/L	**1**	2.4
Bromate	µg/L	**10**	10
Cadmium	µg/L	5	**3**
Chlorate	mg/L	-	**0.7**
Chloride	mg/L	**250****	**-**

Parameter	Unit	Turkish[1]	WHO[2]
Chromium	µg/L	**50**	**50**
Clostridium perfringens including spores	number/100 ml	**0****	-
Copper	mg/L	**2**	**2**
Cyanide	µg/L	**50**	-
1,2-dichloroethane	µg/L	**3**	30
Epichlorohydrin	µg/L	**0.1**	0.4
Fluoride	mg/L	**1.5**	1.5
Iron	µg/L	**200****	-
Lead	µg/L	**10**	**10**
Manganese	µg/L	**50****	80
Mercury	µg/L	**1**	6
Nickel	µg/L	**20**	70
Nitrate	mg/L	**50**	50
Nitrite	mg/L	**0.5**	3
Pesticides	µg/L	**0.1**	-
Pesticides Total	µg/L	**0.5**	-
Polycyclic aromatic hydrocarbons	µg/L	**0.1**	-
Selenium	µg/L	**10**	40
Sulphate	mg/L	**250****	-
Sodium	mg/L	**200****	-
Tetrachloroethene and Trichloroethene	µg/L	**10**	40
Trihalomethanes Total	µg/L	**100**	-
Uranium	µg/L	-	**30**
Vinyl chloride	µg/L	0.5	**0.3**
Conductivity	µS cm^{-1} at 20 °C	**2500**	-
Oxidisability	mg/L O2	**5****	-
Coliform bacteria	number/100 ml	**0**	-

Parameter	Unit	Turkish[1]	WHO[2]
Tritium[8]	Bq/l	**100****	**100**
Indicative dose	mSv	**0.10**	-
Taste	Acceptable to consumers and no abnormal change		
Colony count 22°C	No abnormal change		
Total organic carbon (TOC)	No abnormal change		
Turbidity	Acceptable to consumers and no abnormal change		
Colour	Acceptable to consumers and no abnormal change		
Odour	Acceptable to consumers and no abnormal change		

* WHO

** Indicator values

*** Elevated levels of tritium may indicate the presence of other artificial radionuclides. If the tritium concentration exceeds its parametric value, an analysis of the presence of other artificial radionuclides shall be required

[1] Regulation on the Water Intended for Human Consumption, O.G.:25730, 2005

[2] WHO Guidelines for drinking-water quality, 4th edition, incorporating the 1st and 2nd addendum

SOIL QUALITY

The Regulation on Soil Pollution Control and Point Source Contaminated Sites ("Soil Regulation") was published on June 8, 2010 (Official Gazette: 27605) and was fully implemented on June 8, 2015. In accordance with Social Regulation, it is obligatory to prevent pollution, stop pollution release in polluted areas and determine the extent of pollution.

Facilities must ensure that the waste and residues are not discharged into the environment and are stored in compliance with the standards and procedures stated in the Environmental Law and the relevant regulations. This is to ensure that they do not harm the soil and cause soil pollution. According to the Soil Regulation, it is the responsibility of the facility owner to remediate (i.e., clean up) contaminated soil. In addition to this, once remediation has been undertaken, parameters listed in the regulation should be analysed through soil sampling and should comply with the generic limit values of these parameters.

"Potential Soil Pollutant Activities and Activity Specific Pollution Indicator Parameters List" is given in Annex 2, Table 2 of the Soil Regulation. The activities within the Project would probably be covered with the below-listed activity codes in the Soil Regulation.

Table 14: Applicable Activity Codes of the Project and Relevant Contaminant Indicator Parameters

NACE Code	Industrial Activity	Activity-Based Contaminant Indicator Parameters
3511	Electricity Production	TOX, TPH, As, B, Ba, Cd, Cr, Cu, Hg, Mo, Pb, Sb, Se, Zn

[8] Council Directive 2013/51/Euratom of 22 October 2013 laying down requirements for the protection of the health of the general public with regard to radioactive substances in water intended for human consumption (europa.eu)

Soil Quality Standards in the “Soil Regulation* related to the above-mentioned activity codes are given below.

Table 15: Soil Quality Standards

Regulation on Soil Pollution Control and Point Source Contaminated Sites					
Measured Parameters	**Units**	**Ingestion of soil or dermal contact (mg/kg oven-dry soil)**	**Outdoor inhalation of fugitive dust (mg/kg oven-dry soil)**	**Transport of pollutants to groundwater and use of groundwater for drinking [1] (mg/kg oven-dry soil)**	
				SF = 10	**SF = 1**
Extractable Metals / Major Cations					
Antimony	mg/kg	31	-	2	0.2
Arsenic	mg/kg	0.4	471	3	0.3
Barium	mg/kg	15643	433702	288	29
Cadmium	mg/kg	70	1124	27	3
Chromium	mg/kg	235	24	900000	1
Cobalt	mg/kg	23	-	5	0.5
Copper	mg/kg	3129	-	514	51
Lead	mg/kg	400	-	135	14
Mercury	mg/kg	23	-	3	0.6
Molybdenum	mg/kg	391	-	14	1
Nickel	mg/kg	1564	-	13	1
Selenium	mg/kg	391	-	0.5	0.05
Vanadium	mg/kg	548	-	2556	256
Zinc	mg/kg	23464	-	6811	681
Total Petroleum Hydrocarbons (TPH)	mg/kg	188496	-	175	17.4

1 If the distance to the aquifer is less than 3m, the aquifer is cracked or karstic, or the pollution source area is 10 hectares or more, the dilution factor SF is taken as "1"; in other cases, SF should be taken as "10".

NOISE

Table 16: Noise Limits (Turkish Regulation on Environmental Noise Control)

Noise Source	Measured Parameter	Environmental Noise Value (Regulation on Environmental Noise Control, Annex-2, Table 1)		
		Day 07:00 – 19:00	Evening 19:00 – 23:00	Night time 23:00 - 07:00
Industrial facilities, transportation sources	LAeq,5min.	65 dB(A)	60 dB(A)	55 dB(A)

Noise Source	Measured Parameter	Environmental Noise Value (Regulation on Environmental Noise Control, Annex-2, Table 1)		
		Day 07:00 – 19:00	Evening 19:00 – 23:00	Night time 23:00 - 07:00
Music broadcasting establishments (1)	LAeq 63-250 Hz	60 dB(A)	55 dB(A)	50 dB(A)
Workplaces (2)	LAeq,5min.	Background + 5 dB(A)		Background + 3 dB(A)
In case of more than one workplace (3)	LAeq,5min.	Background + 7 dB(A)		Background + 5 dB(A)
All sources	LCmax	100 dB(C)		

Table 17: IFC Noise Standards

	One Hour LAeq* (dBA) (IFC EHS Guidelines General EHS Guidelines: Environmental Noise Management and Noise at Work Directive 2003/10/EC) [1]	
Receptor	Day-time 07:00 - 22:00	Night time 22:00 - 07:00
Residential; institutional; educational	55	45
Industrial; Commercial	70	70

1 According to the IFC General EHS Guideline Noise measurement levels sourced from Project activities should not exceed the levels presented above or result in a maximum increase in background levels of **3 dB** at the nearest receptor location off-site.

VIBRATION

Table 18: Vibration Standards (Turkish Regulation on the Environmental Noise Control)

Regulation on the Environmental Noise Control Noise (Annex-2, Table 5)		
Maximum Allowed Vibration Velocity (Peak value – mm/s)	**Continuous Vibration**	**Intermittent Vibration**
Residential Areas	5	10
Industrial and Commercial Areas	15	30
Historical and Natural Structures[1]	2	5

1 These limit values determined for historical and natural structures may be limited by precise, comprehensive vibration measurements and scientific studies to be carried out on-site.

Vibration criteria are defined in “BS 5228-2:2009 - Code of practice for noise and vibration control on construction and open sites” which defines vibration limits for humans and which could result in cosmetic damage to buildings.

Table 19: Guidance on Effects of Vibration Levels on Humans

Vibration level $[mm/s]$	Effect
0.14	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3	Vibration might be just perceptible in residential environments.
1.0	It is likely that vibration of this level in residential environments will cause complaints but can be tolerated if prior warning and explanation have been given to residents.
10	Vibration is likely to be intolerable for any more than very brief exposure to this level.
Source: BS 5228-2:2009. Code of practice for noise and vibration control on construction and open sites. Vibration	

Table 20: Transient Vibration Guide Values for Cosmetic Damage of Buildings

Type of building	Peak component particle velocity in the frequency range of predominant pulse, $[mm/s]$	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures	50	50
Industrial and heavy commercial buildings		
Unreinforced or light-framed structures	15-20	20-50
Residential or light commercial buildings		
Note: Values referred to are at the base of the building		
Source: BS 7385-2:1993. Evaluation and measurement for vibration in buildings. Guide to damage levels from ground-borne vibration		

According to BS 7385-2:1993, minor damage to buildings is possible at vibration levels greater than twice those given in Table 20 and major damage to a building structure can occur at values greater than four times the tabulated values.

In addition, the values in Table 20 are related predominantly to transient vibration that does not generate resonant responses in structures, and to low-rise buildings. Where the dynamic loading caused by continuous vibration is such as generating resonance, then the guide values in Table 20 might need to be reduced by up to 50%. Therefore, the lower limit for vibration level that may cause cosmetic damage to residential buildings is 5 mm/s, while the limit of human perception is much lower, comprising 0.14 to 0.30 mm/s.

WATER QUALITY

SURFACE WATER

Classification of the surface water quality will be done based on the threshold values provided in Annex-5, Table 2 of the Regulation on Surface Water Quality. Relevant parameters and threshold values for each water quality class are listed below.

Table 21: Inland Surface Waters Quality Criteria

Parameters	Unit	Regulation on Surface Water Quality, Annex 5, Table 2 Water Quality		
		Class I	Class II	Class III
Ammonium Nitrogen	mg/L	< 0,2	1	>1
Biochemical Oxygen Demand (BOD)	mg/L	< 4	8	>8
Dissolved Oxygen	mg/L	> 8	6	< 6
Fluoride	µg/L	≤ 1000	1500	> 1500
Orthophosphate Phosphorus	mg/L	< 0,05	0,16	> 0,16
Conductivity	µS/cm	< 400	1000	> 1000
Chemical Oxygen Demand (COD)	mg/L	< 25	50	> 50
Manganese	µg/L	≤ 100	500	> 500
Nitrate Nitrogen	mg/L	< 3	10	> 10
pH	-	6-9	6-9	6-9
Colour (436 nm)	m-1	≤ 1.5	3	> 4.3
Colour (525 nm)	m-1	≤ 1.2	2.4	> 3.7
Colour (620 nm)	m-1	≤ 0.8	1.7	> 2.5
Selenium	µg/L	≤ 10	15	> 15
Sulphur	µg/L	≤ 2	5	> 5
Total Nitrogen	mg/L	< 3,5	11,5	> 11,5
Total Phosphorous	mg/L	< 0,08	0,2	> 0,2
Total Kjeldahl Nitrogen	mg/L	< 0,5	1,5	> 1,5
Oil-Grease	mg/L	< 0,2	0,3	> 0,3

APPENDIX C

Detailed Project Schedule

Activity	Start Date	Finish Date
Permitting		
Ministry Approval of Design	15-Jan-23	17-Feb-23
Construction Permit	19-Aug-23	21-Aug-23
Final Delivery Acceptance Certificate Application & Issuance	07-Oct-23	11-Oct-23
The signing of the YEKA Contract	01-Jul-21	-
Master Plan Approval	14-Apr-22	01-Jul-23
EMRA (EPDK) Pre-License Approval	01-Jul-22	21-Jul-22
Base Plan Approval of the Site	01-Apr-22	25-May-22
Environmental Impact Assessment Approval	01-Mar-22	25-Nov-22
Signing TEİAŞ Connection Agreement	16-Nov-22	19-Apr-23
Transfer of Land Ownership	18-Nov-22	18-Aug-23
Land Allocation Approval	21-Jul-23	20-Sep-23
Electricity Generation License Approval	19-Aug-23	28-Aug-23
Baseline Studies (Physical Measurements & Biodiversity Monitoring)	01-May-23	30-Jun-23
Engineering	**06-Sep-22**	**26-Aug-23**
SPP Engineering	28-Sep-22	24-Jun-23
Substation Contracting & Engineering	06-Sep-22	01-Jul-23
OHTL Contracting, Engineering	04-Oct-22	31-Mar-23
CCTV & Lighting Engineering	24-Jul-23	26-Aug-23
Procurement	**09-May-23**	**24-Nov-23**
Early Works	**24-Jul-23**	**03-Sep-23**
Earthworks on Site Surface	24-Jul-23	15-Aug-23
Reptile & Mammal Burrow Monitoring Prior to Earthworks	24-Jul-23	20-Aug-23
Mobilization Works	05-Aug-23	03-Sep-23
Construction	**27-Jul-23**	**05-Feb-24**
Solar System	27-Jul-23	05-Feb-24
Substation	01-Aug-23	08-Dec-23
OHTL	09-Nov-23	08-Dec-23
Test & Commissioning & Provisional Acceptance	**11-Sep-23**	**17-Feb-24**
Final Acceptance & Commercial Operation of SPP	-	17-Feb-24
Solar System	11-Sep-23	17-Feb-24
Substation	09-Dec-23	23-Dec-23
OHTL	19-Dec-23	23-Dec-23

APPENDIX D

List of species

Reptile species

Family	Species	Global IUCN Status	End./ RR	Lit./ Obs.
Agamidae	*Stellagama stellio*	LC	-	L
Agamidae	*Trapelus lessonae*	LC	-	L
Blanidae	*Blanus strauchi*	LC	-	L
Colubridae	*Dolichophis jugularis*	LC	-	L
Colubridae	*Dolichophis schmidti*	LC	-	L
Colubridae	*Eirenis coronelloides*	LC	-	L
Colubridae	*Eirenis eiselti*	LC	-	L
Colubridae	*Eirenis persicus*	LC	-	L
Colubridae	*Elaphe sauromates*	LC	-	L
Colubridae	*Hemorrhois nummifer*	LC	-	L
Colubridae	*Hemorrhois ravergieri*	LC	-	L
Colubridae	*Platyceps najadum*	LC	-	L
Colubridae	*Rhynchocalamus melanocephalus*	LC	-	L
Elapidae	*Walterinnesia morgani*	LC	-	L
Gekkonidae	*Cyrtopodion scabrum*	LC	-	L
Gekkonidae	*Mediodactylus heterocercus*	LC	-	L
Lacertidae	*Apathya cappadocica*	LC	-	L
Lacertidae	*Ophisops elegans*	LC	-	L
Leptotyphlopidae	*Myriopholis macrorhyncha*	LC	-	L
Natricidae	*Natrix tessellata*	LC	-	L

Family	Species	Global IUCN Status	End./ RR	Lit./ Obs.
Psammophiidae	*Malpolon insignitus*	LC	-	L
Scincidae	*Chalcides ocellatus*	LC	-	L
Scincidae	*Eumeces schneiderii*	LC	-	L
Scincidae	*Heremites auratus*	LC	-	L
Scincidae	*Heremites vittatus*	LC	-	L
Testudinidae	*Testudo graeca*	VU	-	L
Trionychidae	*Rafetus euphraticus*	EN	-	L
Typhlopidae	*Xerotyphlops vermicularis*	LC	-	L
Varanidae	*Varanus griseus*	LC	-	L
Viperidae	*Macrovipera lebetinus*	LC	-	L

Bird species

Family	Species	Global IUCN Status	End./ RR	Lit./ Obs.
Accipitridae	*Accipiter brevipes*	LC	-	L
Accipitridae	*Accipiter nisus*	LC	-	L
Accipitridae	*Aegypius monachus*	NT	-	L
Accipitridae	*Aquila heliaca*	VU	-	L
Accipitridae	*Aquila nipalensis*	EN	-	L
Accipitridae	*Buteo buteo*	LC	-	L
Accipitridae	*Buteo rufinus*	LC	-	L

Family	Species	Global IUCN Status	End./ RR	Lit./ Obs.
Accipitridae	*Circaetus gallicus*	LC	-	L
Accipitridae	*Circus aeruginosus*	LC	-	L
Accipitridae	*Circus cyaneus*	LC	-	L
Accipitridae	*Circus macrourus*	NT	-	L
Accipitridae	*Circus pygargus*	LC	-	L
Accipitridae	*Clanga clanga*	VU	-	L
Accipitridae	*Clanga pomarina*	LC	-	L
Accipitridae	*Gyps fulvus*	LC	-	L
Accipitridae	*Haliaeetus albicilla*	LC	-	L
Accipitridae	*Hieraaetus pennatus*	LC	-	L
Accipitridae	*Milvus migrans*	LC	-	L
Accipitridae	*Neophron percnopterus*	EN	-	L
Accipitridae	*Pernis apivorus*	LC	-	L
Acrocephalidae	*Acrocephalus scirpaceus*	LC	-	L
Acrocephalidae	*Hippolais languida*	LC	-	L
Acrocephalidae	*Iduna pallida*	LC	-	L
Alaudidae	*Alauda arvensis*	LC	-	L
Alaudidae	*Alaudala heinei*	LC	-	L
Alaudidae	*Alaudala rufescens*	LC	-	L
Alaudidae	*Calandrella brachydactyla*	LC	-	L
Alaudidae	*Eremophila alpestris*	LC	-	L

Family	Species	Global IUCN Status	End./ RR	Lit./ Obs.
Alaudidae	*Galerida cristata*	LC	-	L
Alaudidae	*Lullula arborea*	LC	-	L
Alaudidae	*Melanocorypha bimaculata*	LC	-	L
Alaudidae	*Melanocorypha calandra*	LC	-	L
Anatidae	*Anas platyrhynchos*	LC	-	L
Anatidae	*Aythya nyroca*	NT	-	L
Anatidae	*Marmaronetta angustirostris*	NT	-	L
Anatidae	*Oxyura leucocephala*	EN	-	L
Anatidae	*Tadorna ferruginea*	LC	-	L
Apodidae	*Apus apus*	LC	-	L
Apodidae	*Tachymarptis melba*	LC	-	L
Ardeidae	*Ardea alba*	LC	-	L
Ardeidae	*Ardea purpurea*	LC	-	L
Ardeidae	*Ardeola ralloides*	LC	-	L
Burhinidae	*Burhinus oedicnemus*	LC	-	L
Caprimulgidae	*Caprimulgus europaeus*	LC	-	L
Charadriidae	*Charadrius asiaticus*	LC	-	L
Charadriidae	*Charadrius dubius*	LC	-	L
Charadriidae	*Vanellus gregarius*	CR	-	L
Charadriidae	*Vanellus leucurus*	LC	-	L
Ciconiidae	*Ciconia ciconia*	LC	-	L

Family	Species	Global IUCN Status	End./ RR	Lit./ Obs.
Ciconiidae	*Ciconia nigra*	LC	-	L
Columbidae	*Columba livia*	LC	-	L
Columbidae	*Columba oenas*	LC	-	L
Columbidae	*Spilopelia senegalensis*	LC	-	L
Columbidae	*Streptopelia decaocto*	LC	-	L
Columbidae	*Streptopelia turtur*	VU	-	L
Coraciidae	*Coracias garrulus*	LC	-	L
Corvidae	*Corvus corax*	LC	-	L
Corvidae	*Corvus corone*	LC	-	L
Corvidae	*Corvus frugilegus*	LC	-	L
Corvidae	*Corvus monedula*	LC	-	L
Corvidae	*Garrulus glandarius*	LC	-	L
Corvidae	*Pica pica*	LC	-	L
Cuculidae	*Clamator glandarius*	LC	-	L
Cuculidae	*Cuculus canorus*	LC	-	L
Emberizidae	*Emberiza calandra*	LC	-	L
Emberizidae	*Emberiza cia*	LC	-	L
Emberizidae	*Emberiza cineracea*	NT	-	L
Emberizidae	*Emberiza hortulana*	LC	-	L
Emberizidae	*Emberiza melanocephala*	LC	-	L
Emberizidae	*Emberiza schoeniclus*	LC	-	L

Family	Species	Global IUCN Status	End./ RR	Lit./ Obs.
Falconidae	*Falco cherrug*	EN	-	L
Falconidae	*Falco columbarius*	LC	-	L
Falconidae	*Falco naumanni*	LC	-	L
Falconidae	*Falco peregrinus*	LC	-	L
Falconidae	*Falco subbuteo*	LC	-	L
Falconidae	*Falco tinnunculus*	LC	-	L
Falconidae	*Falco vespertinus*	VU	-	L
Fringillidae	*Bucanetes githagineus*	LC	-	L
Fringillidae	*Carduelis carduelis*	LC	-	L
Fringillidae	*Fringilla montifringilla*	LC	-	L
Fringillidae	*Linaria cannabina*	LC	-	L
Fringillidae	*Spinus spinus*	LC	-	L
Glareolidae	*Glareola nordmanni*	NT	-	L
Gruidae	*Anthropoides virgo*	LC	-	L
Hirundinidae	*Cecropis daurica*	LC	-	L
Hirundinidae	*Delichon urbicum*	LC	-	L
Hirundinidae	*Hirundo rustica*	LC	-	L
Hirundinidae	*Ptyonoprogne rupestris*	LC	-	L
Hirundinidae	*Riparia riparia*	LC	-	L
Laniidae	*Lanius minor*	LC	-	L
Laniidae	*Lanius nubicus*	LC	-	L

Family	Species	Global IUCN Status	End./ RR	Lit./ Obs.
Laniidae	*Lanius senator*	NT	-	L
Laridae	*Chlidonias niger*	LC	-	L
Laridae	*Larus armenicus*	LC	-	L
Laridae	*Larus canus*	LC	-	L
Laridae	*Larus fuscus*	LC	-	L
Locustellidae	*Locustella fluviatilis*	LC	-	L
Meropidae	*Merops apiaster*	LC	-	L
Motacillidae	*Anthus campestris*	LC	-	L
Motacillidae	*Anthus pratensis*	LC	-	L
Motacillidae	*Anthus spinoletta*	LC	-	L
Motacillidae	*Anthus trivialis*	LC	-	L
Motacillidae	*Motacilla alba*	LC	-	L
Motacillidae	*Motacilla cinerea*	LC	-	L
Motacillidae	*Motacilla flava*	LC	-	L
Muscicapidae	*Cercotrichas galactotes*	LC	-	L
Muscicapidae	*Erithacus rubecula*	LC	-	L
Muscicapidae	*Ficedula albicollis*	LC	-	L
Muscicapidae	*Ficedula parva*	LC	-	L
Muscicapidae	*Irania gutturalis*	LC	-	L
Muscicapidae	*Luscinia megarhynchos*	LC	-	L
Muscicapidae	*Luscinia svecica*	LC	-	L

Family	Species	Global IUCN Status	End./ RR	Lit./ Obs.
Muscicapidae	*Monticola saxatilis*	LC	-	L
Muscicapidae	*Monticola solitarius*	LC	-	L
Muscicapidae	*Muscicapa striata*	LC	-	L
Muscicapidae	*Oenanthe finschii*	LC	-	L
Muscicapidae	*Oenanthe hispanica*	LC	-	L
Muscicapidae	*Oenanthe isabellina*	LC	-	L
Muscicapidae	*Oenanthe xanthoprymna*	LC	-	L
Muscicapidae	*Phoenicurus ochruros*	LC	-	L
Muscicapidae	*Phoenicurus phoenicurus*	LC	-	L
Muscicapidae	*Saxicola torquatus*	LC	-	L
Oriolidae	*Oriolus oriolus*	LC	-	L
Otididae	*Otis tarda*	VU	-	L
Otididae	*Tetrax tetrax*	NT	-	L
Pandionidae	*Pandion haliaetus*	LC	-	L
Passeridae	*Carpospiza brachydactyla*	LC	-	L
Passeridae	*Passer domesticus*	LC	-	L
Passeridae	*Passer hispaniolensis*	LC	-	L
Passeridae	*Passer moabiticus*	LC	-	L
Passeridae	*Petronia petronia*	LC	-	L
Pelecanidae	*Pelecanus crispus*	NT	-	L
Phasianidae	*Alectoris chukar*	LC	-	L

Family	Species	Global IUCN Status	End./ RR	Lit./ Obs.
Phasianidae	*Coturnix coturnix*	LC	-	L
Phylloscopidae	*Phylloscopus collybita*	LC	-	L
Phylloscopidae	*Phylloscopus nitidus*	LC	-	L
Phylloscopidae	*Phylloscopus trochilus*	LC	-	L
Picidae	*Dendrocopos syriacus*	LC	-	L
Podicipedidae	*Podiceps cristatus*	LC	-	L
Psittacidae	*Alexandrinus krameri*	LC	-	L
Pteroclidae	*Pterocles alchata*	LC	-	L
Pteroclidae	*Pterocles orientalis*	LC	-	L
Pycnonotidae	*Pycnonotus xanthopygos*	LC	-	L
Recurvirostridae	*Himantopus himantopus*	LC	-	L
Recurvirostridae	*Recurvirostra avosetta*	LC	-	L
Remizidae	*Remiz pendulinus*	LC	-	L
Scolopacidae	*Gallinago media*	NT	-	L
Scolopacidae	*Limosa limosa*	NT	-	L
Scolopacidae	*Numenius arquata*	NT	-	L
Scolopacidae	*Tringa totanus*	LC	-	L
Scotocercidae	*Cettia cetti*	LC	-	L
Sittidae	*Sitta tephronota*	LC	-	L
Strigidae	*Athene noctua*	LC	-	L
Strigidae	*Otus brucei*	LC	-	L

Family	Species	Global IUCN Status	End./ RR	Lit./ Obs.
Strigidae	*Otus scops*	LC	-	L
Sturnidae	*Pastor roseus*	LC	-	L
Sturnidae	*Sturnus vulgaris*	LC	-	L
Sylviidae	*Curruca communis*	LC	-	L
Sylviidae	*Curruca curruca*	LC	-	L
Sylviidae	*Curruca mystacea*	LC	-	L
Sylviidae	*Sylvia borin*	LC	-	L
Turdidae	*Turdus iliacus*	NT	-	L
Turdidae	*Turdus merula*	LC	-	L
Turdidae	*Turdus pilaris*	LC	-	L
Tytonidae	*Tyto alba*	LC	-	L
Upupidae	*Upupa epops*	LC	-	L

Mammal species

Family	Species	Global IUCN Status	End./ RR	Lit./ Obs.
Canidae	*Canis aureus*	LC	-	L
Canidae	*Canis lupus*	LC	-	L
Canidae	*Vulpes vulpes*	LC	-	L
Cricetidae	*Microtus guentheri*	LC	-	L
Cricetidae	*Microtus socialis*	LC	-	L
Cricetidae	*Nothocricetulus migratorius*	LC	-	L

Family	Species	Global IUCN Status	End./ RR	Lit./ Obs.
Dipodidae	*Scarturus euphratica*	LC	-	L
Erinaceidae	*Erinaceus concolor*	LC	-	L
Erinaceidae	*Hemiechinus auritus*	LC	-	L
Felidae	*Felis lybica*	LC	-	L
Hystricidae	*Hystrix indica*	LC	-	L
Molossidae	*Tadarida teniotis*	LC	-	L
Muridae	*Meriones tristrami*	LC	-	L
Muridae	*Mus macedonicus*	LC	-	L
Muridae	*Mus musculus*	LC	-	L
Muridae	*Rattus rattus*	LC	-	L
Mustelidae	*Martes martes*	LC	-	L
Mustelidae	*Meles meles*	LC	-	L
Mustelidae	*Mustela nivalis*	LC	-	L
Mustelidae	*Vormela peregusna*	VU	-	L
Rhinolophidae	*Rhinolophus ferrumequinum*	LC	-	L
Rhinolophidae	*Rhinolophus hipposideros*	LC	-	L
Soricidae	*Crocidura suaveolens*	LC	-	L
Spalacidae	*Nannospalax ehrenbergi*	DD	-	L
Suidae	*Sus scrofa*	LC	-	L
Vespertilionidae	*Eptesicus serotinus*	LC	-	L
Vespertilionidae	*Myotis aurascens*	LC	-	L

Family	Species	Global IUCN Status	End./ RR	Lit./ Obs.
Vespertilionidae	*Myotis blythii*	LC	-	L
Vespertilionidae	*Myotis capaccinii*	VU	-	L
Vespertilionidae	*Pipistrellus kuhlii*	LC	-	L

wsp.com