FINAL REPORT

Niğde G4-Bor-1 Solar Power Plant Project

Environmental and Social Impact Assessment Report

Submitted to:

Smart Güneş Enerjisi Teknolojileri Ar-Ge Üretim San ve Tic A.Ş.
Rüzgarlıbahçe Mah., Feragat Sk. Energy Plaza No:2, 34805 Beykoz/İstanbul

Submitted by:

WSP Danışmanlık ve Mühendislik Ltd. Şti.
Hollanda Caddesi 691. Sok. No: 4 Yıldız 06550 Ankara, Türkiye

+90 312 4410031

23633814_final

August, 2024

Distribution List

1 Copy Lenders

1 Copy Smart Güneş Enerjisi Teknolojileri Ar-Ge Üretim San ve Tic A.Ş.

1 Copy WSP Türkiye

Record of Issue

Company	Contact	Version	Date Issued	Method of Delivery
Smart Güneş Enerjisi Teknolojileri Ar-Ge Üretim San ve Tic A.Ş.	Ebru Sağ	Draft_R0	02.08.2024	E-mail (word)
Smart Güneş Enerjisi Teknolojileri Ar-Ge Üretim San ve Tic A.Ş.	Ebru Sağ	Draft_R1	20.08.2024	E-mail (word)
Smart Güneş Enerjisi Teknolojileri Ar-Ge Üretim San ve Tic A.Ş.	Ebru Sağ	Final	20.08.2024	E-mail (word)

Table of Contents

TABLES

FIGURES

APPENDICES

APPENDIX A
List of Applicable National Legislation and International Agreements Ratified by Türkiye

APPENDIX B
Applicable Environmental Limits

APPENDIX C
List of species

APPENDIX D
CCRA

ABBREVIATIONS

Abbreviation	Definition
AoI	Area of Influence
AZE	Alliance for Zero Extinction
CHA	Critical Habitat Assessment
CIA	Cumulative Impact Assessment
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
dBA	Decibels A
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
EIA-AF	EIA Application File
EPRP	Emergency Preparedness and Response Plan
EPs	Equator Principles
ESGA	Environmental and Social Gap Assessment
ESIA	Environmental and Social Impact Assessment
ESMS	Environmental and Social Management System
ETL	Energy Transmission Line
EU	European Union
E&S	Environmental and Social
GHG	Greenhouse Gas
GIIP	Good International Industry Practice
ha	hectare
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

Abbreviation	Definition
KBA	Key Biodiversity Area
km	Kilometer
LRP	Livelihood Restoration Plan
m	Meter
m^3	Cubic meter
MoEUCC	Ministry of Environment, Urbanization and Climate Change
MWp	Megawatt Power
N/A	Not Applicable
NGO	Non-Governmental Organization
NT	Near Threatened
PDoEUCC	Provincial Directorate of Environment, Urbanization and Climate Change
PM	Particulate Matter
PSs	Performance Standards
PV	Photovoltaic
RAP	Resettlement Action Plan
SCADA	Supervisory Control and Data Acquisition
Smart	Smart Güneş Enerjisi Teknolojileri Ar-Ge Üretim San ve Tic A.Ş. (Project Owner)
SPP	Solar Power Plant
TCFD	Task Force on Climate-related Financial Disclosures
TEİAŞ	Turkish Electricity Transmission Corporation
UNESCO	United Nations Educational, Scientific and Cultural Organization
VEC	Valued Environmental and Social Component
WSP Türkiye	WSP Danışmanlık ve Mühendislik Ltd. Şti.
YEKA	Renewable Energy Source Area

1.0 INTRODUCTION

1.1 Project Background

Smart Güneş Enerjisi Teknolojileri Ar-Ge Üretim San ve Tic A.Ş. (hereinafter referred as “Smart”) has retained WSP Danışmanlık ve Mühendislik Ltd. Şti. (hereinafter referred as “WSP Türkiye” or “WSP”) to prepare the Environmental and Social Impact Assessment (“ESIA”) for the Niğde G4-Bor-1 Solar Power Plant Project (hereinafter referred as “the Project’”) in compliance with the national and international requirements.

The Project will have a total installed capacity of 140 MWp / 100 Mwe and located in Seslikaya and Badak Villages in Bor District, Niğde Province. A national Environmental Impact Assessment (EIA) report has been prepared for the Project in accordance with the requirements of Turkish EIA Regulation, and the “EIA Positive” decision has been obtained on October 27th, 2022, with the decision number of 6882.

As part of the ESIA process, in December 2023, WSP Türkiye prepared the Scoping Report, which includes the gap analysis of the national EIA Report and available documentation obtained from Smart, with respect to International Finance Institutions’ (“IFIs”) standards, Equator Principles (“EPs”) IV, International Finance Corporation (“IFC”) Performance Standards (“PSs”), and Environmental, Health, and Safety (“EHS”) Guidelines, and the best practices in the industry. The study recommends specific actions to address these gaps and achieve a comprehensive and financially viable ESIA in accordance with the Equator Principles IV, IFC Performance Standards, and the national legislation.

The Solar Power Plant (“SPP”) will consist of solar panels, an assembly structure, an inverter, a substation, an administrative building, and Supervisory Control and Data Acquisition (“SCADA”) system as main components. The energy transmission line (“ETL”) will be established as an associated facility. With the establishment of the Project, it is planned to produce 100 MWe of electrical energy annually during the operation phase, and the produced energy will be transmitted to the Yaysun SPP Substation by an approximately 29.5 km long 154 kV ETL that will be constructed by the Turkish Electricity Transmission Corporation (“TEİAŞ”).

The Ministry of Energy and Natural Resources has allocated 2,539 hectares of land in the Bor District of Niğde Province on September 29th, 2018, where the Project is located. The legal status of the allocated land was changed to an industrial zone suitable for the development of solar power projects (i.e. Renewable Energy Resource Area (abbreviated as “YEKA” in Turkish)). In accordance with that, "Competition Announcement on the Allocation of Renewable Energy Resource Areas and Connection Capacities Based on Solar Energy" was launched on July 14th, 2021, and YEKA SPP-4 (Bor-1, Bor-2 and Bor-3) competitions were held by the Ministry of Energy and Natural Resources on April 8th, 2022, accordingly. As a result of the competition, Smart was awarded the YEKA Right of Use Agreement for the G4-Bor-1 region on May 16th, 2022.

The Project will be located on a 201.3 ha treasury land whose status was changed from pastureland by Niğde Governorship Revenue Office National Real Estate Directorate's letter dated June 1st, 2018, and numbered 7112. The Project Area has been classified as an "Industrial Zone" in the 1/100,000 scale Environmental Plan and located within the borders of the "Niğde-Bor Energy Specialized Industrial Zone".

Background on the Project Owner, Smart

Smart Solar Technologies was founded in 2014 in Istanbul, the Company has been operating with a mission to foster a sustainable future to accelerate decarbonization through innovation and science. The Company engages in the manufacture of solar photovoltaic modules and provides solar energy solutions focusing on Research and Development. At present, Smart Solar Technologies serves hundreds of customers in 20 countries and regions around the world. The services include;

- Financing & Leasing Solutions
- Solar Module Production
- EPC Turnkey Installation Services
- Engineering Services
- Project Development, Operation and Maintenance Services
- EV Charging Installation and Maintenance Services

Smart Solar Technologies has 3 production bases in Türkiye; Gebze, Dilovası and Aliağa. It expects that the annual production capacity for solar modules is 2.9 GW and the solar cell capacity is 2 GW, respectively, by Q1 2024. As to date, the company has more than 1,000 employees and has been certificated as a responsible company in the sphere of human rights at work.

1.2 Purpose of the ESIA Report

1.2.1 Objectives

An 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:

- identifying and assessing social and environmental impacts, both adverse and beneficial, in the project's area of influence;
- following the mitigation hierarchy of avoidance, minimizing and mitigating impacts and if needed compensating, with respect to adverse impacts to workers, other affected people, and the environment;
- conducting meaningful consultation; and
- promoting 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; and
- a social management plan to maximize benefits to the local community and promote a sustainable economy.

This ESIA Report has been prepared by WSP 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 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.

1.2.1 Categorization of the Project

According to the IFC's Policy on Environmental and Social (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 into four categories:

- Category A: business activities with potential significant adverse environmental and social risks and/or impacts that are diverse, irreversible, or unprecedented;
- Category B: business activities with potential limited adverse environmental and social 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 environmental and social 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 E&S categorization criteria of the applicable standards given above, based on WSP experience with the lenders in the other projects which have similar environmental and social risks, available data, the National EIA, associated facilities such as an ETL with around 30 km length, the Project area being located inside a Key Biodiversity Area (KBA), the Project is proposed to be categorized as "Category A".

2.0 REGULATORY FRAMEWORK

This chapter provides an overview of the national and international regulatory framework, including policies, legislation, requirements, guidelines and standards applicable to the Project. In the presence of multiple standards coming from different regulatory sources, the Project will apply the most stringent standards to protect the environment and the communities potentially affected by the Project.

Applicable Environmental and Social Requirements of the Project are defined based on Turkish national legislation, international agreements, EP IV, IFC PSs and EHS Guidelines, and the best practices in the industry).

2.1 National Legal and Regulatory Framework

2.1.1 Current National Environmental 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. 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 Environment, Urbanization and Climate Change ("MoEUCC") is the responsible organization for the issuing and implementation of policies and legislation adopted for the protection and conservation of the environment and sustainable development and management of natural resources.

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

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 the 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.

A list of regulations currently in force and applicable to the context of the Project are presented in Appendix A.

2.1.2 Environmental Impact Assessment Procedure in Türkiye

The current "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 must 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 projects with high production capacity are listed in Annex 1 and the EIA submission and approval process 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 Information 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, Ministry authorities and Project representatives. This commission is responsible for defining all required studies for the EIA report.

The MoEUCC, when making decisions 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 organization, professional association/chamber, trade union, association and Non-Governmental Organization ("NGO") representatives to the commission meetings. Main steps in the Turkish EIA Process to be followed are as follows:

- Firstly, site visit by informing the PDoEUCC before the EIA Application File ("EIA-AF") studies;
- Submission of the EIA-AF to the MoEUCC;
- A 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; and
- Obtaining final decision from the MoEUCC (EIA Positive or EIA Negative).

2.1.3 Current National Labour and H&S Legislation

Labour and occupational health & safety issues in Türkiye are governed by the Ministry of Labour and Social Security. Turkish law and the major regulations relevant to labour and working conditions are given in Appendix A.

2.2 Applicable International Agreements

Türkiye is a party to many international agreements regarding multiple subjects. These are listed in Appendix A. These would be further evaluated during the ESIA phase for their applicability.

Türkiye has also ratified the following international conventions and agreements related to labour and working conditions and human rights that 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

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;
- IUCN Red Data Book for protected species (fauna and flora); and
- 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 IV, and IFC PSs and Guidelines) have been analysed and considered together with Turkish 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 PSs, IFC General EHS Guidelines and IFC Industry-Specific EHS Guidelines. The PSs 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 PSs and Other Guidelines are listed below.

2.3.1 Equator Principles - IV (2020)

The Equator Principles Financing Institutions ("EPFIs") have ten principles:

- 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

2.3.2 IFC Performance Standards (2012)

The eight 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 (not applicable to the Project)
- 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, 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 and Safety;
- Community Health and Safety; and
- Construction and Decommissioning.

2.3.2.2 IFC EHS Guidelines for Electric Power Transmission and Distribution

Published on April 30th, 2017, the EHS Guidelines for Electric Power Transmission and Distribution include information relevant to power transmission between a generation facility and a substation located within an electricity grid, in addition to power distribution from a substation to consumers located in residential, commercial, and industrial areas. The document addresses the following issues:

- Terrestrial Habitat Alteration;
- Aquatic Habitat Alteration;
- Electric and Magnetic Fields;
- Hazardous Materials;
- Occupational Health and Safety; and
- Community Health and Safety.

2.3.2.3 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 the 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.

2.3.2.4 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

2.4 Environmental Limits

A preliminary list of potentially applicable limits derived from the applicable requirements is presented in Appendix B for each environmental component. 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

The "G4-Bor-1 Solar Power Plant Project (140 MWp / 100 MWe, 201.3 ha)" is planned to be constructed and operated by Smart in the province of Niğde, Bor district, Seslikaya, and Badak Villages, with a total area of 2,013,306.5 m². The produced energy will be transmitted to the Yaysun SPP Substation by approximately 29.5 km long 154 kV ETL that will be constructed by TEİAŞ.

The Project Area, covering an area of 2,539 ha, is located within the boundaries of the "Niğde-Bor Energy Specialized Industrial Zone," which was approved by the Council of Ministers decision dated 09.11.2015 and subsequently published in the Official Gazette on 19.11.2015 with the number 29537.

As of November 2023, an administrative building (in the form of a container, not a concrete structure) has been established within the Project Area, for both construction and operation phases of the Project and needs of employees such as meals, toilets, etc. are met here.

General view of the Project area is presented in Figure 3-1, while the Project layout is presented in

General view of the Project Area-1

General view of the Project Area-2

General view from the mobilization area

Solar panels used for electricity generation during construction phase

Figure 3-1: Site Visit Photographs (taken by WSP on 16 November 2023)

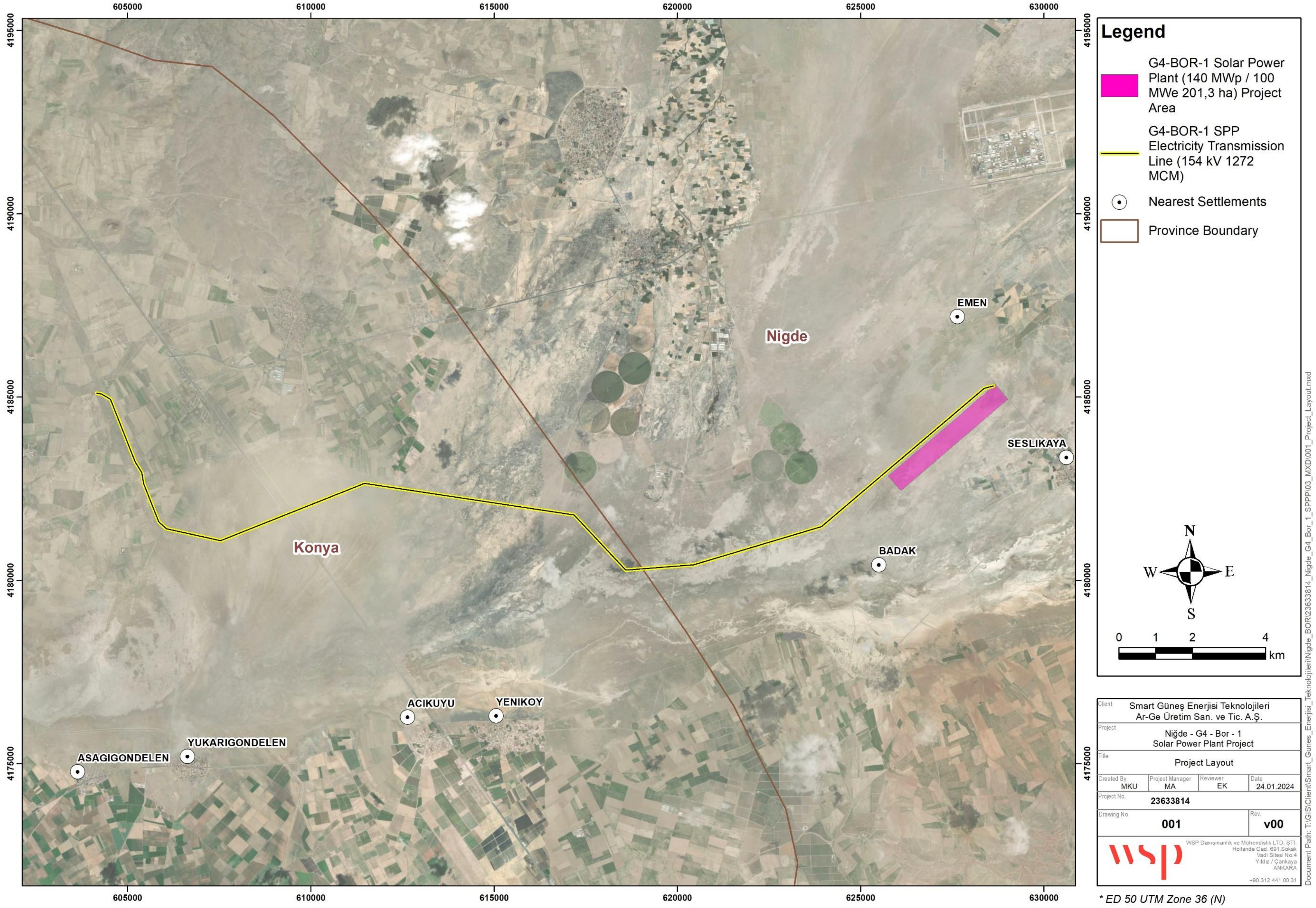


Figure 3-2: Project Layout with Energy Transmission Line

3.2 Project Components

The main components of solar power plants, along with solar panels, include inverters, panel support systems, and the Balance of System (BOS). Solar Power Plants consist of four main structures:

- Photovoltaic (PV) Panel: Integrates semiconductor PV cells on the panel to ensure the generation of direct current electricity from the sunlight.
- Inverter: Converts the direct current electricity generated by PV panels into grid electricity for daily use.
- Panel Support System: Refers to the support structure systems and mounting apparatus where photovoltaic PV panels are installed.
- Balance of System (BOS): Encompasses elements beyond the fundamental materials mentioned above. In the context of Solar Energy Plants, the part outside the Module, Inverter, and construction is defined as BOS. It includes infrastructure activities and materials necessary for the sustainability and protection of the system, such as infrastructure, AC-DC cables, connectors, paralleling panels, switchgear equipment, low-voltage panels, transformer substations, medium/high-voltage panels, construction works, wire fences, lighting, camera systems, and others.

Photovoltaic (PV) Panel

In solar energy plants, solar panels are indispensable components for converting the energy obtained from solar radiation into electricity. Photovoltaic (PV) Panel, crucial for renewable energy sources and solar energy systems, converts sunlight directly into electrical energy through silicon cells.

Silicon is used in the construction of solar panels. Boron is added to make silicon the positive pole. A chemical surface texturing process is performed to create very small pyramids on the sheet surface, reducing the reflective property and ensuring the capture of sunlight. Phosphorus is injected into the silicon sheet at high temperatures, and then phosphorus is carefully removed from the back surface of the sheet. The aim is to create positive and negative poles and generate direct current between these two poles. PV solar modules produce DC (Direct Current) electricity. Solar panels consist of seven layers:

1) Aluminum Frame: A durable aluminum frame that surrounds the panel, ensuring a sturdy mounting of the panel.
2) Tempered Glass: The top layer of solar panels, made of tempered glass, protects the panels from external factors and directs sunlight into the panel.
3) Encapsulant (Insulation Layer): An insulation layer surrounding and protecting the solar cells, providing protection against damage from external factors.
4) Solar Cells: The fundamental components that convert solar energy into electricity, responsible for the energy production of the panel.
5) Encapsulant (Insulation Layer): A second insulation layer surrounding the solar cells, providing additional protection and durability.
6) Backsheet: The bottom layer of the panel, the backsheet reinforces the lower part of the panel and provides support.
7) Connection Box: The connection box manages the electrical connections of the panel, used to safely transmit the generated electricity.

Inverter

A Solar Inverter converts the DC (direct current) electricity produced by solar panels into AC (alternating current) electricity. Inverters, which serve as the brains of solar electric systems, not only transform DC energy into AC but also provide protection against ground faults. They monitor and transmit statistics such as current, voltage, generated energy, and more. In addition, inverters enable the solar panels to operate at their maximum power points through Maximum Power Point Tracking (MPPT).

Central and String inverters have been widely used in the solar industry since its early days. Central Inverters are an advanced inverter technology developed for large-scale open-field solar plants and large industrial applications. Central inverters manage the entire system from a single point. Unlike other inverter types, central inverter technology involves connecting panels in connection boxes before being linked to the inverter.

Panel Support System

The panel support system consists of PV panel support structures and mounting fixtures. In the Project, steel construction is utilized as the building material for the panel support system.

Balance of System (BOS)

In solar power plants, the part excluding the module, inverter, and construction is referred to as "BOS" (Balance of System). This section consists of infrastructure, AC-DC cables, connectors, paralleling panels, switchgear equipment, low-voltage panels and equipment, transformer substation, medium/high-voltage panels and equipment, construction works, wire fences, lighting, camera systems, and similar components.

AC Collection Panels: In the case of using string inverters, these are local panels used for making AC line cable connections. The energy collected in these panels is transferred to the main collection panel with a single cable. Intermediate connections include additional safety and switching mechanisms. These panels are produced in two types: fiberglass-reinforced and metal.

Transformer: Adjusts the AC grid voltage (400 Volts) coming from the inverter to the appropriate national grid voltage level (such as 31.5 kV - 15.8 kV).

3.3 Project Phases

3.3.1 Construction Phase

In the initial stages of constructing a solar power plant, the process begins with field mobilization, involving the preparation and mobilization of resources and equipment to the designated site. This is followed by the essential step of preparing the infrastructure for tracker systems that support solar panels. The construction of these tracker systems, designed to optimize solar panel orientation for maximum energy capture, is then undertaken.

Once the tracker systems are in place, the installation of solar panels and inverters is carried out. This includes mounting the solar panels on the tracker systems and connecting them to inverters, which convert the DC electricity generated by the panels into AC electricity for integration into the power grid.

Simultaneously, electrical infrastructure works, both low voltage (LV) and medium voltage (MV), are executed to establish the necessary electrical connections and systems within the solar power plant.

As the construction phase progresses, operational testing stages are initiated. These stages involve comprehensive testing of the entire system, from individual solar panels and tracker systems to the electrical infrastructure and inverters. This rigorous testing ensures that each component functions correctly and safely.

The final crucial step in the construction phase is commissioning. This involves formally bringing the entire solar power plant online and integrating it with the electrical grid. Commissioning includes final checks, adjustments, and synchronization procedures to ensure the plant operates efficiently and effectively.

In summary, the construction phase of a solar power plant involves a systematic process starting with field mobilization and infrastructure preparation, followed by the construction of tracker systems and the installation of solar panels and inverters. Concurrently, electrical infrastructure works are undertaken, and the system undergoes thorough operational testing stages. The culmination of this phase is the commissioning, marking the successful integration of the solar power plant into the electrical grid.

3.3.2 Operation Phase

During the operation phase of a solar power plant, regular maintenance activities are paramount to sustaining optimal performance. This includes routine inspections of solar panels to detect any signs of damage or degradation, along with the essential task of cleaning the panels to preserve their efficiency. Additionally, thorough checks and maintenance are carried out on tracker systems to ensure they are functioning correctly, contributing to the overall effectiveness of the energy capture process.

Monitoring and maintaining inverters play a crucial role in the operation phase. Continuous checks are performed to confirm their proper functionality, and any identified issues are promptly addressed. Firmware and software updates are implemented as necessary to enhance performance and address evolving technological requirements.

The electrical system, including balance of system (BOS) components, undergoes regular inspection and maintenance. This encompasses a meticulous assessment of electrical connections and infrastructure integrity, contributing to the sustained reliability of the power plant.

Performance monitoring activities involve the continuous assessment of energy production. Analyzing performance data provides insights into the overall efficiency of the solar power plant, allowing operators to implement corrective measures and optimize output.

A robust data analysis and reporting framework is established to assess operational efficiency comprehensively. Periodic reports are generated for stakeholders and regulatory compliance, facilitating transparency and informed decision-making.

Security and surveillance measures are crucial during the operation phase. Ensuring the security of the plant premises and closely monitoring surveillance systems contribute to safeguarding the entire facility.

Environmental compliance remains a priority, with measures in place to meet regulatory standards and minimize environmental impact. This includes strategies for waste management, habitat protection, and adherence to local environmental regulations.

Emergency response planning is a critical aspect of the operation phase, involving the development and maintenance of plans to address potential crises. Regular drills and training sessions ensure the readiness of the plant's response team.

Community relations initiatives are maintained to engage with local communities, address concerns, and contribute positively to the areas surrounding the solar power plant. Establishing a positive relationship fosters community support and cooperation.

Regulatory compliance is closely monitored throughout the operation phase, ensuring adherence to local, regional, and national regulations. The management of permits and licenses required for ongoing operation remains a priority.

The long-term sustainability of the solar power plant is considered through lifecycle management strategies. Planning for potential upgrades or replacements of components ensures continued efficiency and adaptability in the face of evolving technologies and industry standards. Through these comprehensive activities, solar power plant operators can uphold optimal performance, environmental responsibility, and regulatory compliance throughout the operational life of the facility.

3.3.3 Decommissioning Phase

The decommissioning phase of a solar power plant involves a systematic process for the responsible retirement of the facility, considering environmental, social and biodiversity impact mitigation. The economic life of the Project is anticipated as 30 years. This process includes a comprehensive site assessment to identify risks, dismantling of major equipment, waste management, and land remediation. Infrastructure demolition, legal compliance, financial planning, and community engagement are integral aspects. Safety measures for workers, coordination with energy grid operators, and a final site inspection ensure a controlled and safe decommissioning. The Project concludes with the handover of the site to the Ministry of Industry and Technology after covering the ground with suitable vegetation. This marks the formal closure of the solar power plant's operational life, emphasizing responsible practices and adherence to regulatory standards.

3.4 Associated Facilities

According to the OECD definition 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”.

As per the project components, only associated facility of concern is determined as the Energy Transmission Line (ETL). Approximately 29.5 km long, the 154 kV ETL was established by TEİAŞ to transmit the produced electrical energy to the Yaysun SPP Substation. An EIA report has been prepared for the ETL project in accordance with the requirements of the Turkish EIA Regulation, and the “EIA Positive” decision has been obtained on August 22nd, 2023, with decision number of 7217. During the EIA process, the connection agreement between Smart and TEİAŞ was signed on January 24th, 2023. According to the EIA report, along the 154 kV ETL, 14 some poles and 2 final poles will be established.

As per the information obtained from Smart, the construction phase of the ETL is finished. The Project Schedule of the ETL is given in the Section 3.7.

3.5 Project Rationale

Solar power plant demand is increasing around the world since there is the imperative shift towards renewable energy sources to address pressing environmental concerns and secure a sustainable energy future. Solar power represents a crucial component of this transition, offering a clean and renewable alternative to traditional fossil fuels. By harnessing the abundant energy from the sun, solar power plants contribute significantly to reducing carbon emissions and mitigating the impacts of climate change. This environmental benefit forms a cornerstone of the project's rationale, highlighting its role in preserving ecosystems, improving air quality, and combating global warming.

Moreover, solar power plants offer substantial advantages in terms of energy security and independence. By tapping into domestic solar resources, countries can reduce their reliance on imported fossil fuels, enhancing their energy resilience and sovereignty. This aspect of the rationale underscores the strategic importance of diversifying the energy mix and reducing vulnerability to supply disruptions or geopolitical tensions. Furthermore, the cost-effectiveness of solar energy is a compelling factor driving the adoption of solar power plants. With the continual decline in solar panel prices and the realization of operational efficiencies, solar power has become increasingly competitive with conventional energy sources. A thorough economic analysis within the project rationale demonstrates the potential for long-term cost savings and financial benefits associated with solar power generation.

Beyond environmental and economic considerations, solar power projects also offer significant social benefits. The development of solar power infrastructure creates employment opportunities across various stages, from manufacturing and installation to operation and maintenance. This job creation aspect contributes to local economic growth and fosters community development. Moreover, solar power plants serve as catalysts for technological innovation, driving advancements in solar technology, energy storage solutions, and grid integration capabilities. The project rationale underscores the potential for continued innovation and technological development within the renewable energy sector, positioning solar power as a key driver of future energy systems.

Supportive regulatory frameworks and policies play a pivotal role in facilitating the development and deployment of solar power projects. Government incentives, subsidies, and renewable energy targets provide essential support and create favorable conditions for investment in solar energy infrastructure. Additionally, effective community and stakeholder engagement are integral to the success of solar power projects. By fostering collaboration, transparency, and consultation throughout the project lifecycle, stakeholders can address concerns, build trust, and ensure the project's social license to operate. In summary, the rationale for a solar power plant encompasses environmental stewardship, energy security, economic viability, technological innovation, regulatory support, and community engagement, underscoring its pivotal role in shaping a sustainable and resilient energy future.

Türkiye, situated within the solar belt, boasts significant solar energy potential due to its geographical location between latitudes 36° - 42° North and longitudes 26° - 45° East. This potential is distributed across all provinces, making solar electricity generation feasible throughout the country. The Solar Energy Potential Atlas of Türkiye (abbreviated as GEPA in Turkish) was developed to identify prime areas for solar energy application and determine the feasibility of generating electricity or heat energy from solar sources. The atlas serves various purposes, including identifying high solar potential areas, providing necessary solar resource information for feasibility studies, and offering high-resolution solar resource maps to assist decision-making for government, energy companies, and private investors. Türkiye's solar energy technical potential is approximately 380 billion kWh, equivalent to 87.5 million tons of oil equivalent (TOE), with significant portions suitable for both thermal and electricity generation. The completion of GEPA and its accessibility through the General Directorate's website enables users to easily access solar energy potential information by district and county, facilitating the identification of suitable locations for solar power plant installation and eliminating the need for resource exploration efforts.

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

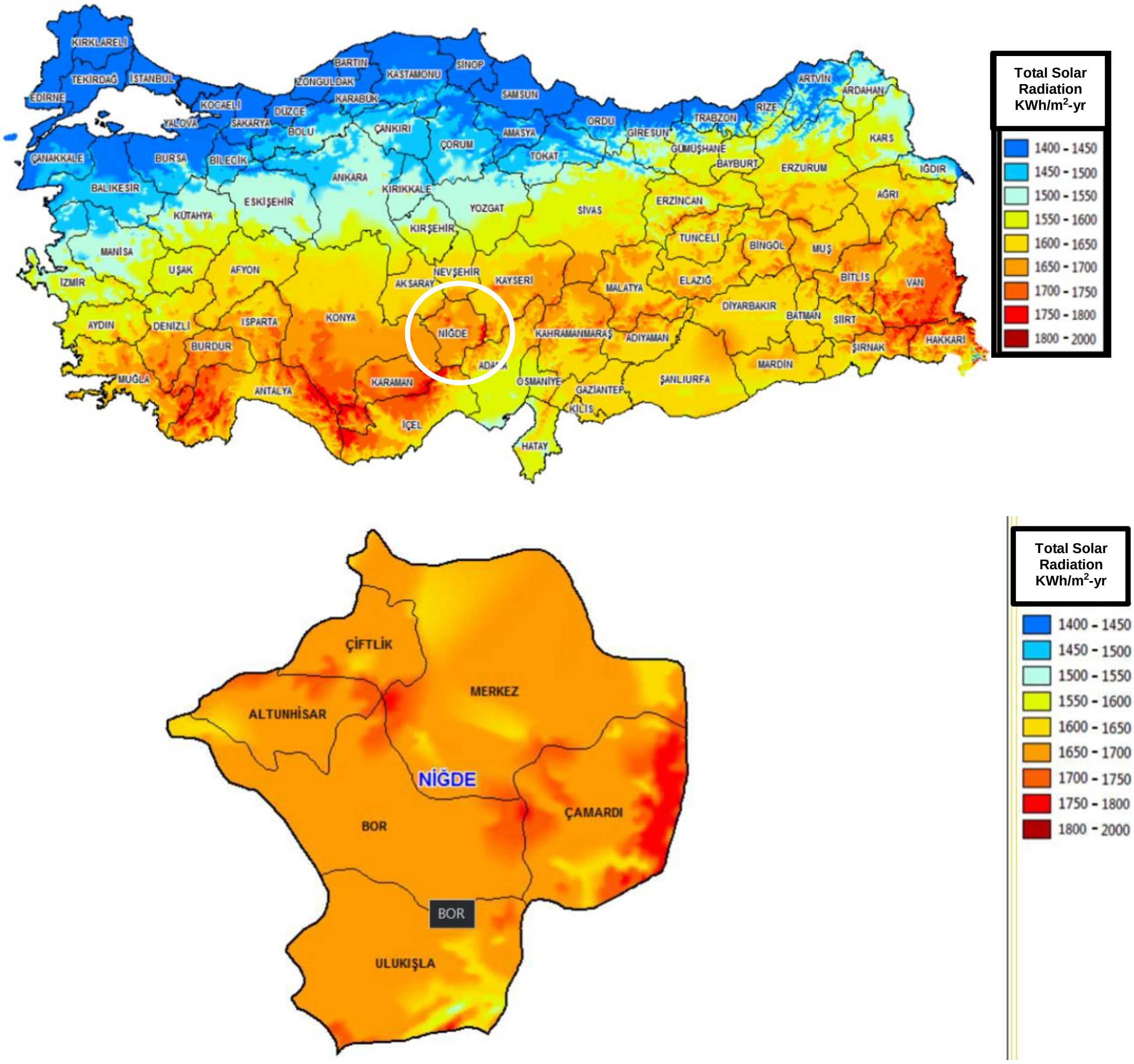


Figure 3-3: Türkiye's and Niğde’s Total Global Radiation Distribution

Source: Republic of Türkiye Ministry of Energy and Natural Sources[1]

When the energy potential map of Türkiye is examined, it is generally observed that the southern regions have a higher solar energy potential compared to the northern regions. As seen in the map, the entire province of Niğde, where the planned Project is located, is quite rich in terms of sun exposure potential. Therefore, the Ministry of Energy has designated The Project Area as a Renewable Energy Resource Area (YEKA) and allocated this area to Smart through a competitive bidding processes.

---

[1] 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.

In general, the initiation of the Project is in line with sustainability objectives, encourages environmental accountability, diminishes carbon footprints, and provides economic advantages, all while aiding the shift towards a greener and more robust energy landscape.

3.6 Project Parties

Organisation chart explaining the project parties that will be involved in the SPP investment are presented in Figure 3-4.

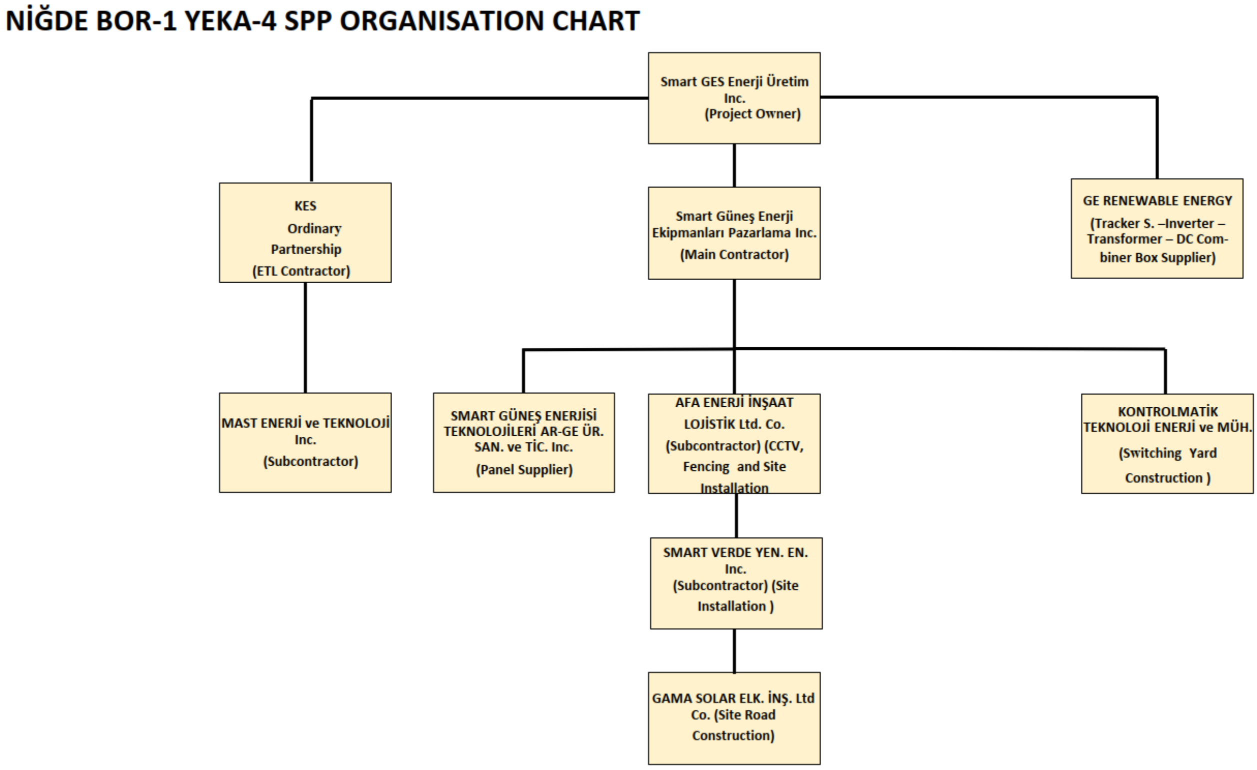


Figure 3-4: Organisation Chart

3.7 Project Schedule

Within the scope of the Project, construction phase is estimated around 11 months, while operation phase is estimated as 30 years.

Summary of the project schedule is provided in Table 3-1 and the project schedule of ETL is summarised in Table 3-2. As it can be seen from the figures, construction of SPP has already been started in October 2023 and it planned to be completed in September 2024 by completion of the test and commissioning activities, while the construction of the ETL has been completed in early November 2023 and the commissioning phase is planned to be ended in January 2024.

Table 3-1: Summary of Project Schedule

Activity	Start Date	Finish Date
Singing YEKA Contract	16.05.2022	16.05.2022
EMRA (EPDK) Pre-License Approval	24.05.2022	08.09.2023

Activity	Start Date	Finish Date
EIA Approval	01.07.2022	27.10.2022
Approval of the Development Plans	27.07.2022	28.09.2022
Connection Contract	28.10.2022	16.11.2022
Construction Permit	16.05.2022	04.06.2022
Grounding Measurements	16.05.2022	20.05.2022
Geotechnical Investigation	16.05.2022	24.06.2022
Approval of the Final Project	16.05.2022	22.05.2024
Purchasing Procedure	01.09.2023	27.05.2024
SPP Installation (including mobilisation, fencing, infrastructural digging, cabling and road constructions)	01.10.2023	25.03.2025
Electrical Mounting (including underground cable system, OG transformer, inverter and concrete kiosk installations, AC/DC panel mounting and cabling)	01.01.2024	27.032025
Mechanical Mounting (including foot mounting, up carrier system mounting and PV modules)	05.09.2024	25.03.2025
Commissioning (including SPP testing and commissioning activities)	01.10.2024	05.04.2025

Table 3-2: Summary of ETL Construction Schedule

Activity	Start Date	Finish Date
Excavation	24.04.2023	07.09.2023
Lean Concrete	06.05.2023	13.10.2023
Bottom Mounting Adjustment	06.05.2023	14.10.2023
Concrete Casting	07.05.2023	14.10.2023
Filling	06.05.2023	16.10.2023
Floor Installation	01.05.2023	15.10.2023
Pole Installation	19.07.2023	26.10.2023
Electrical Cable Installation	26.10.2023	11.11.2023
Test and Commissioning	10.11.2023	17.01.2024

3.8 Project Location and Ownership

The Project will be in Turkiye, Niğde Province, in the Bor District, Seslikaya neighbourhood Project location map is given in Figure 3-5

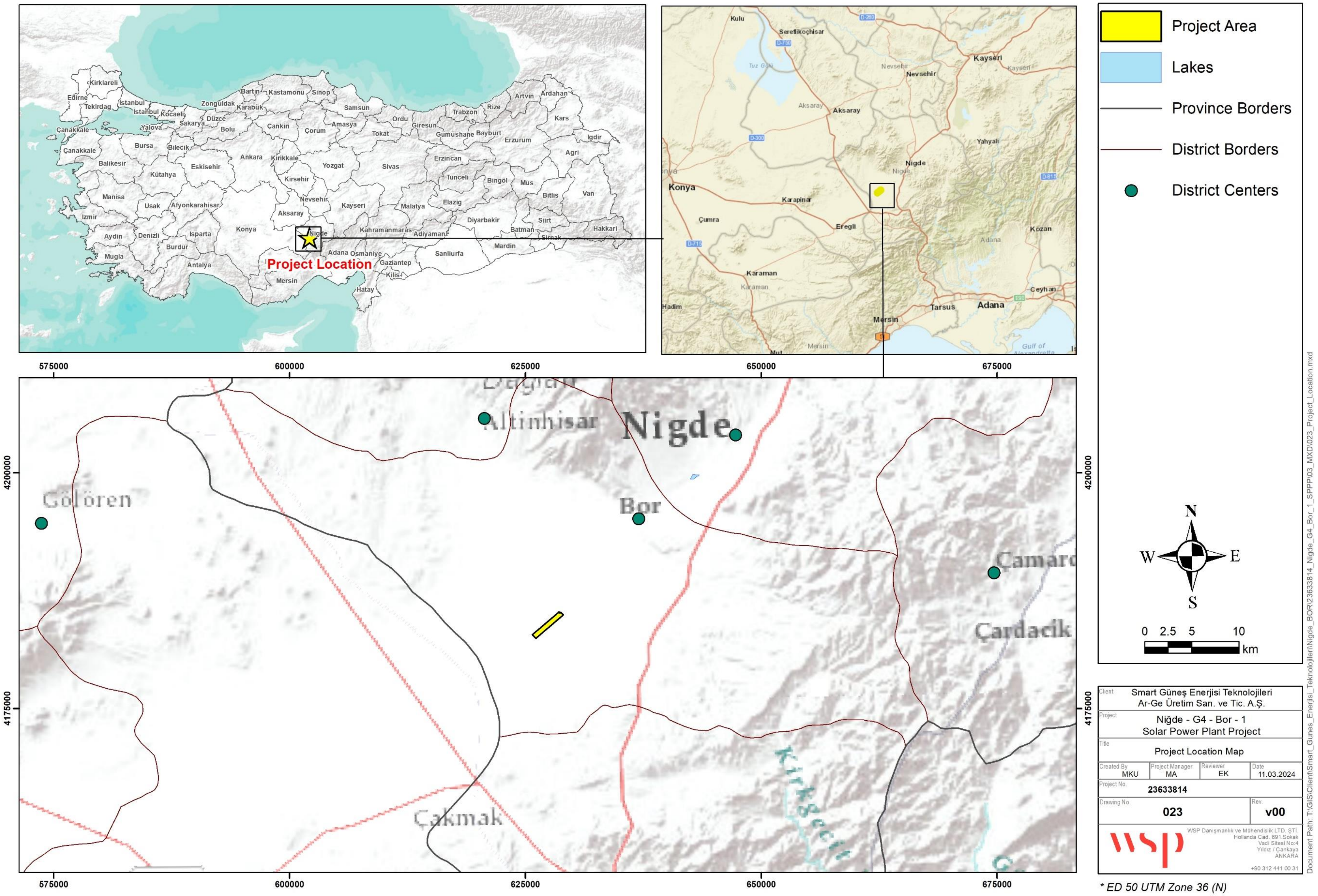


Figure 3-5: Project Location

The Project is set to be developed on a 201.3 ha of former pastureland. Designated as an "Industrial Zone" in the 1/100,000 Scale Environmental Plan, the Project site falls within the borders of the "Niğde-Bor Energy Specialized Industrial Zone."

The existing roads will be used during construction and operation phases of the Project and no link road is planned (see Figure 3-2). Since no heavy-load transportation beyond the standard road transportation limitations is planned within the scope of the Project, road improvements requiring construction are not considered necessary for the transportation of construction materials and equipment. The Project will include the design and construction of permanent on-site roads within the project area, intended for operational use throughout the project's lifespan.

The closest settlements to the Project area, Seslikaya Neighbourhood (2.64 km away), Emen Neighbourhood (1.92 km away), and Badak Neighbourhood(5.08 km away) and their proximity to the Project are presented in Figure 3-6.

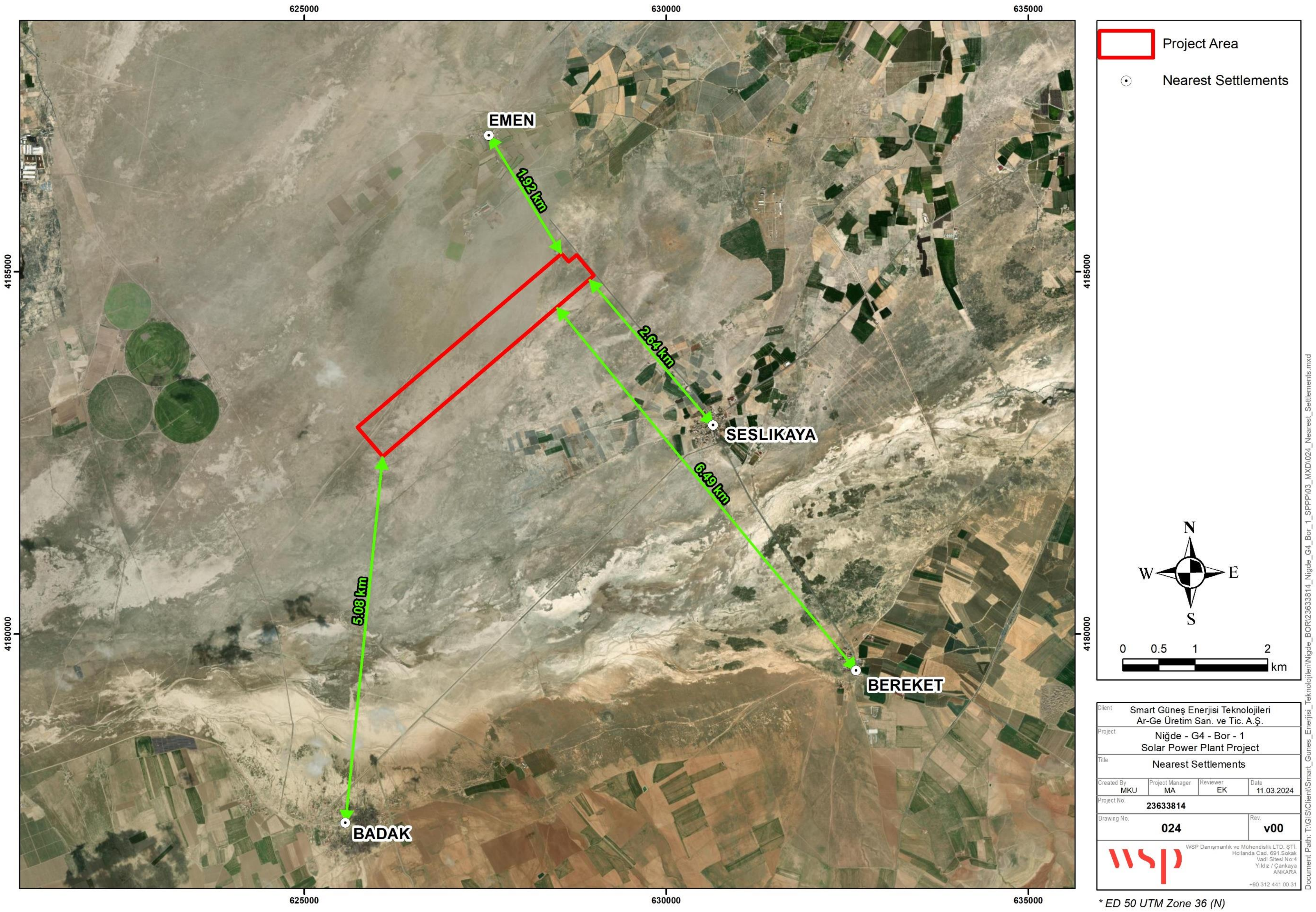


Figure 3-6: Nearest Settlements to the Project Area

3.9 Project Labor and Working Conditions

It is planned to employ 100 people during the construction phase of the Project and 20 people during the operation phase. There are no worker accommodation facilities planned for the construction phase of the Project. As per the information obtained from Smart, it is planned to employ local workforce where possible during the construction and operation phases. Hotel and home accommodation services are offered to personnel from neighbouring provinces and districts in the Niğde/Bor region. Shuttle transportation and fuel support are provided for personnel working in the local area.

Working hours will be planned in compliance with the Labor Law. Construction working hours are planned to be 16 hours/day as 2 shifts and operation working hours are planned to be in 3 shifts of 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 Niğde Province is given below.

Table 3-3: Waste Management Facilities in Niğde

Facility Type	Number
Landfill (Municipality)	1
Licensed Packaging Waste Collection, Separation and Recycling Facilities	5
Hazardous Waste Recovery Facilities	7
Waste Oil Recovery Facility	2
Vegetable Waste Oil Recovery Facility	1
Waste Battery and Accumulator Recovery Facility	1
End-of-life Tire Recovery Facility	1
Medical Waste Sterilization Facility	1
Non-Hazardous Waste Recovery Facility	18
Waste Electrical and Electronic Equipment Processing Facility	6
Mine Waste Disposal Facility	1

Source: Niğde Provincial Environmental Status Report for 2022 (2023) (https://webdosya.csb.gov.tr/db/ced/icerikler/nigde-ilcdr-2022-20230823154504.pdf).

Wastewater Infrastructure

Urban wastewater management facilities in Niğde are listed below.

Table 3-4: Urban wastewater Management Facilities in Niğde

Settlement	Treatment Facility	Capacity (ton/day)
Bor Municipality	Wastewater Treatment Plant (Physical)	**5,000**
Central District	Wastewater Treatment Plant (Biological, Advanced)	44,000

Settlement	Treatment Facility	Capacity (ton/day)
Altunhisar Municipality	Wastewater Treatment Plant (Physical)	1.2
Çukurkuyu Municipality	Wastewater Treatment Plant (Physical)	1.44
Edikli Municipality	Wastewater Treatment Plant (Physical, Biological)	0.5
Karaatlı Municipality	Wastewater Treatment Plant (Physical, Biological)	0.5

Source: Niğde Provincial Environmental Status Report for 2022 (2023) (https://webdosya.csb.gov.tr/db/ced/icerikler/nigde-ilcdr-2022-20230823154504.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	50 tons
Steel	5166 tons
Filling Material	20 tons
Wire/Fence	7050 meters

The material needed for the construction activities, including bedding, padding, backfilling and aggregate, concrete will be provided from companies in Niğde Province as Beton Inşaat Nakliye Sanayi ve Tic. Ltd. Sti. Niğde Bor Province which have permits/licenses in accordance with national regulations.

Components of the 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	249.993	Turkiye	Trucks
DC Combiner Box	476	UK	Trucks+Ship
Inverter Station	28	UK	Trucks
Substation and Switchyard	1	Turkiye	Trucks
Cable	180km	Turkiye	Trucks

A 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
Truck	2
Loader	1
Crawler Dozer	1
Water Truck	1
Concrete Pump	1
Transmixer	1
Pile Driving Machine	1

3.10.2.2 Infrastructure

Electricity and Fuel

Smart established a small solar panel area in the mobilization area to generate electricity necessary for the construction phase of the Project emphasizing their commitment not to purchase electricity or LNG during the construction phase. By generating electricity on-site, Smart aims to reduce the reliance on traditional energy sources like diesel generators and LNG during the construction phase.

During the construction phase, the sole fuel requirement will be for construction machinery and vehicles. Diesel fuel required for construction will be transported to the Project site via road tankers authorized with the necessary permits and licenses. Designated supply zones will be set up to fuel vehicles, incorporating preventive measures to safeguard surface and ground waters as well as drainage systems.

Water Supply and Consumption

- Potable water needs of the personnel

The construction phase will require both drinking and utility water for the personnel involved. A total of 100 personnel will be employed during this phase. According to data from the Turkish Statistical Institute (TUIK) Municipal Water Statistics for 2022, the estimated water demand per person per day is 229 Liters. Hence, the daily water consumption is determined as follows:

Water demand of personnel = 100 individuals x 229 L/person day = 22,900 L/day ≈ 22.9 m^3/day.

The personnel's drinking water will be procured as bottled water from local markets. Potable water required at the construction site will be delivered via water tankers from Kemerhisar Municipality, pursuant to a protocol between Smart and the municipality for water supply to the Project site.

- Water needs for dust suppression during dry periods

During dry periods, the requirement for water to suppress dust is projected to be 25 cubic meters per day. This water will be supplied from Kemerhisar Municipality by water tankers.

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 during operations is not expected during the operating phase.

3.10.3.2 Infrastructure

Electricity and Fuel

Throughout the operational phase, the electricity demand will be met through internal production, eliminating the need for reliance on the electricity grid.

During the operational phase, no fuel station will be available on-site. Instead, the diesel fuel required for vehicles will be sourced from gas stations located in the district centre. Furthermore, the fuel needed for emergency generators will be obtained by purchasing fuel in barrels.

Water Supply and Consumption

- Potable water needs of the personnel;

During the operation phase, personnel will require drinking and utility water. A total of 20 individuals will be employed during this phase. Based on the 2022 data from the Turkish Statistical Institute (TUIK) Municipal Water Statistics, the estimated water demand per person per day is 229 litres. Therefore, the daily water consumption is calculated as follows:

Water demand of personnel = 20 individuals x 229 L/person day = 4,580 L/day ≈ 4.58 m^3/day.

The personnel's drinking water will be provided in the form of bottled water sourced from local markets. Potable water required during the operation phase will be delivered via water tankers from Kemerhisar Municipality, pursuant to a protocol between Smart and the municipality for water supply to the Project site.

- Water needs for PV panel cleaning;

The dry-cleaning method will be utilized for cleaning solar panels when necessary. Dry cleaning of solar panels involves removing dirt, dust, and other debris from the surface of the panels without using water. This method is typically employed in situations where water availability is limited, or where waterless cleaning is preferred due to environmental concerns or operational constraints. The process usually involves the use of specialized cleaning equipment such as soft brushes, microfiber cloths, or air blowers to gently dislodge and remove debris from the surface of the solar panels. These tools are designed to be non-abrasive to prevent scratching or damaging the delicate solar panel surfaces. Therefore, there will be no water requirement for the panel cleaning.

3.11 Emission, Wastewater and Waste

3.11.1 Construction Phase

Emissions

During the construction phase, dust emissions are likely to occur due to activities such as excavation, movement of earth materials, operation of construction machinery, and exposure of bare soil and soil piles to wind. These activities can disturb the soil and create airborne dust particles, contributing to fugitive dust emissions.

Additionally, exhaust gas emissions such as Nitrogen Oxides (NOx), Carbon Monoxide (CO), Hydrocarbons (HC), Particulate Matter (PM), and Sulphur Dioxide (SO_2) are expected to be generated primarily from the operation of construction equipment and machinery.

During the construction phase, noise emissions may arise from various sources such as the operation of pile drivers, earth-moving and excavation equipment, cranes, and the transportation of equipment, materials, and personnel.

Wastewater

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

- Domestic wastewater generated by the personnel;

Water demand per capita is estimated as 229 L/person day based on 2022 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 22.90 m^3/day

During the construction phase, domestic wastewater generated will be collected in a leak-proof septic tank with a capacity of 10 tons. These wastewater tanks will be regularly emptied by the Industrial Specialized Zone administration and transported to the licensed treatment facility of Industrial Specialized Zone.

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

Waste

The construction activities generate both general non-hazardous and hazardous wastes, including municipal waste, packaging waste, used oil, contaminated packaging materials, hydraulic fluids, spent batteries, empty containers for paint and chemicals, filters, fluorescent bulbs, scrap metals and cables, welding residues, discarded tires, electrical and electronic waste, treatment sludge, and medical waste. No excavation waste is anticipated as any resulting materials will be utilized for backfilling purposes.

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

3.11.2 Operation Phase

Emissions

Given the Project's characteristics, it is anticipated that there will be no air or noise emissions during the operational phase. Any minimal noise emissions from inverters are typically mitigated through a combination of shielding, noise cancellation, filtering, and noise suppression techniques. Electric heaters and air conditioners will fulfil the heating and hot water requirements.

Wastewater

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

- Domestic wastewater generated by the personnel;

Based on the 2022 data from the Turkish Statistical Institute (TUIK) Municipal Water Statistics, the estimated water demand per person per day is 229 liters. It is assumed that all domestic water used by Project personnel will result in domestic wastewater. Therefore, the daily wastewater generation during the operational period is calculated as 4.58 cubic meters per day. The domestic wastewater produced by personnel will be collected by sewage infrastructure, stored in septic tanks, and regularly transported to a licensed wastewater treatment plant.

- Wash water

As the panels will be cleaned utilizing dry cleaning method, there will be no water requirement for the panel cleaning and no wastewater generation is expected.

Waste

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

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

4.0 ALTERNATIVES ANALYSIS

IFC PS1 mandates a comprehensive rationale for any alternative proposals during the process of identifying and assessing environmental and social risks and impacts. The objective of this section is to outline how the Project's location and elements embody an optimized design that is both technically and financially feasible, while also mitigating overall environmental and social effects to the greatest extent possible.

4.1 Site Alternatives

The Project Area was determined by the Ministry of Energy and Natural Resources during YEKA development process, which is a program initiated to enhance Türkiye's renewable energy potential and encourage investments. The YEKA process typically involves a specific procedure for the development and operation of large-scale renewable energy projects.

During the determination of YEKA SPP-4 zone, Niğde-Bor Energy Specialization Industrial Zone was established. The main stages of the process is as follows:

1) Identification of the Region: A total area of 2,539 hectares within the boundaries of Badak and Emen-Seslikaya Villages in Bor District of Niğde Province has been designated as an industrial zone, encompassing Tozlukaya, Karataşlı, Çekirge Yurdu, and Eski Badak locations.

2) Project Preparation: A project has been prepared in partnership between the Ministry of Industry and Technology and the Niğde Provincial Administration for the purpose of solar energy production. This project was submitted to the Ministry of Industry and Technology on March 19, 2015.

3) Technical Examination: A technical team consisting of experts from the Ministry of Industry and Technology and the Ministry of Energy and Natural Resources conducted on-site inspections on July 22-23, 2015, completing the site selection studies.

4) Decision Process: A meeting of the Industrial Zones Coordination Board was held on October 14, 2015, under the chairmanship of the Undersecretary of the Ministry of Industry and Technology, with the participation of relevant institutions. As a result of this meeting, it was unanimously decided to establish the industrial zone.

5) Official Decision: On October 22, 2015, the Ministry of Industry and Technology forwarded the matter to the Prime Ministry for discussion in the Council of Ministers. Subsequently, with the decision of the Council of Ministers published in the Official Gazette dated November 9, 2015, certain areas in Bor District were declared as the Niğde-Bor Energy Specialization Industrial Zone.

6) Infrastructure and Tender Process: Necessary approvals were obtained from the Ministry of Agriculture and Forestry for the designated area, and it was registered on behalf of the Treasury. The Ministry of

Energy and Natural Resources declared this area as a renewable energy source area. A draft specification has been published for the tender process.

The YEKA competition process serves as a structured approach for fostering the development and operation of large-scale renewable energy projects.

At the outset of the process, a tender announcement is made, signaling the availability of a specific renewable energy source for development. This announcement is disseminated through official channels such as official gazettes or the websites of relevant authorities. The tender announcement aims to attract investor interest and stimulate competition for the opportunity to develop or operate renewable energy projects in designated areas.

Following the tender announcement, specifications are published by the relevant authorities as part of the tender process. These specifications provide detailed information on technical requirements, financial terms, investment areas, and other pertinent details essential for prospective investors to understand the project requirements thoroughly. Specifications serve as comprehensive guidelines for investors to prepare their bids effectively.

Subsequently, investors submit their bids within the stipulated timeframe outlined in the tender documents. Bids typically are comprised of comprehensive files containing detailed technical and financial proposals. The submitted bids undergo a rigorous evaluation process based on predefined criteria, encompassing factors such as technical feasibility, financial viability, sustainability, and other relevant considerations.

After a thorough evaluation, the investor whose bid is deemed the most suitable is selected as the winner of the competition. Upon selection, a contract is entered into between the winning investor and the relevant authorities. This contract delineates the terms and conditions for project development and operation, including the roles, responsibilities, and obligations of the parties involved.

With the contract in place, the winning investor embarks on the project development process, which entails obtaining necessary permits, securing financing, establishing infrastructure, and undertaking other requisite steps for project execution. Throughout this phase, adherence to environmental and social standards is paramount to ensure sustainable project development and operation.

According to the "Competition Announcement for the Allocation of Solar-Based Renewable Energy Resource Areas and Connection Capacities" published in the Official Gazette dated 14/07/2021 with number 31541, YEKA GES-4 (Bor-1, Bor-2, and Bor-3) competitions were held on 08/04/2022. As per the Ministry of Energy and Natural Resources letter dated 20/05/2022 with reference number 121795, it was reported that Smart Ges Energy Production Joint Stock Company won the competition for Bor-1 region by offering the lowest bid. YEKA Right of Use Agreements were signed with these companies on 16/05/2022.

4.2 Technology Alternatives

During the YEKA tender stage, the Ministry of Energy and Natural Resources identified photovoltaic solar energy as the project technology. There are 4 different types of photovoltaic panels:

- Monocrystalline solar panel: These panels are made from single-crystal silicon, which is grown in a controlled environment. They are known for their high efficiency and sleek appearance. Monocrystalline panels typically have a higher power output and better performance in low-light conditions compared to other types.
- Polycrystalline solar panel: Polycrystalline panels are made from silicon fragments melted together. They have a blueish hue due to the multiple crystals in the material. While they are generally less efficient than monocrystalline panels, they are cost-effective and widely used in solar installations.

- Thin-film solar panel: Thin-film panels use layers of photovoltaic materials deposited onto a substrate such as glass, plastic, or metal. They are lightweight, flexible, and can be integrated into various surfaces. Thin-film panels are less efficient than crystalline silicon panels but are more affordable and suitable for certain applications where space or weight is a concern.
- Flexible solar panel: Flexible solar panels are typically made from thin-film materials and are designed to bend or conform to curved surfaces. They are lightweight, durable, and suitable for applications where rigid panels are not practical, such as on boats, RVs, or backpacks. Flexible panels offer versatility in installation but may have slightly lower efficiency compared to traditional rigid panels.

Monocrystalline solar panels are selected for the Project. Monocrystalline solar panels offer several advantages over other types of solar panels, including:

- Higher efficiency: Monocrystalline panels are known for their higher efficiency rates compared to polycrystalline and thin-film panels. This means they can generate more electricity per square meter of space, making them ideal for installations where space is limited.
- Better performance in low light: Monocrystalline panels perform better in low-light conditions, such as cloudy days or early morning and late afternoon hours. This is due to their higher efficiency and ability to capture sunlight from a wider range of angles.
- Longevity: Monocrystalline panels have a longer lifespan compared to other types of panels. They typically come with longer warranties and can last upwards of 25 years or more with proper maintenance.
- Space efficiency: Monocrystalline panels have a higher power output per square meter of space, which means you need fewer panels to generate the same amount of electricity compared to other types. This makes them a good option for installations with limited roof space.
- Sleek appearance: Monocrystalline panels have a uniform, black color and a sleek appearance, making them aesthetically pleasing for residential and commercial installations.

4.3 No Project Alternative

The "No Project" alternative refers to the circumstance where the Project does not move forward. If this happens, there are a few implications to consider:

- Environmental impact: Since the project doesn't proceed, there would be no direct negative impacts on the environment from construction, operation, or other project-related activities.
- Socio-economic outcomes: Any anticipated benefits such as job creation, improved infrastructure, or community development associated with the project would not materialize.
- Economic benefits: Local and national stakeholders, including businesses involved in the project's supply chain, would not receive the expected economic benefits.
- Contribution to sustainability: The project's potential contribution to sustainable energy generation and environmental conservation would be forgone.

However, it's important to note that even if the proposed project doesn't proceed, the area designated for it, such as a Renewable Energy Resource Area, remains available for similar projects in the future. This means that other renewable energy projects could still be developed in the same area, leveraging the infrastructure and resources already allocated for renewable energy development.

5.0 ESIA METODOLOGY

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

7) **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;

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

9) **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.

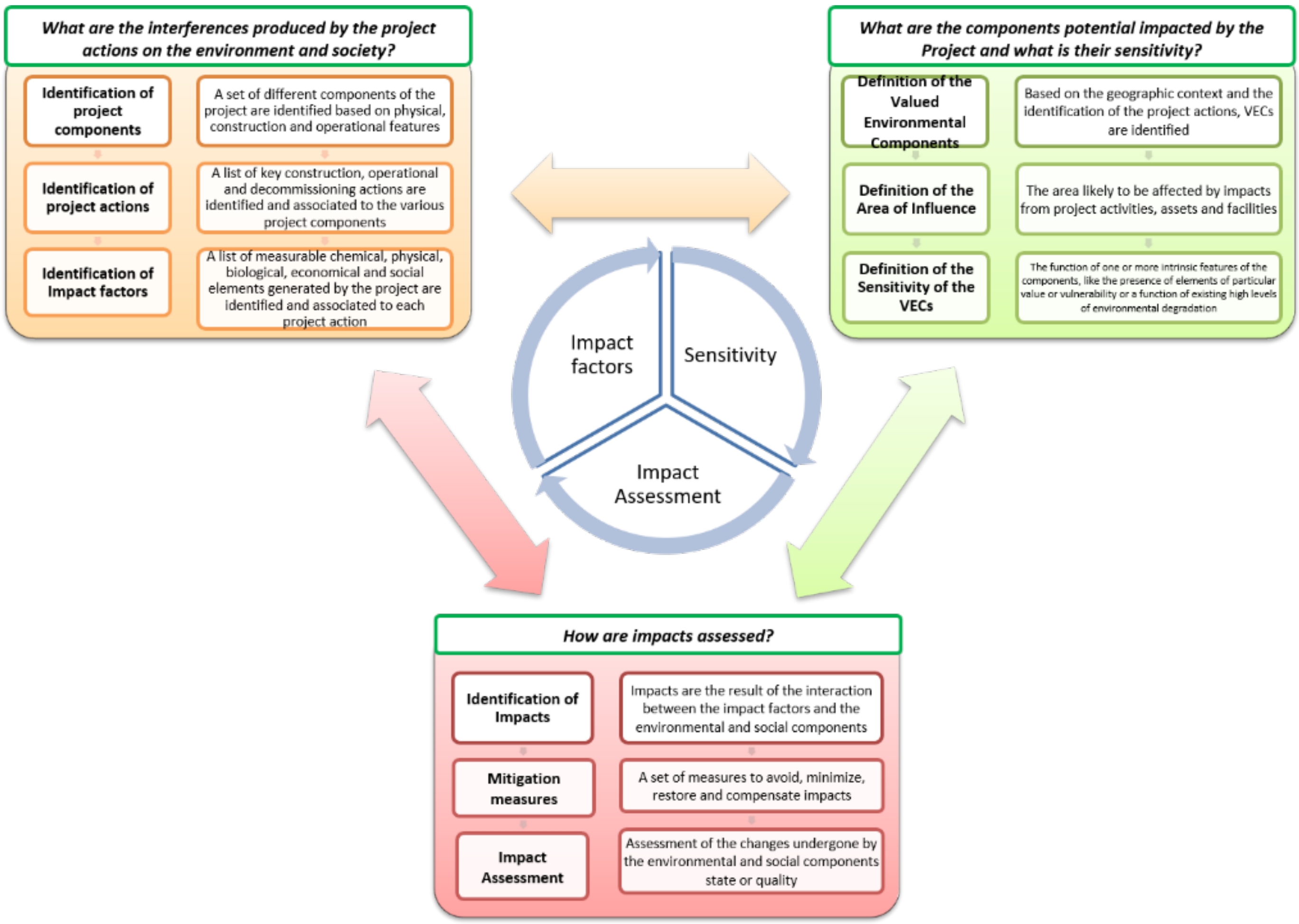


Figure 5-1: Three Phases of ESIA Process

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

ESIA Component	AoI
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 Emen, Seslikaya and Badak villages
Cultural Heritage	AoI includes the Project footprint and nearest settlements

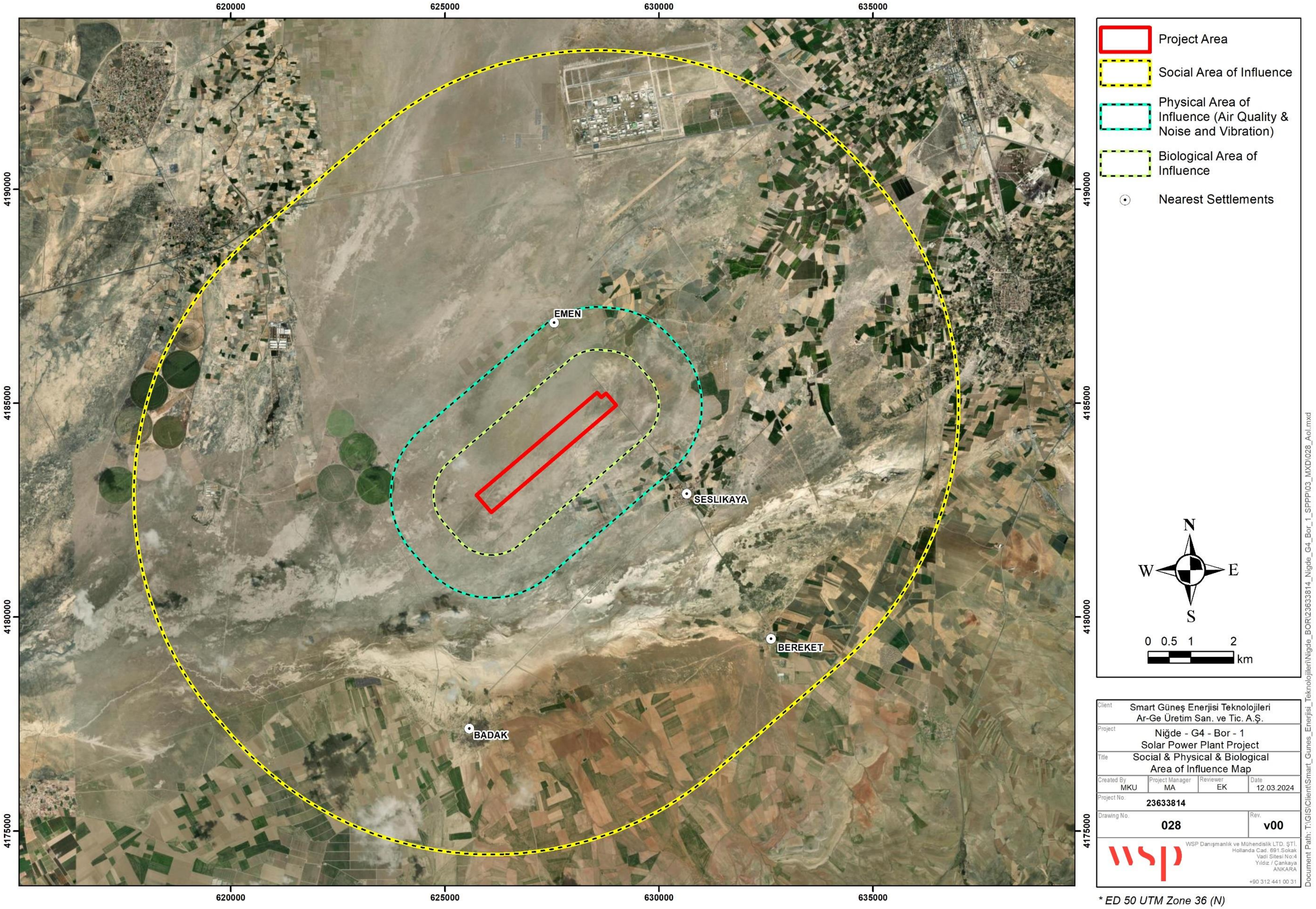


Figure 5-2: Area of Influence Map of the Project

5.2 Identification of the Project Components

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

- The Project and Smart'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 after earthworks such as laying concrete foundations, fencing, establishment of internal roads, erection of buildings and infrastructures, material storage, construction of temporary 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.
- **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.
- **Management of the workforce:** includes transportation of the project personnel and activities and services relating to the catering, management of free time, and all the administrative and management activities to ensure full respect of workers' rights and duties

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 disassembly, 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 taking the national EIA process, international guidelines and previous experiences into consideration, 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	
Vegetation clearing/soil removal (earthworks) General engineering/construction works Transportation of construction materials Temporary stockpiling of material (storage) Management of the workforce	Emission of dust and particulate matter Emission of gaseous pollutants and/or greenhouse gases GHG Emissions Emission of noise Emission of vibrations Removal of soil Accidental introduction of hazardous chemicals Occupation of land Disposal of waste deriving from construction activities Discharge of wastewater Changes in the local morphology Accidental introduction of hazardous chemicals (Groundwater pollution) Increased and/or modified road traffic Vegetation disturbance Accidental introduction of alien species (potential risk) Increase of population (influx) Demand for workforce (Employment opportunities) Demand for goods, materials and services Labor and Working Conditions related risks Infrastructure and equipment design Traffic and pedestrian safety Transport of dangerous goods Occupation of lands (pasture and agricultural) Risk of Communicable diseases Introduction of buildings/infrastructures (Occupational of land) Emission of light Impact on the cultural heritage
Operation	
Plant/infrastructure operation	Emission of gaseous pollutants and/or greenhouse gases Emission of noise GHG Emissions Accidental introduction of hazardous chemicals Occupation of land Disposal of waste deriving from operation activities Discharge of wastewater

Project actions	Impact factors
	Accidental introduction of hazardous chemicals (Surface water pollution) Changes in local hydrogeology Accidental introduction of hazardous chemicals (Groundwater pollution) Water need & Water abstraction (if any) Presence of permanent infrastructures (occupation of land) Emission of light (Presence of artificial lights) Accidental introduction of alien species (potential risk) Increase of population (influx) Contribution to national economy Labor and Working Conditions related risks Presence of permanent infrastructures (occupation of land) Increase and modification of traffic
Decommissioning	
General decommissioning works	No new impacts are anticipated in the decommissioning and closure phase of the Project, beyond those already listed during the construction and operation phases (after mitigation measures have been applied).

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 5-6.

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

Environmental Components / Project Actions		Physical Components							Biological Components					
		Air quality	Geology and geomorphology	Natural Hazards and Seismology	Soil	Hydrology and surface water quality	Hydrogeology and groundwater quality	Noise and vibration	Amphibians	Reptiles	Birds	Mammals	Habitats	Flora
Construction Phase	General engineering/construction works	√	√		√	√	√	√		√	√	√	√	√
	Material transportation	√						√		√	√	√		
	Material storage												√	
	Accommodation and management of the workforce	√	√					√					√	
Operation Phase	Plant/infrastructure operation		√			√	√			√	√	√	√	
Decommissioning	General decommissioning works	√	√		√			√		√	√	√	√	√

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

Environmental 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		√									√
	Accommodation and management of workforce		√		√		√	√		√		
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 are 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 one of 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 one of 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 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 a 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 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 in areas designated for air quality protection; and
- Presence of sensitive ecological receptors like protected or classified areas, protected or endangered habitats and species exposed to air emissions from the Project; the sensitivity increases with the ecological receptors exposed.

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 exposed to noise and vibration from the Project; the sensitivity increases with the ecological receptors exposed.

Landscape and components with sensitivity to visual quality:

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

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; the sensitivity increases with the area of grounds or the amount of routes present.

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.

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.

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 considers 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 (1)**: when the duration is shorter than a month;
- **Short (2):** when the duration is between a month and one year;
- **Medium (3):** when the duration is between one and two years;
- **Long (4):** when the duration is between two and five years;
- **Very long (5):** when the duration is over five years.

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

- **Single event (1)**;
- **Infrequent (2):** if it consists of a few events evenly or randomly distributed over time;
- **Recurrent (3):** if it consists of numerous events evenly or randomly distributed over time;
- **Frequent (4):** if it consists of a high number of events evenly or randomly distributed over time;
- **Continuous (5)**: 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 (1):** the impact factor is confined within the facilities owned or exclusively controlled by the Project;
- **Local (2)**: the impact factor extends to the areas or communities neighbouring the Project site;

- **Regional (3):** 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 (4)**: the impact factor extends throughout several regions or to the entire country;
- **International (5)**: 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 (1)**: the impact factor is generated in quantities that cannot be easily detected or perceived and are unlikely to be able to cause any detectable change in the target environmental or social components;
- **Low (2)**: 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 (3):** 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 (4):** 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 (5):** 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 (''IV'')** is done by multiplying the Impact Factor Score, the value of Sensitivity of the target component, and the Reversibility. IV = IFS x S x R

The reversibility is the property of an impact to diminish its magnitude over time and to eventually recede entirely. Considering Reversibility within the Impact Value is crucial for an accurate impact assessment. Reversibility may vary from reversible to irreversible according to the following definitions and is measured on a scale of 1 to 5:

- **Reversible in the short term (1):** 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 (2):** 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 (3):** 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 (4):** 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 (5)**: if it is not possible to predict the restoration of the initial conditions.

5.7 Calculation of the Residual Impact

The next step consists of 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(1)**: the measures can reduce the impacts by less than 20% of the expected outcome;
- **Medium low(0.8)**: the measures can reduce the impacts by 20% - 40% of the expected outcome;
- **Medium(0.6)**: the measures can reduce the impacts by 40% - 60% of the expected outcome;
- **Medium high(0.4)**: the measures can reduce the impacts by 60% - 80% of the expected outcome;
- **High(0.2)**: 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 measure 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(1)**: the measures can enhance the positive impacts by less than 10% of the expected outcome;
- **Medium low(2)**: the measures can enhance the positive impacts by 10% - 20% of the expected outcome;
- **Medium(3)**: the measures can enhance the positive impacts by 20% - 30% of the expected outcome;
- **Medium high(4)**: the measures can enhance the positive the impacts by 30% - 40% of the expected outcome;
- **High(5)**: 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 dividing 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[2]. 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 to 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:

- 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;

[2] 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 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).

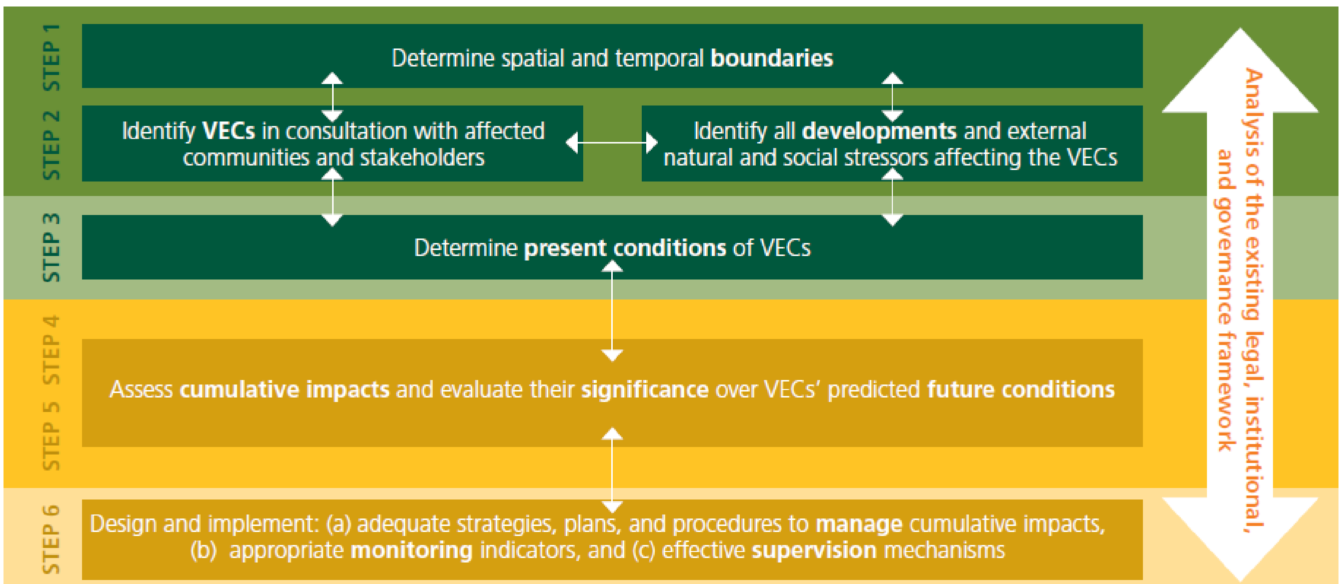


Figure 5-3: RCIA: Six-Step Approach

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.

6.0 ENVIRONMENTAL AND SOCIAL BASELINE

This chapter is designed to present an overview of the environmental (physical and biological) and social settings within the Regional Study Area (RSA) and Area of Influence (AoI) before the Project is implemented. Following the methodology guidelines outlined in Chapter 5, the information provided here will cover all pertinent aspects to offer insight into the environmental and social conditions of the area, including air quality, terrestrial fauna and flora, and land use, among others. This aims to assess their sensitivity. The data presented in this chapter serves as the baseline for the subsequent Impact Assessment in Chapter 7.

The baseline description process aligns with the identified Project components as outlined in Chapter 3. The determination of the Project's Area of Influence varies based on the assessed environmental and social components, summarized in the Methodology (Chapter 5), and detailed separately for physical, biological, and social aspects in this chapter. The term RSA is also utilized in the methodology to provide high-level information when site-specific data is absent at the AoI level, or regional data is necessary to define components and assess impacts. Consequently, the RSA encompasses the Project AoI.

The RSA offers information that comprises a geographically distinct collection of environmental conditions, serving as a starting point for understanding the regional-scale environmental context. This is achieved using secondary sources such as scientific papers, grey literature, and databases, with descriptions provided under each component. For each investigated component, the AoI is defined, considering the Project footprint along with a variable-width buffer based on the characteristics of the components and Project activities. The AoI for each physical component is represented and detailed in the respective chapters.

6.1 Physical Components

6.1.1 General Methodology

6.1.1.1 Desktop Studies

A thorough literature review has been conducted, specifically concentrating on the regional Study Area, with the aim of documenting existing data related to air quality, soil quality, water quality, pollution sources, hydrology, hydrogeology, geology, and geomorphology. This comprehensive review encompasses both scientific and grey literature to ensure a precise and comprehensive depiction of the physical attributes of the environment within the Project Area.

6.1.1.2 Field Studies

The visit encompassed the Project Area, its surroundings, with a focus on evaluating physical and biological components. Furthermore, interviews were conducted with the Mukhtars of Emen, Seslikaya, and Badak Neighborhoods to gather additional insights into the local perspectives and considerations.

6.1.2 Meteorology and Climatology

The meteorological characteristics of the Area of Influence (AoI in 2,000 m buffer zone) play a critical role in assessing air quality, the dispersion of pollutants in the air, and ensuring the structural safety of Project components and the overall Project environment. Understanding these meteorological factors is essential for a comprehensive analysis and effective management of environmental and safety considerations.

This section details the baseline conditions for local and regional meteorology and climatology, forming the foundation for the evaluation of air quality. The parameters discussed here are essential for assessing air quality baselines, identifying dispersion pathways and the range of pollutants in the air, and providing crucial input for structural design considerations.

Meteorological data utilized in this analysis were sourced from Meteorology Stations situated around the Project site. Specifically, data were recorded at the Niğde Meteorology Station and obtained from the Turkish State Meteorology General Directorate to establish fundamental conditions for meteorology and climatology. The geographic location of the meteorology station is illustrated in Figure 6-1. The prevailing climate in the Niğde Province is characterized by continental climate, featuring cold and snowy winters and hot and dry summers. This climatic information is vital for the comprehensive understanding of the meteorological conditions that influence air quality and structural design considerations in the Project area.

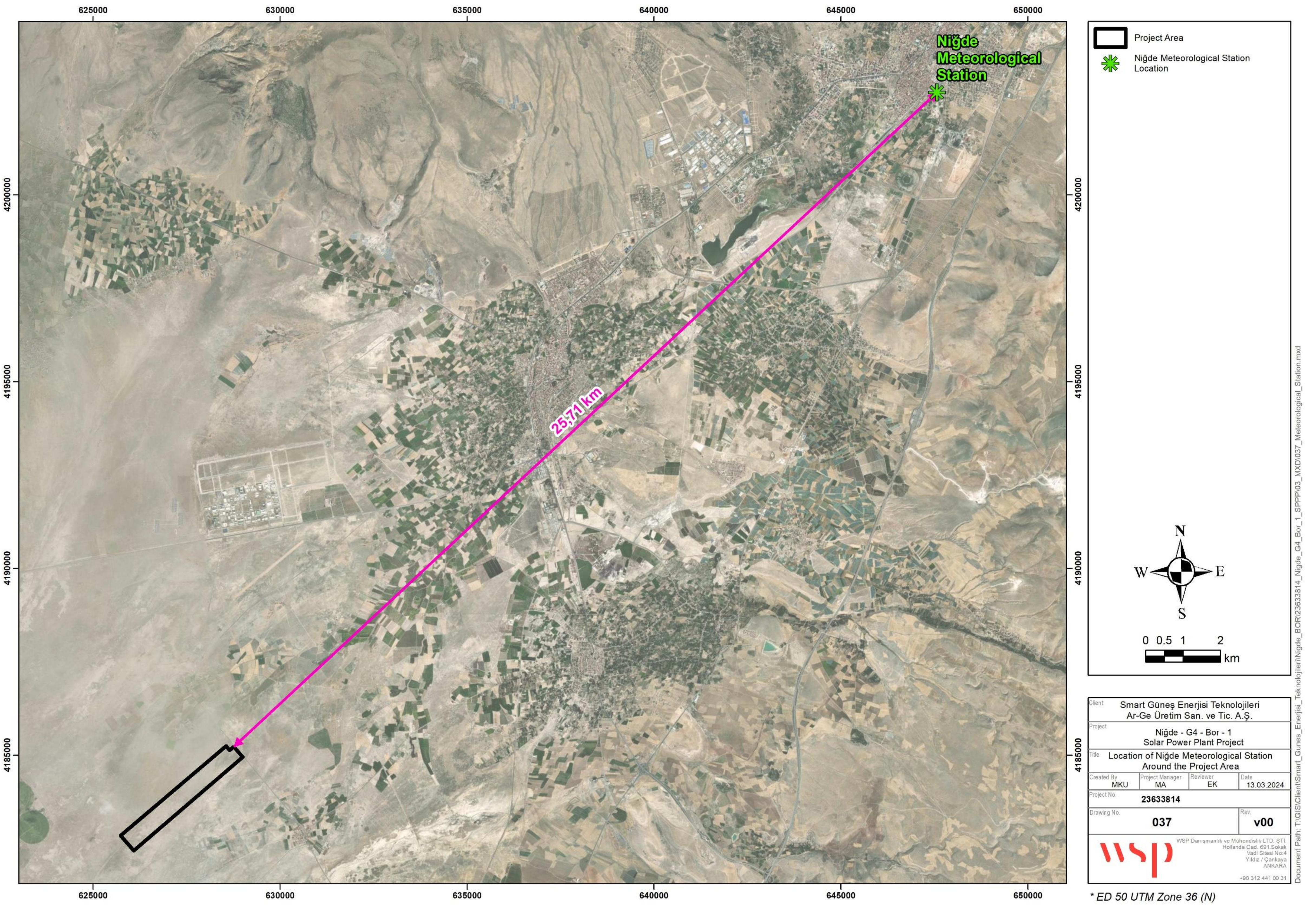


Figure 6-1: Location of Niğde Meteorological Station

Air Temperature

According to the observation records of Niğde Meteorology Station between 1960 and 2021, the highest air temperature was recorded in July and August with 38.5°C, and the lowest air temperature was measured in February with -24.2°C. Annual average air temperature is 11.2°C (see Table 6-1 and Figure 6-2).

Table 6-1: Niğde Meteorological Station – Air Temperature Measurements (°C) (1960 - 2021)

Months	Average Air Temperature	Maximum Air Temperature	Minimum Air Temperature
January	-0.3	19.9	-21.7
February	1.2	20.5	-24.2
March	5.4	26.3	-23.9
April	10.6	30.8	-6.9
May	15.0	32.1	-2.6
June	19.0	34.8	3.5
July	22.4	38.5	7.1
August	22.1	38.5	6.7
September	18.0	37.3	1.0
October	12.5	30.6	-5.2
November	6.4	24.6	-14.7
December	1.9	20.9	-20.6
Annual	**11.2**	**38.5**	**-24.2**

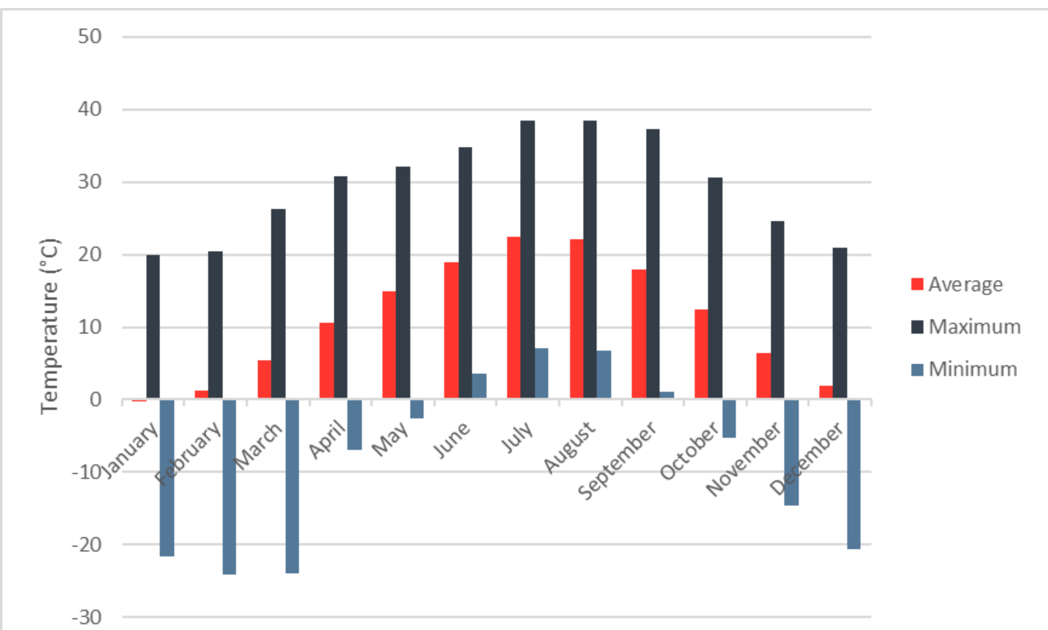


Figure 6-2: Niğde Meteorological Station – Air Temperature Measurements (°C) (1960 - 2021)

Precipitation

According to the observation records of Niğde Meteorology Station between 1960 and 2021, maximum amount of precipitation per day was measured in December with 54.5 mm. Annual average total precipitation is 336.9 mm (see Table 6-2 and Figure 6-3).

Table 6-2: Niğde Meteorological Station - Precipitation Measurements (mm) (1960 - 2021)

Months	Average Total Precipitation	Maximum Daily Precipitation
January	32.9	40.6
February	31.4	30.1
March	36.3	32.6
April	42.8	42.9
May	46.7	43.1
June	27.1	39.2
July	5.1	22.5
August	5.4	20.6
September	10.1	27.8
October	26.4	34.4
November	31.4	43.7
December	41.3	54.5
Annual	**336.9**	**54.5**

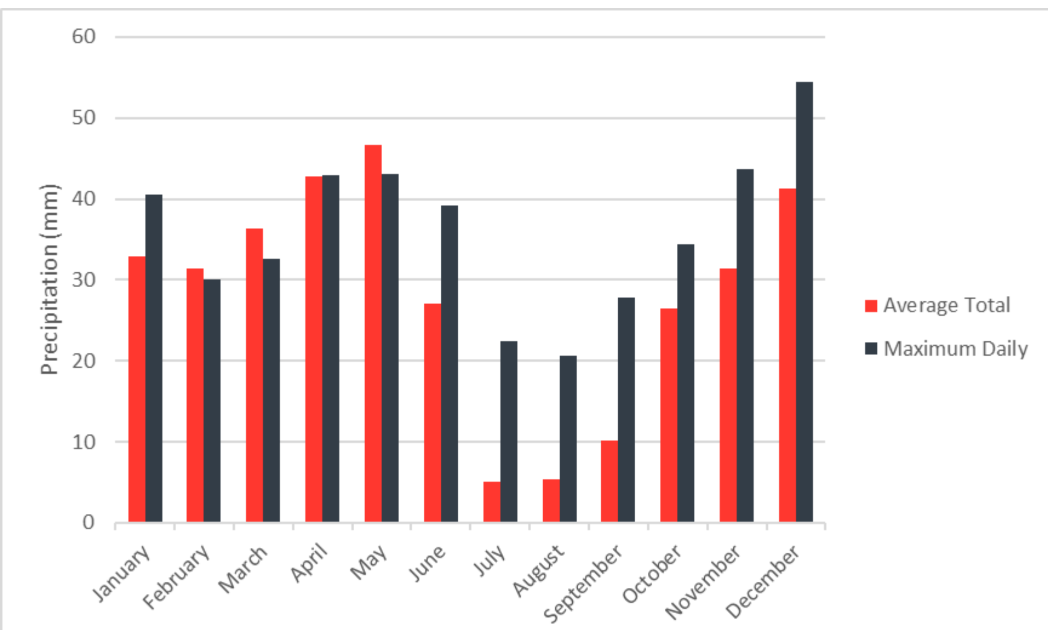


Figure 6-3: Niğde Meteorological Station - Precipitation Measurements (mm) (1960 - 2021)

Atmospheric Pressure

According to the long term (1960-2021) observation records of Niğde Meteorology Station, maximum atmospheric pressure is observed as 899.9 hPa, and minimum atmospheric pressure is 852.9 hPa. Average atmospheric pressure is 879.6 hPa per year (see Table 6-3 and Figure 6-4).

Table 6-3: Niğde Meteorological Station - Atmospheric Pressure Measurements (hPa) (1960 - 2021)

Months	Average Atmospheric Pressure	Maximum Atmospheric Pressure	Minimum Atmospheric Pressure
January	880.2	899.9	852.9
February	879.0	895.5	856.3
March	878.1	892.8	854.7
April	877.7	890.3	860.1
May	878.8	888.5	865.0
June	878.5	886.9	866.7
July	877.3	885.3	869.1
August	878.2	885.1	870.3
September	880.6	889.2	868.4
October	882.7	891.9	865.6
November	882.8	893.3	865.0
December	881.4	896.4	852.9
Annual	**879.6**	**899.9**	**852.9**

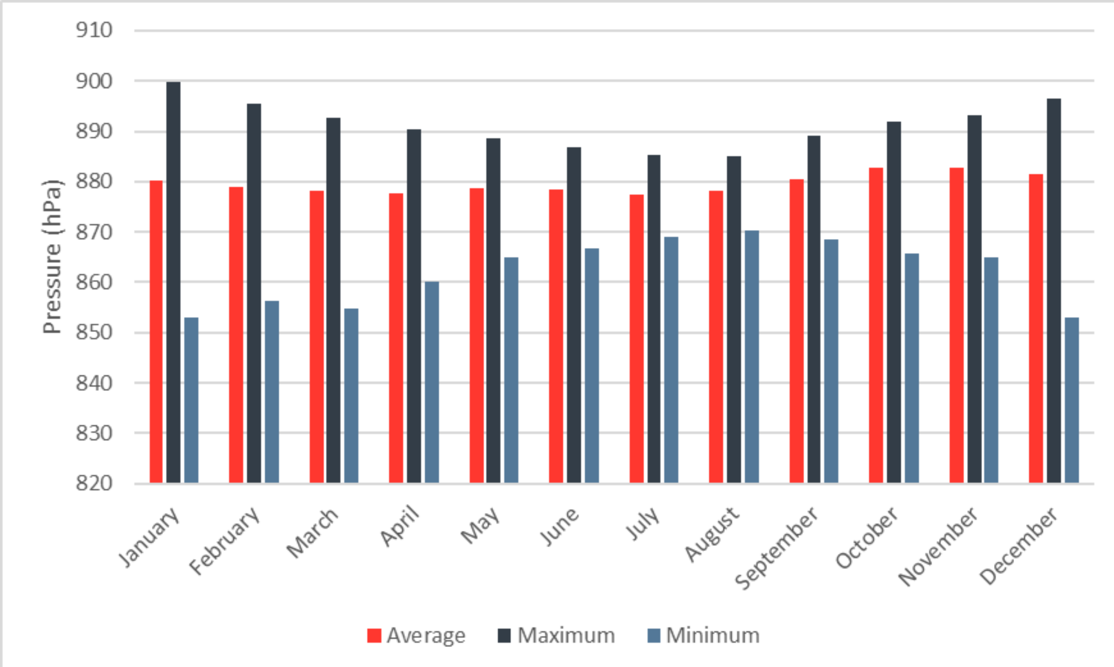


Figure 6-4: Niğde Meteorological Station - Pressure Measurements (1960 - 2021)

Relative Humidity

According to the observation records of Niğde Meteorology Station between 1960 and 2021, the annual average relative humidity is 58.5%. Relative humidity values for 1960-2021 are presented in Table 6-4 and Figure 6-5.

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

Months	Average Relative Humidity (%)
January	72.8
February	69.9
March	63.1
April	57.7
May	55.9
June	50.4
July	43.5
August	43.6
September	47.8
October	58.0
November	66.4
December	72.9
Annual	58.5

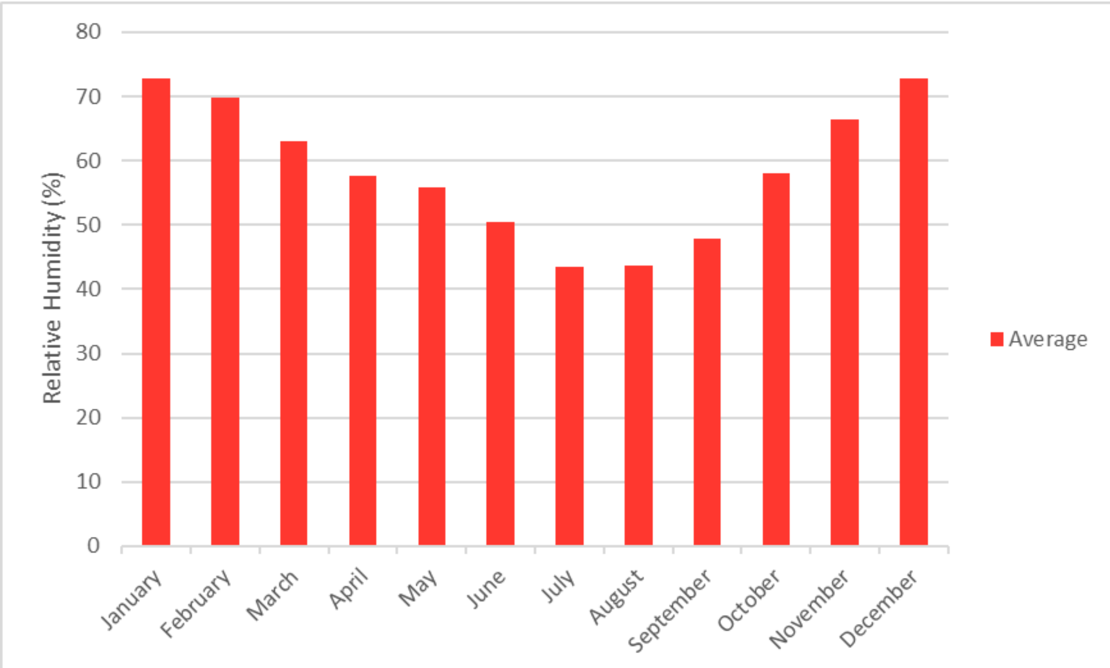


Figure 6-5: Niğde Meteorological Station - Relative Humidity Measurements (%) (1960 - 2021)

Evaporation

According to the observation records of Niğde Meteorology Station between 1960 and 2021, the average total evaporation was 1272.6 mm, and the daily maximum evaporation was 17 mm in June and July. Evaporation Values for 1960-2021 are presented in Table 6-5 and Figure 6-6.

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

Months	Average Evaporation (mm)	Daily Maximum Evaporation (mm)
January	0	-
February	0	-
March	0	-
April	58.3	12.1
May	168.2	15.0
June	214.3	17.0
July	273.0	17.0
August	257.9	13.0
September	185.3	11.0
October	100.4	10.0

Months	Average Evaporation (mm)	Daily Maximum Evaporation (mm)
November	15.2	5.4
December	0	-
Annual	1272.6	17

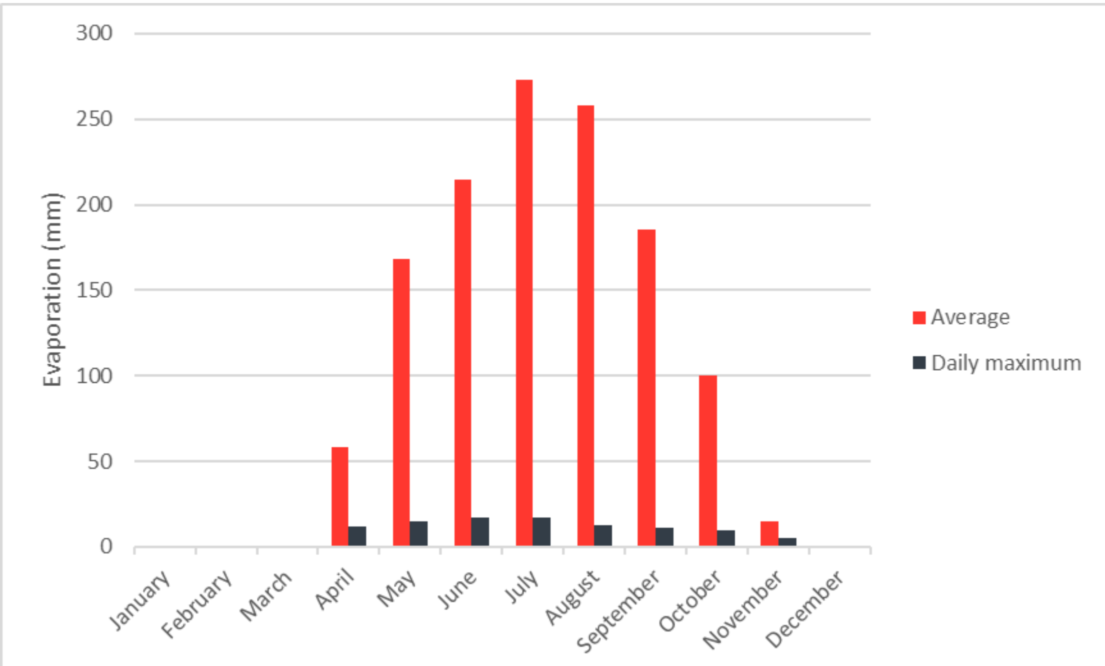


Figure 6-6: Niğde Meteorological Station - Evaporation Measurements (mm) (1960 - 2021)

Wind Distribution

Number of Winds

The total number of the wind blowing measured at Niğde 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 north-northeast (NNE) direction, second degree dominant wind direction is blowing from northeast (NE) direction.

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

Direction	Annual Total Wind
N	13822
NNE	130642
NE	111696
ENE	41862

Direction	Annual Total Wind
E	8542
ESE	5559
SE	5233
SSE	19996
S	16914
SSW	60972
SW	36470
WSW	46016
W	12218
WNW	8210
NW	2896
NNW	8911

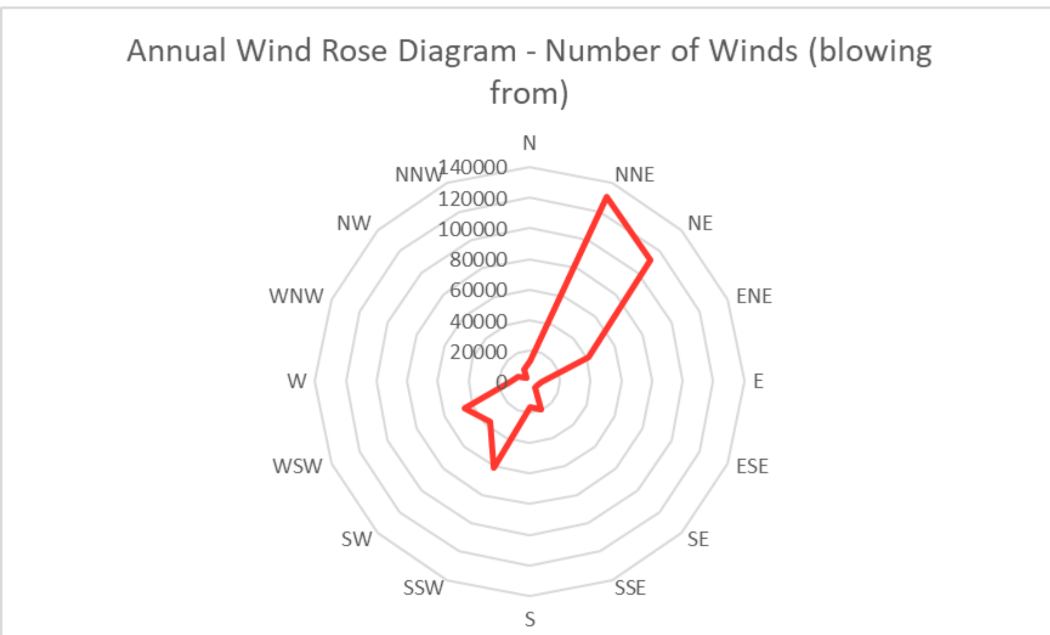


Figure 6-7: Niğde Meteorological Station - Wind Direction Measurements (mm) (1960 - 2021) (blowing from)

Wind Speed

According to data from Niğde Meteorology Station between 1960 and 2021, the annual average wind speed is 3.0 m/s. Maximum monthly wind speed is measured as 38.3 m/sec blowing from south-southeast (SSE) direction (see Table 6-7)

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

	Average Monthly Wind Speed (m/sec)	Maximum Monthly Wind speed (m/sec) and Direction
I	3	SSE 32.0
II	3.3	SSE 30.4
III	3.4	SE 31.0
IV	3.3	SSE 38.3
V	2.8	SE 28.3
VI	2.8	SE 26.2
VII	3.1	S 20.9
VIII	3	W 24.3
IX	2.7	S 25.3
X	2.5	S 21.7
XI	2.7	WSW 35.9
XII	2.9	SSE 27.8
Annual	3	SSE 38.3

Other parameters

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

- The maximum snow thickness was measured as 39 cm in December 2002,
- The average annual number of snow days is 22.35,
- The number of snow-covered days is 32.92,
- The number of foggy days is 4.72,
- The number of hail days is 2.88,
- The number of frosty days was 24.11,
- The number of thunderstorm days was 4.98,
- The number of strong windy days is 51.99 days per year, and
- The number of stormy days is 9.68 days per year.

6.1.3 Air Quality

Ambient air quality encompasses the overall extent of air pollution in outdoor settings. According to the World Health Organization (WHO), it refers to the presence of potentially harmful pollutants released by industries, households, vehicles, and other sources. The construction and decommissioning processes can contribute to the emission of fugitive dust, resulting from on-site excavation, movement of earth materials, interaction of construction machinery with bare soil, and exposure of soil and soil piles to wind.

Additionally, the use of diesel engines for electricity generation and the operation of construction equipment during land preparation and construction activities can lead to the release of exhaust gas emissions. These emissions may include nitrogen oxides, carbon monoxide, hydrocarbons, particulate matter, and sulphur dioxide.

2,000 m buffer zone including Project footprint (see Figure 6-8) is considered as Area of Influence (AoI) of the Project and nearby settlements around the Project area are potentially exposed to pollutant emissions.

For the evaluation of the baseline conditions, baseline air quality measurements conducted at three locations in the dates between 13 December 2023 and 11 February 2024 and data from Air Quality Monitoring Stations in Niğde Province were considered.

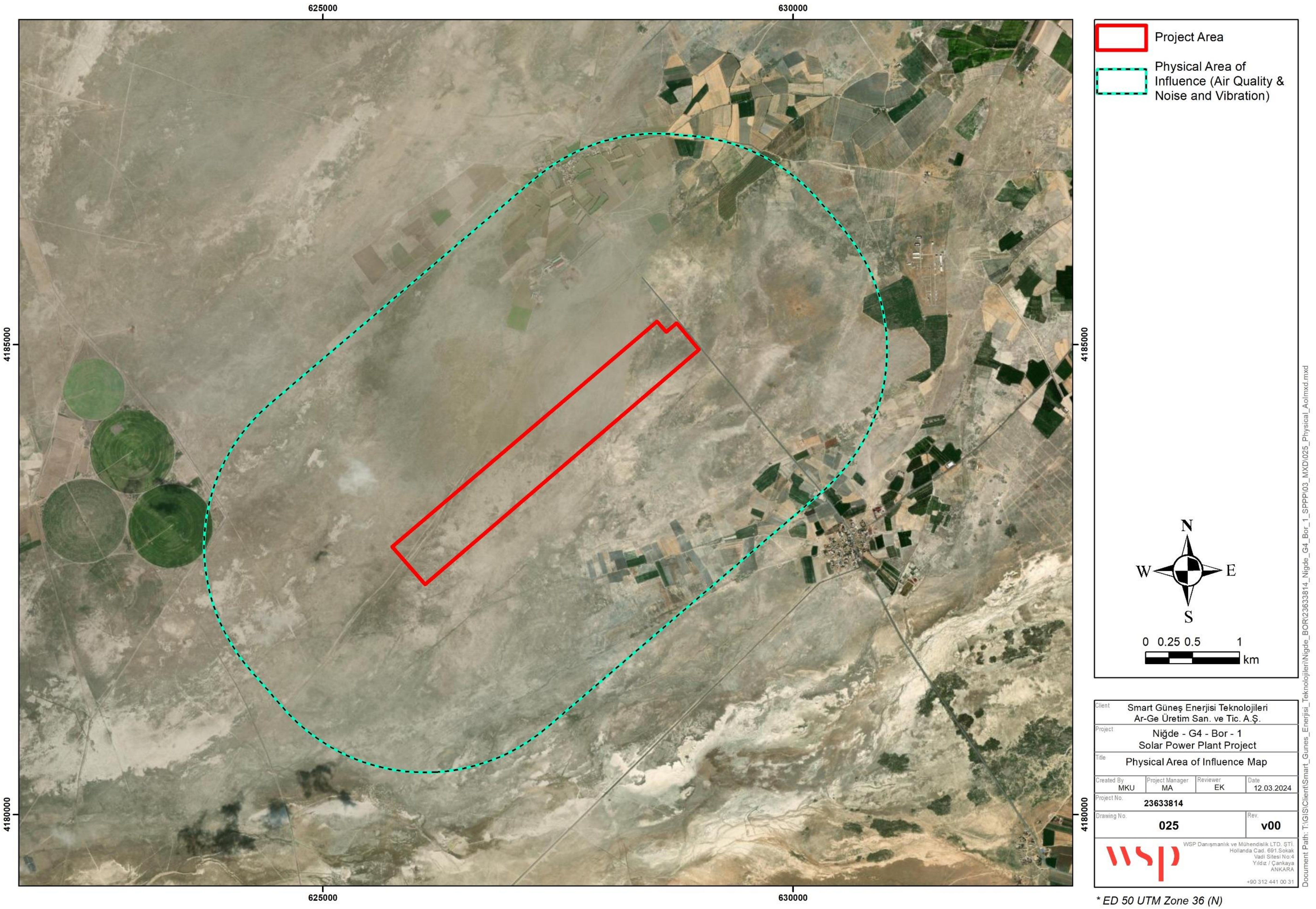


Figure 6-8: Map Showing Physical Area of Influence of Air Quality and Noise Components

Methodological Approach

Air Quality Monitoring Stations

Data on air quality in the Regional Study Area (RSA) is sourced from the National Air Quality Monitoring Stations located in Niğde. The air quality information collected at these stations is made available on the Continuous Monitoring Center (CMC) website of the Ministry of Environment and Urban Climate Change (MoEUCC). In Niğde, there are two CMCs, specifically in Niğde Center and Bor. The Bor CMC, situated approximately 12 km from the Project area, provides relevant data for the Regional Center (RC), and the summarized information for the year 2023 is utilized. Refer to Figure 6-9 for the depiction of the air quality monitoring station.

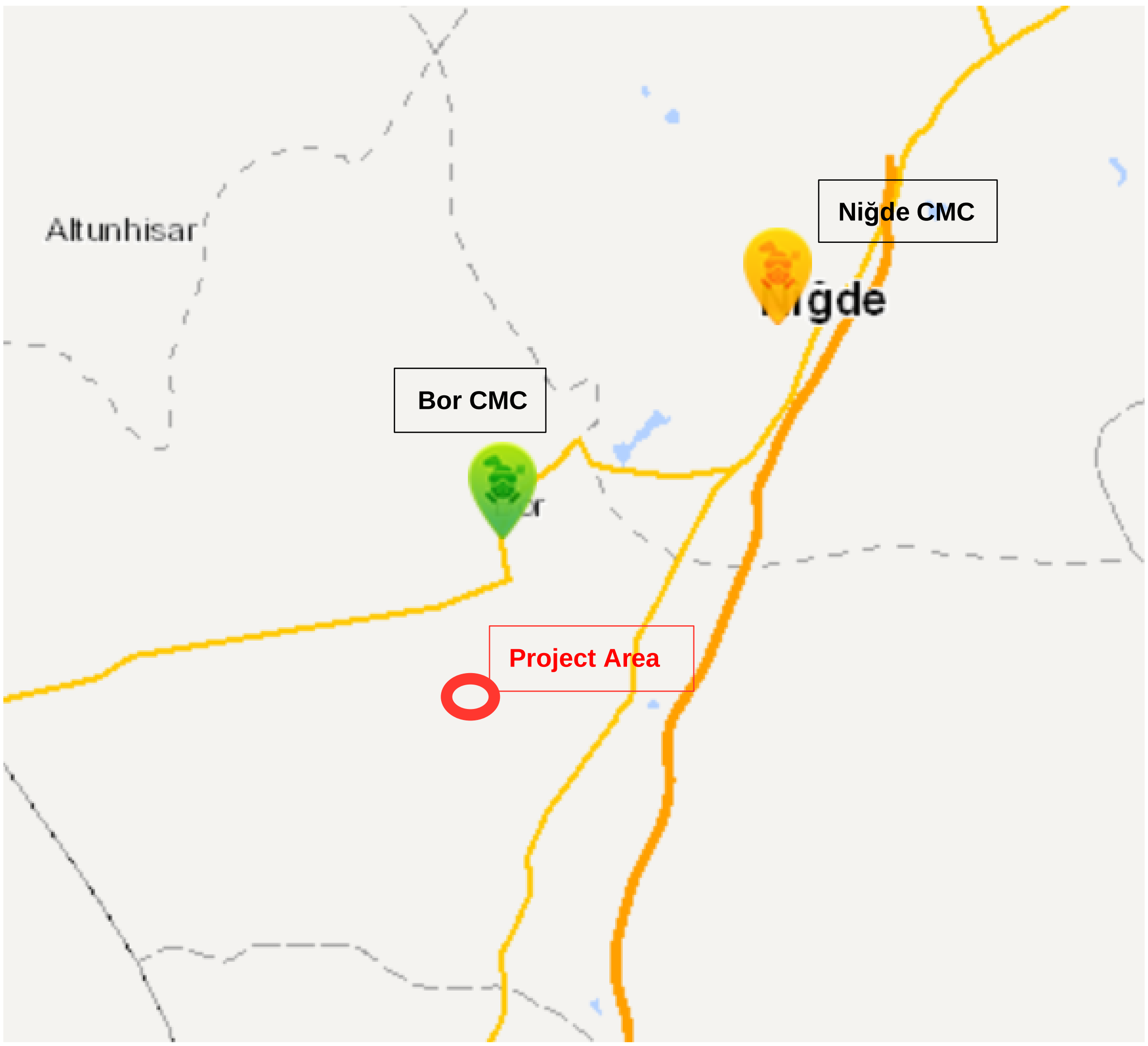


Figure 6-9: Continuous Measurement Center of MoEUCC and Project Area

ESIA studies encompassed the assessment of PM10, PM2.5, and settled dust with the measurements conducted in AoI. The evaluation involved concurrent PM10 and PM2.5 measurements at identical points, with measurement locations and durations provided in Table 6-8, Table 6-9 and Figure 6-10. PM10 and PM2.5 measurements spanned 72 hours at four designated points, while settled dust measurements were carried out over a two-month period at these identical locations.

Table 6-8: PM10 & PM2.5 Measurement Coordinates and Periods

Points	Coordinates (UTM/WGS) (36T)		Measurement Period and Date
AQ-1	627451	4185538	72 hours – 13.12.2023 - 16.12.2023
AQ-2	627662	4186326	72 hours – 13.12.2023 - 16.12.2023
AQ-3	629735	4183552	72 hours – 13.12.2023 - 16.12.2023
AQ-4	630222	4183274	72 hours – 13.12.2023 - 16.12.2023

Table 6-9: Settled Dust Measurement Coordinates and Period

Points	Coordinates (UTM/WGS) (36T)		Measurement Period and Date
AQ-1	627451	4185538	2 months – between 13.12.2023 and 11.02.2024
AQ-2	627662	4186326	2 months – between 13.12.2023 and 11.02.2024
AQ-3	629735	4183552	2 months – between 13.12.2023 and 11.02.2024
AQ-4	630222	4183274	2 months – between 13.12.2023 and 11.02.2024

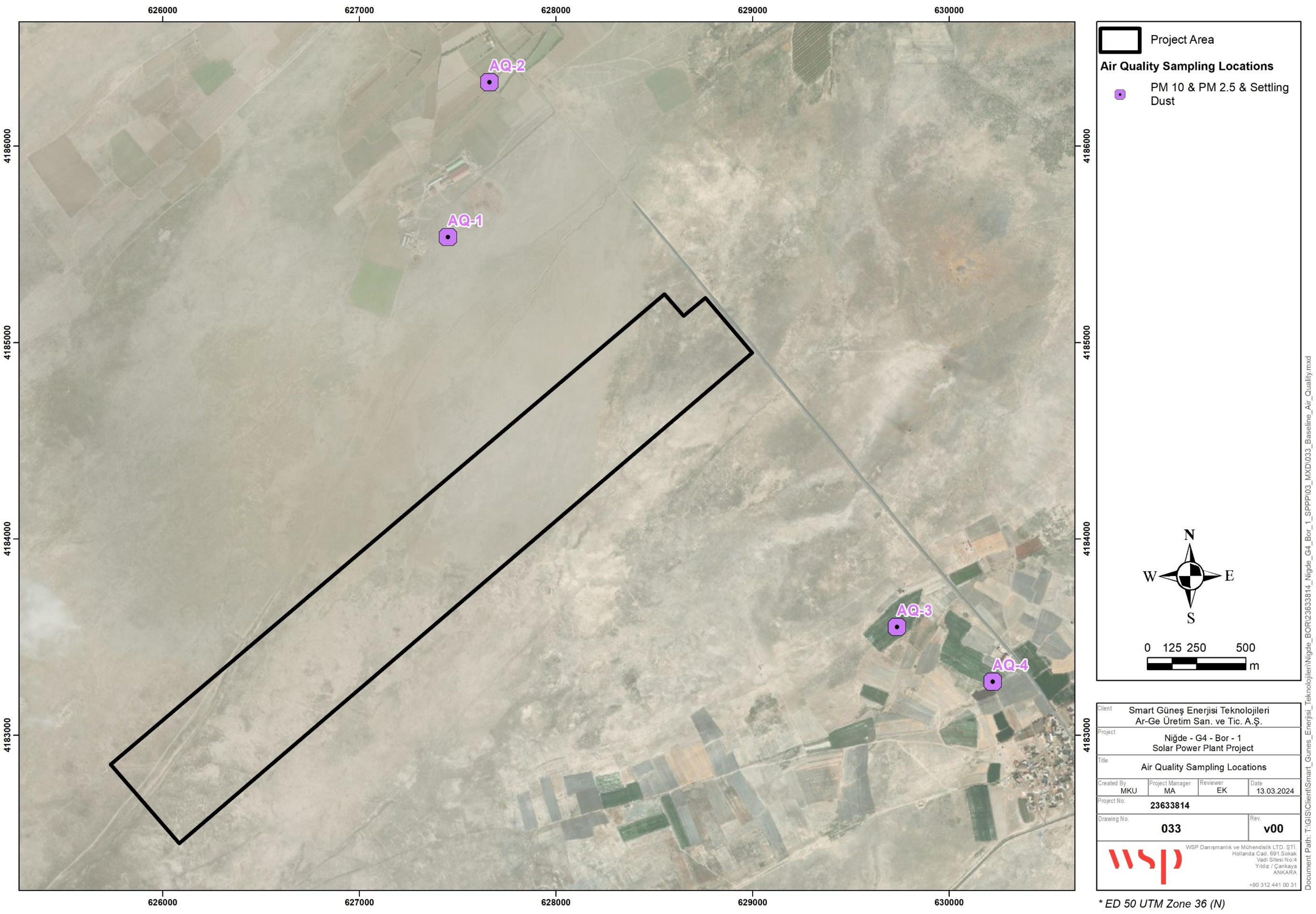


Figure 6-10: Baseline Air Quality Measurement Points

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

- PM10 and PM2.5 measurements were performed in line with TS 12341 standard: " Standard gravimetric measurement method for the determination of the PM10 or PM2.5 mass concentration of suspended particulate matter." This approach involves using a pump to vacuum air from the ambient environment, passing it through a filter, and collecting the particles on the filter over 24-hour periods for three times (72-hours in total). After sampling, the filter is transported to the laboratory for gravimetric analysis. The concentrations of PM10 and PM2.5 in the ambient air are then determined by calculating the amount of dust on the filter.
- Methodology of settled dust measurements followed the guidelines of the TS 2342 standard: " Methods for the measurement of air pollution methods for the installation and the use of the directional dust gauge." This method centers on the collection of particles settled due to various factors such as gravity and precipitation in a directional dust gauge. The gauge is retrieved after a sampling period of 720 hours, and the dust concentration is calculated.

Regional Study Area

The data of the Bor CMC from the Ministry of Environment, Urbanization and Climate Change is given in Table 6-10. The highest PM10 concentration was detected as 621.20 µg/Nm^3 in June 2023 while the highest SO_2 concentration was measured as 216.41 µg/Nm^3 in August 2023. Average PM10 concentration was 56.05 µg/Nm^3 in 2023 which exceeds Turkish Air Quality Standards (20 µg/Nm^3). Average SO2 concentration, on the other hand, was calculated as 18.71 µg/Nm^3 in 2023 which is below the limit determined in Turkish Air Quality Standards (20 µg/Nm^3).

Table 6-10: Air Quality of Bor District*

Parameter	Unit	Minimum Value	Minimum Date	Maximum Value	Maximum Date	Average Value	Turkish Air Quality Standards (µg/Nm^3)
PM10	µg/m^3	0.45	01.06.2023 14:00	621.20	17.05.2023 12:00	56.05	20
SO_2	µg/m^3	0.51	19.08.2023 04:00	216.41	19.11.2023 00:00	18.71	20

Source: (MoEUCC, 2023)

Measurement Parameters

As part of the ESIA, measurements were carried out for PM2.5, PM10, and settled dust. The subsequent sub-sections provide details on the results and evaluations obtained from these measurements.

PM10 Measurement Results

PM10 measurement results are provided in Table 6-11. The results indicate that the average PM10 concentrations in the vicinity of the Project area are complied with both Turkish and IFC Air Quality Standards. The highest recorded PM10 concentration was 44.10 µg/Nm^3 at AQ-2 point in 13-16.12.2023.

Table 6-11: PM10 Measurement Results

Sampling Point	Date	PM10 Measurement Results ($\mu g/Nm^3$)				Turkish Air Quality Standards[1] ($\mu g/Nm^3$)	IFC Air Quality Standards ($\mu g/Nm^3$)[2]
		Day-1 13-14.12.23	Day-2 14-15.12.23	Day-3 15-16.12.23	Average 13-16.12.23		
AQ-1	13-16.12.2023	33.25	36.99	36.79	35.68	50	50
AQ-2	13-16.12.2023	36.83	42.00	44.10	40.98		
AQ-3	13-16.12.2023	39.96	37.43	38.54	38.64		
AQ-4	13-16.12.2023	33.20	39.71	39.63	37.51		

[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

PM2.5 measurement results are presented in Table 6-12. Although the highest PM2.5 concentration (26.44 $\mu g/Nm^3$) measured at AQ-3 point is above the limits of IFC Air Quality Standards, all the average PM2.5 measurement results around the Project area are below the IFC Air Quality Standards.

Table 6-12: PM2.5 Measurement Results

Sampling Point	Date	PM2.5 Measurement Results (µg/Nm3)				Turkish Air Quality Standards (µg/Nm3)	IFC Air Quality Standards (µg/Nm3)[1]
		Day-1 13-14.12.23	Day-2 14-15.12.23	Day-3 15-16.12.23	Average 13-16.12.23		
AQ-1	13-16.12.2023	21.14	26.32	25.94	24.47	-	25
AQ-2	13-16.12.2023	18.31	22.51	19.50	20.11		
AQ-3	13-16.12.2023	19.62	23.33	26.44	23.13		
AQ-4	13-16.12.2023	16.74	19.79	20.14	18.89		

[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 135 mg/m^2-day, at AQ-3 measurement point which is also below both Turkish and IFC Air Quality Standards.

Table 6-13: Settled Dust Measurement Results

Points	Settled dust Measurement Results (mg/m2-day)		Turkish Air Quality Standards (mg/m2-day)		IFC Air Quality Standards
	13.12.2023 - 12.01. 2024 (1st Period)	12.01.- 11.02.2024 (2nd Period)	Long Term Limit	Short Term Limit	
AQ-1	105	123	210	390	-
AQ-2	98	103			
AQ-3	118	135			
AQ-4	107	112			

[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)

Sensitivity Assessment

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

Sensitivity features	Supported by	Sensitivity value
PM10, PM2.5, and settled dust in the AoI Proximity to residential areas, vulnerable entities, and ecologically sensitive receptors may pose a potential exposure to air emissions. Adjacent to the Project area, there are other ongoing Projects in various stages, including those under construction and in the planning phase	Primary and secondary data	Medium

6.1.4 Noise and Vibration

Background noise/vibration or ambient noise/vibration is the sound level of environmental noise/vibration such as 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. Within the scope of the Project, during the construction phase, vibration is expected to be very limited since vibration sources are limited to vehicle movements, and no vibration is expected during the operational phase of the Project.

2,000 m buffer zone including Project footprint (See Figure 6-8) is considered as Area of Influence (AoI) of the Project and nearby receptors around the Project site may be affected from potential noise and vibration impacts.

For the evaluation of the baseline conditions, baseline noise level measurements conducted at three locations in the dates between 15 and 16 December 2023 for 48 hours continuously.

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 3 points for 48 hours continuously between 15 and 16 December 2023 in compliance with the Turkish legislation and IFC General EHS Guideline for Noise.

Measurement locations were presented in Table 6-14 and Figure 6-11.

Table 6-14: Noise Level Measurement Coordinates and Periods

Points	Coordinates		Measurement Period and Date
N-1	37.808315°	34.447483°	48 hours – between 15.12.2023-16.12.2023
N-2	37.815381°	34.450337°	48 hours – between 15.12.2023-16.12.2023
N-3	37.790112°	34.473100°	48 hours – between 15.12.2023-16.12.2023

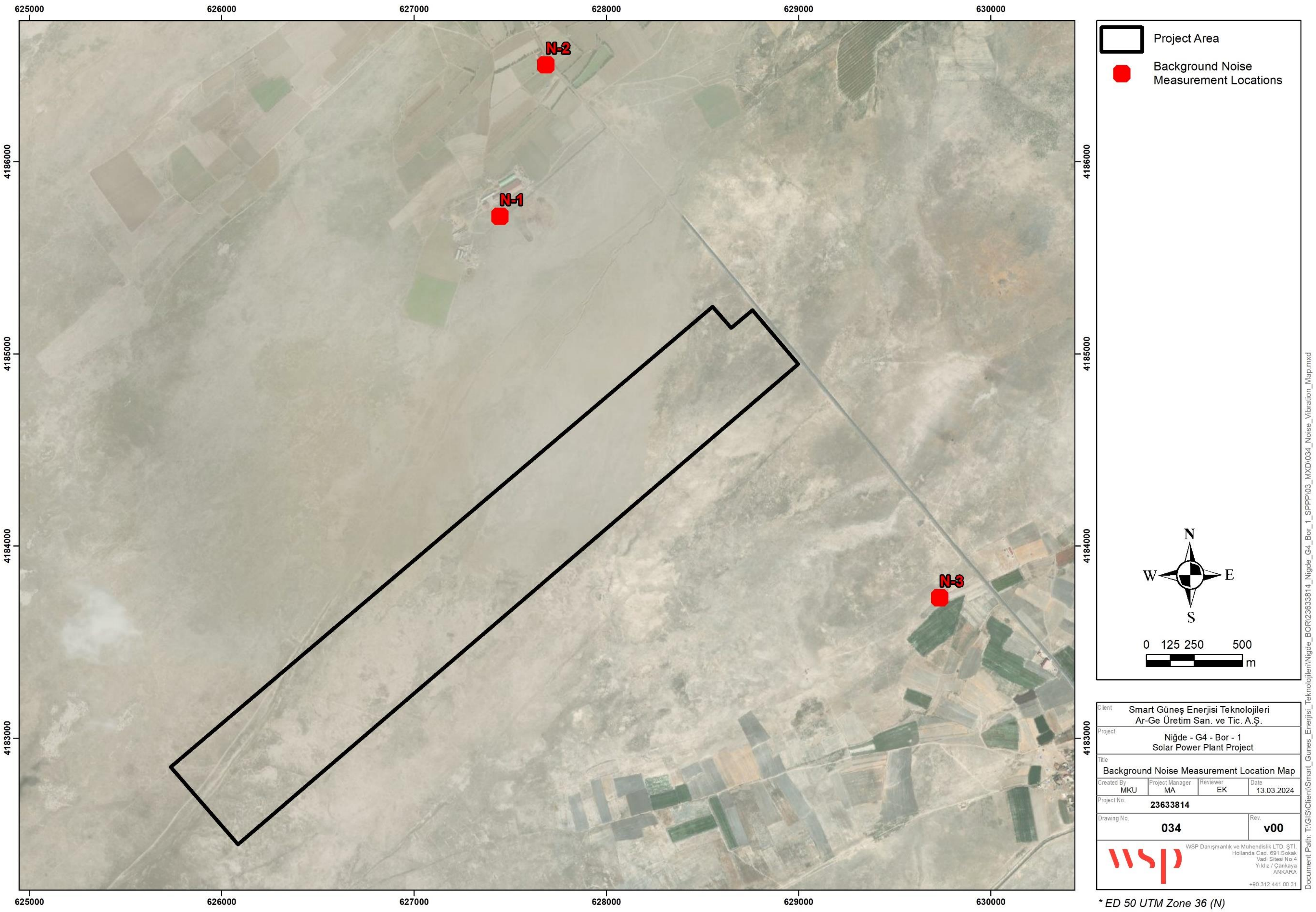


Figure 6-11: Map Showing Background Noise and Baseline Vibration Measurement Points

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 continuous noise measurement results are presented as per both Turkish Legislation and IFC Guidelines in Table 6-15. The measurement results do not exceed Turkish Legislation and IFC Guideline Limits.

Table 6-15: Noise Level Measurement Results

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	15/12/2023	40.2	37.4	37.0	39.6	37.1
	16/12/2023	38.3	36.2	37.3	37.8	37.3
N-2	15/12/2023	52.1	46.5	40.1	51.1	40.5
	16/12/2023	51.5	46.1	38.0	50.5	38.8
N-3	15/12/2023	47.0	47.6	44.5	47.2	44.6
	16/12/2023	47.4	47.8	44.6	47.5	44.8
Limit Values	-	60	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;

Sensitivity Assessment

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

Sensitivity features	Supported by	Sensitivity value
High 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	Primary and secondary data	Medium

6.1.5 Geology, Geomorphology, Geotechnics and Seismicity

Geology is a field of study that focuses on the interactions between humans and the Earth's geological 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 addresses and mitigates 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.

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.

6.1.5.1 Geology, Geomorphology and Geotechnics

The Bor District, situated in the southern part of Central Anatolia, is encircled by Hasan Mountain, Okçu Mountain, and the Taurus Mountains. To the west, it encompasses the Konya Plain and the conjoined Emen Plain. The prevalent geological composition in the area consists of volcanic tuffs and basalt flows. In the plains, the prevailing geological structure is primarily composed of alluvium. The Project Area has a morphologically gently sloped structure. There are no high topographies in the immediate vicinity of the Study Area. The general slope is calculated as 0-10% in the Project Area (Figure 6-12).

Within the scope of the general geology of the Project Area, The Niğde region and its surrounding area, situated on the Anatolides[3], exhibit a geological structure characterized by five distinct rock groups with variations in both stratigraphy and tectonics. The oldest among these groups is the Niğde Metamorphic Complex, forming the basement for all Tertiary rock units, though its base remains hidden. Overlying this complex, the second rock group consists of Paleocene-Eocene volcano-sedimentary sequences from the Ulukışla-Çamardı Group, exhibiting a folded and fractured structure in an east-west direction. The third rock group, deposited in a freshwater environment during the Upper Oligocene-Lower Miocene age, overlays the previous units with an angular unconformity.

The fourth rock group includes Hasandağı, Keçiboyduran, and Melendizdağı volcanics or pyroclastics, accompanied by lacustrine and fluvial sediments from the Upper Miocene-Lower Pliocene age. These volcanic activities cover the underlying Oligocene-Lower Miocene rock units with angular unconformity. Lastly, the fifth rock group comprises the ancient and contemporary continental Quaternary sediments, covering all preceding rock groups with an angular unconformity (Figure 6-13).

The Niğde Group unit and its neighbouring areas within the Project site were influenced by Caledonian–Hercynian and Alpine orogenic movements, leading to the formation of mountains, folds, and fractures. During the tectonic evolution of the Niğde Group units, metamorphism occurred concurrently with tectonic processes. In younger units, localized metamorphism was a result of volcanism rather than tectonics. The Niğde Massif rocks, confined to the Ecemiş Fault in the east, underwent multiple orogenic influences, resulting in the development of fault systems in various directions intersecting each other.

The Tuz Lake Fault Zone (TGFZ), which is around 11 km away from the Project Area, is one of the most important active fault zones in Central Anatolia. TGFZ is approximately 200 km long, 2-25 km wide, NW-trending, active strike-slip normal fault zone. It extends between the north of Tuz Lake in the NW and Kemerhisar (Niğde) in the SE. Additionally, other notable faults in the region include Ecemiş, Cevizlik, Elekgölü, Çukurbağ, Keçiboyunduran – Melendiz, Göllüdağ, Derinkuyu, and Yeşilhisar Faults, which collectively define the Ecemiş Fault Zone, forming a belt[4,5,6]. Some of these faults remain active, indicating compression in the N-S direction. Certain faults within this belt have origins predating the Neogene and may still be active today. The Project Area is nearly thirty-five (35) km away from the Ecemiş Fault Zone (Figure 6-14).

[3] Ketin, İ. (1966). Anadolu'nun Tektonik Birlikleri. Bulletin of the Mineral Research and Exploration, 20-37.

[4] Yetiş, C. (1978). Çamardı (Niğde) Yakın ve Uzak Dolayının Jeoloji İncelemesi ve Ecemiş Yarılım Kuşağı'nın Maden Boğazı-Kamışlı Arasındaki Özellikleri. 164.

[5] Göncüoğlu, M. C. (1981). The origin of the viridine gneiss from Nigde Massif. Bulletin of the Geological Society of Turkey, 45-51.

[6] Atabey, E., & Ayhan, A. (1986). Niğde, Ulukışla, Çamardı, Çiftehan Yöresinin Jeolojisi. Ankara: Maden Tetkik ve Arama Genel Müdürlüğü.

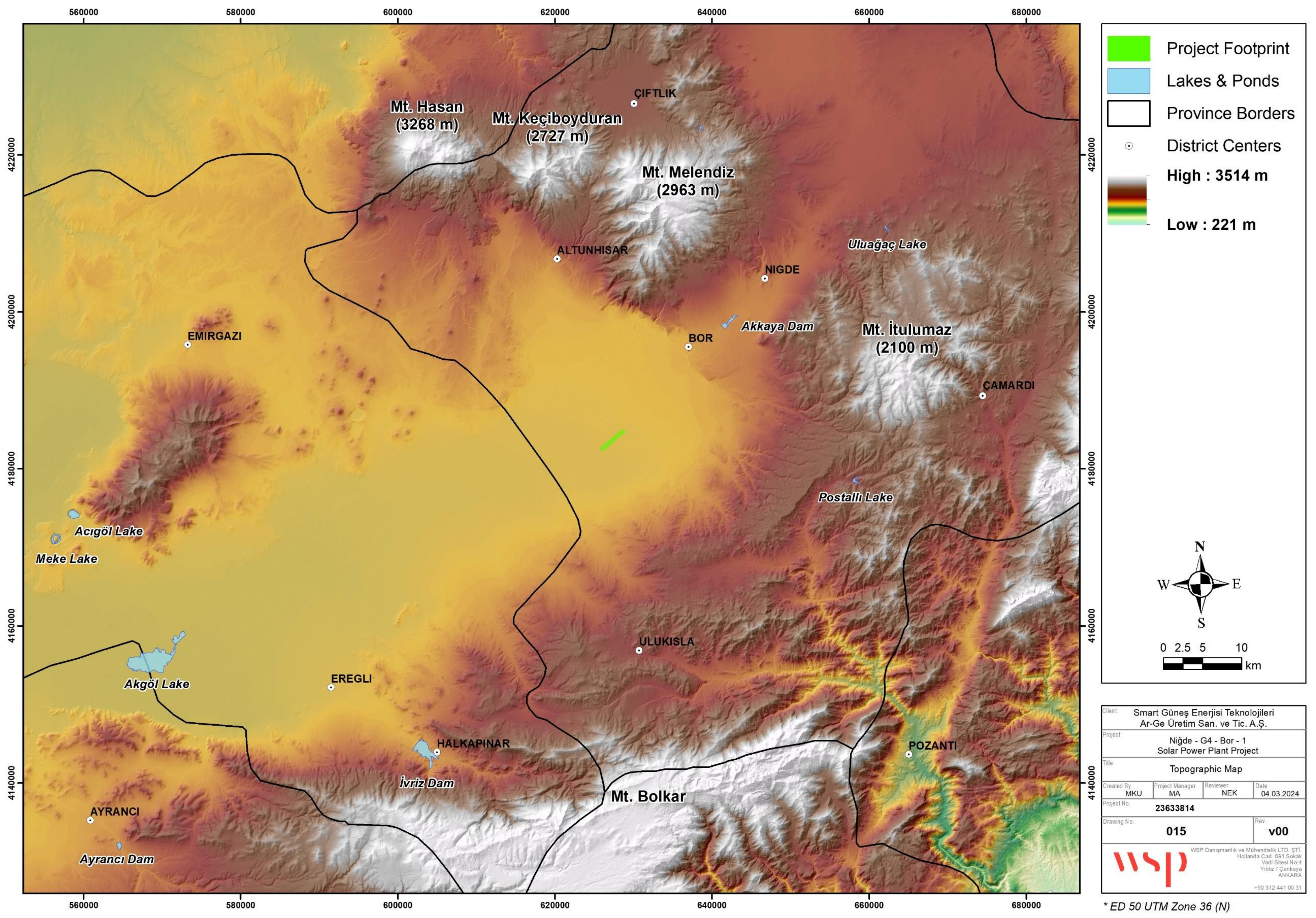


Figure 6-12: Topographic Map Showing the Project Site

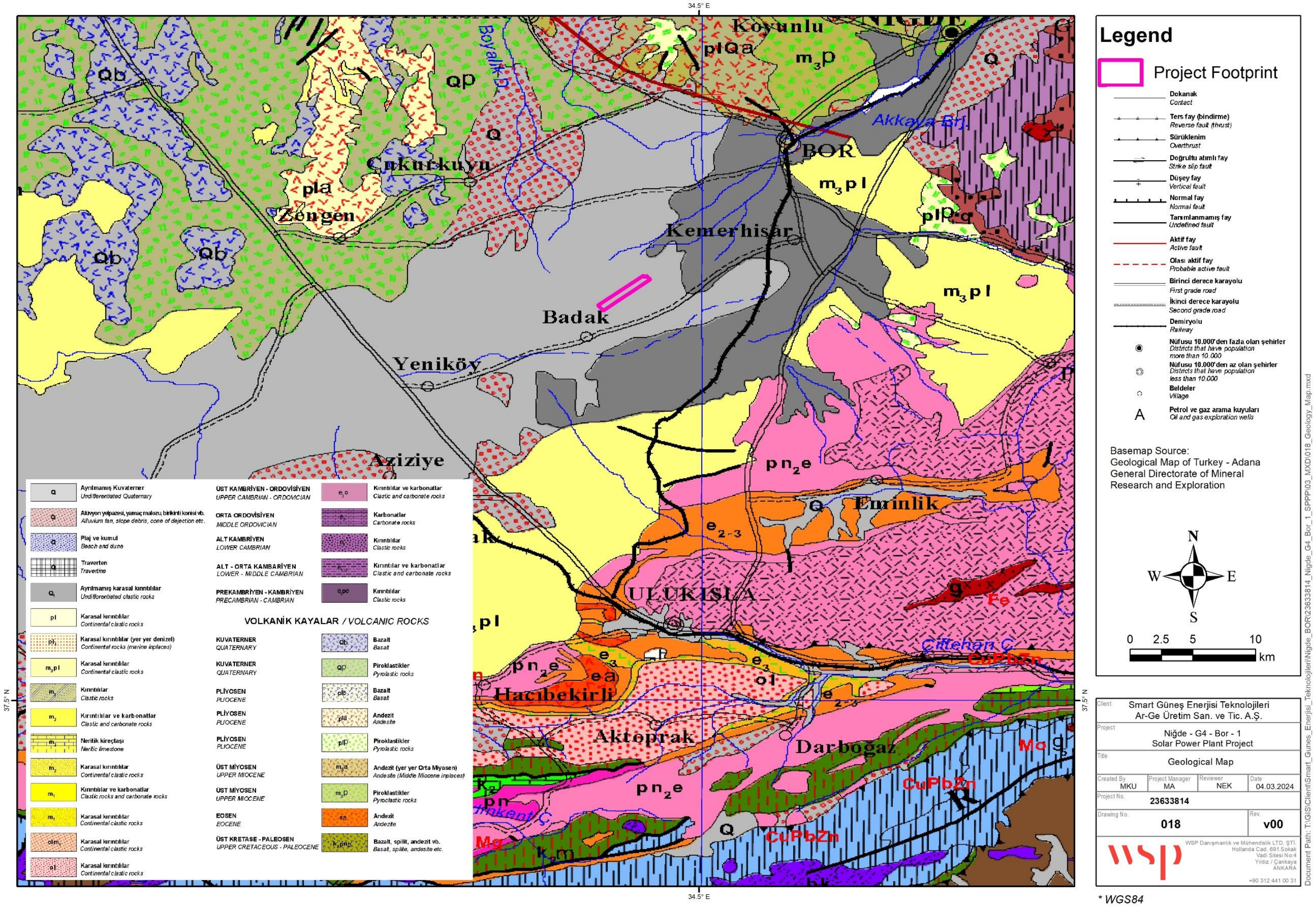


Figure 6-13: 1/500,000 Scale Geological Map of the Regional Study Area (Source: Adana Sheet, MTA)

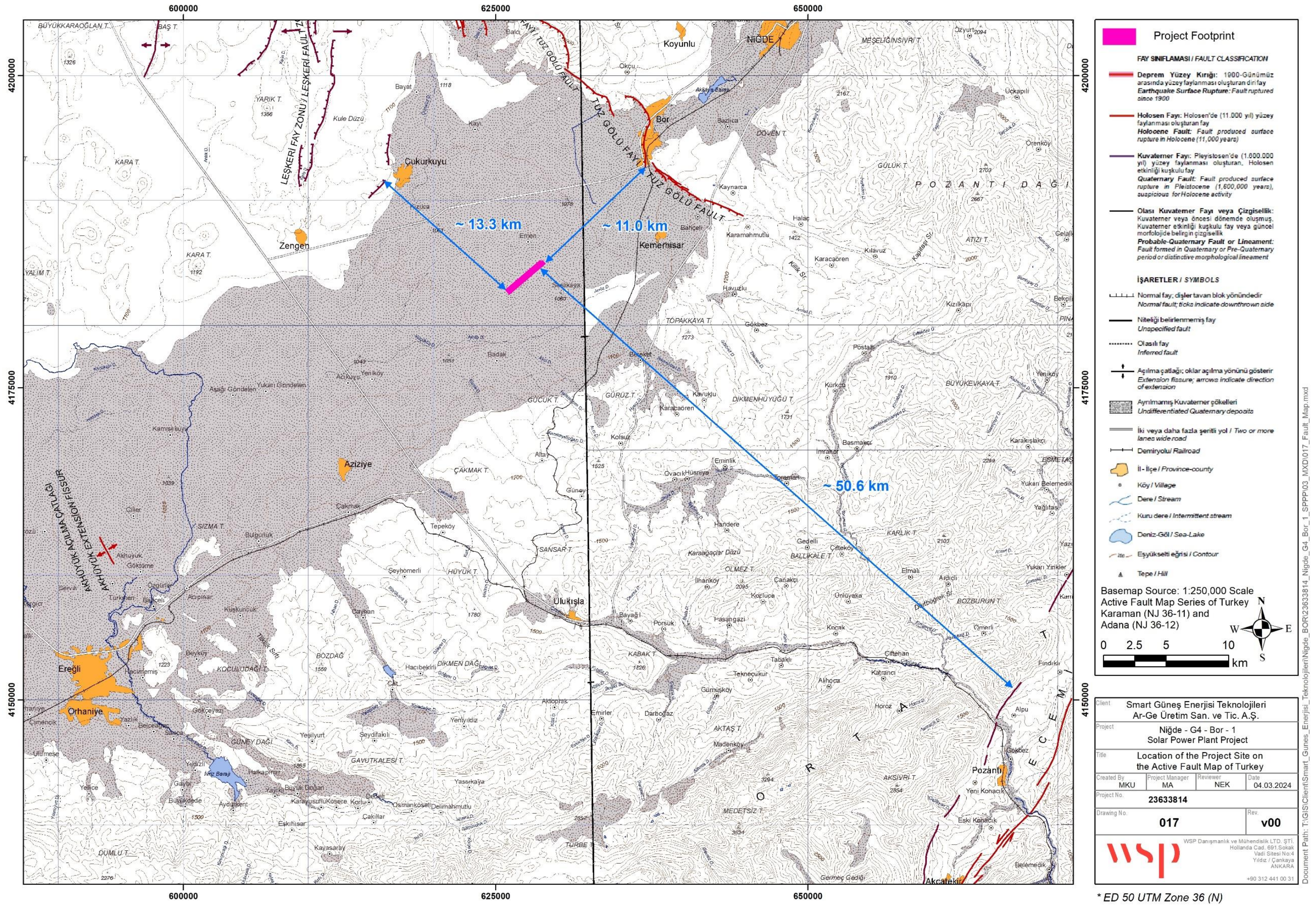


Figure 6-14: 1/250,000 Scale Active Fault Map of the Regional Study Area (Source: Adana-Karaman Sheets, MTA)

A Geotechnical Report for the Project was prepared within the scope of the national EIA in September 2022[7]. To determine the properties of the subsurface soils, drillings were carried out in 15 locations in the study area, at a depth of 15 meters, with a total depth of 225 meters (Figure 6-15).

- Two geological units have been identified in the study area: the sandy clay unit belonging to alluviums with a thickness exceeding 3 m on the surface and the clay-sand intercalated limestones belonging to the Gökbez Formation. Alluvial units were evaluated in the soil class, and clay sand intercalated limestones belonging to the Gökbez Formation were evaluated in the rock class.
- In the drillings, it was observed that the depth to the groundwater level varied between 2.3 m and 3.2 m.
- At the Project Area, in-situ experiments were conducted to determine the rock quality (%TCR, %RQD). As a result of rock quality tests, conducted on the Gökbez Formation, all the well samples were determined as very-low quality rock, and the maximum %RQD and %TCR values were determined as 10% and 20%, respectively, which make the rock classification “very weak”.
- Also, in the drilling wells, standard penetration tests (SPT) were performed every 1.5 meters until the rock started and disturbed samples were taken. According to the results of the SPT test conducted in the drillings opened on the alluviums in the Study Area, SPT N30 values are in the range of 32-R. In light of these data, it is defined as “tight-very tight” according to the definition of tightness. SPT test hardness analysis results are in the 33-R range, meaning it has a “very hard” consistency.
  - In addition to in-situ tests, laboratory tests were also carried out on the samples taken from the Project Area. Point load test, sieve analysis test, natural water content test, Atterberg Limits Test, natural weight per unit of volume test, and direct shear test were applied as a part of laboratory tests.
  - According to the laboratory analysis results of 35 soil samples taken from the drillings, 75% of the soils in the Study Area are fine-grained and 25% are coarse-grained.
  - Atterberg Limits Tests performed on samples taken from the alluvial unit show that they are 43% plastic and 57% non-plastic.
  - The strength of the rocks was determined by evaluating the point loading test results. Point loading values were found to be in the range of 20.47-24.22 kgf/cm^2, which stays in the interval of intermediate strength.
  - According to the results of the direct shear test, the average cohesion value (C^{up}) was found as 0.2579 kg/cm^2, and the average internal friction angle (f^{up}) was found as 17.17°.

According to TS EN ISO 14688-2 Soil Classification, 57% of all samples are classified as Low Plasticity Silt (SiL) and 43% are classified as Medium Plasticity Clay (CiM). Clay sand intercalated limestones belonging to the Gökbez Formation in the Study Area were named as ZC group " very tight sand, gravel and hard clay layers or weathered, weak rocks with many cracks" according to the Turkish Building Earthquake Regulation Local Soil Classification.

[7] Hakan Mühendislik. (2022). Niğde İli Bor İlçesi Seslikaya Köyü'nde Sınırları Koordinatlarla Belirlenen Alana Ait İmar Planına Esas Jeolojik-Jeoteknik Etüt Raporu.

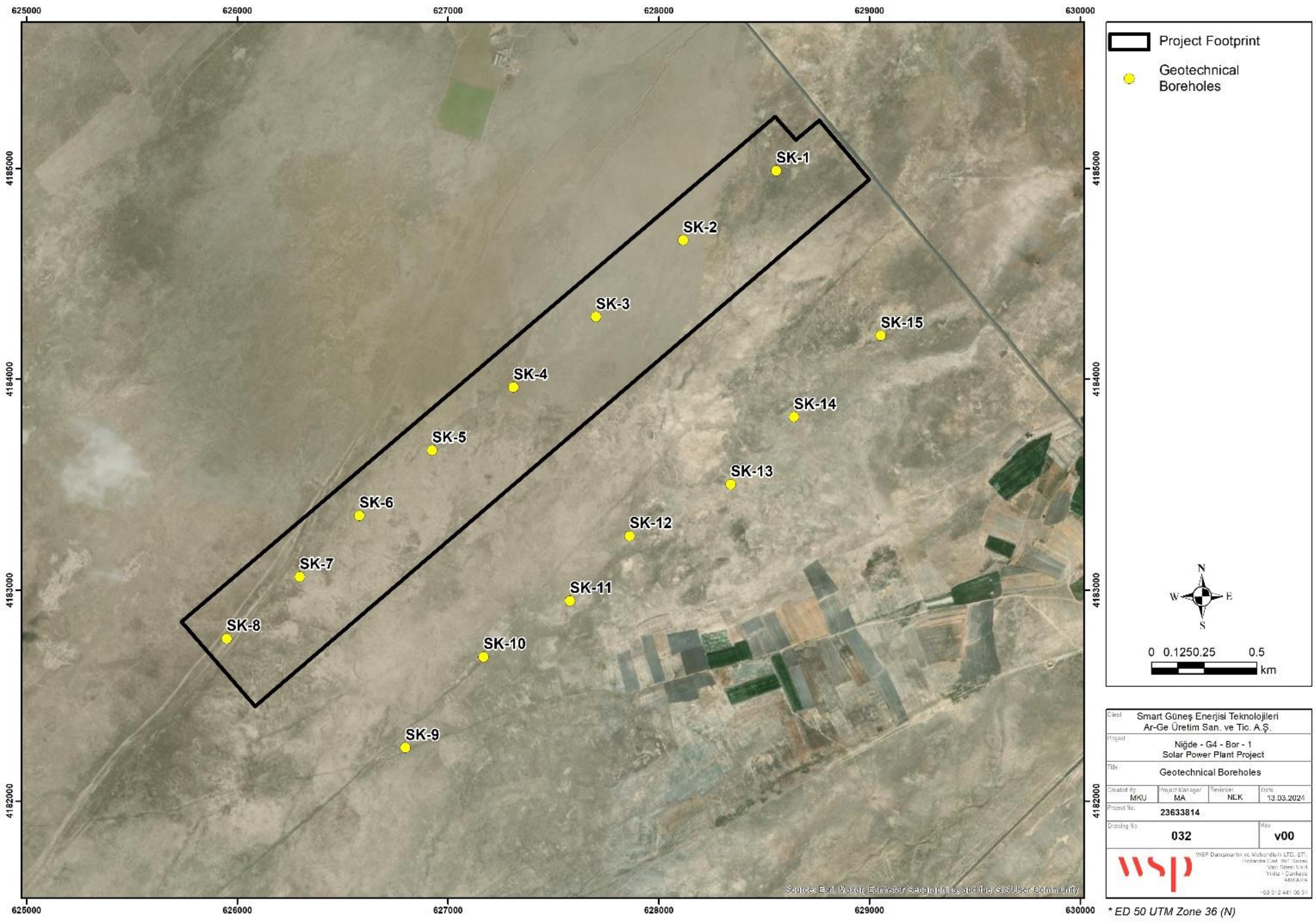


Figure 6-15: Location of the Geotechnical Boreholes

6.1.5.2 Seismicity

The Türkiye Earthquake Regions Map which went into effect in 1966 and has since been revised as the Türkiye Earthquake Hazard Map in the Official Gazette numbered 30364 (dated 18.03.2018) by the Disaster & Emergency Management Presidency, Department of Earthquake Directorate. The Project Site is shown on the relevant section of the Türkiye Earthquake Hazard Map in Figure 6-16.

(AFAD, 2018). The ground type ZC (very tight sand, gravel and hard clay layers or weathered, weak rocks with many cracks) was considered and the earthquake ground motion level (DD-2) is 10% probability of exceedance in 50 years (repetition period 475 years), Peak Ground Acceleration (PGA) was calculated as 0.127 g for the 475-year return period.

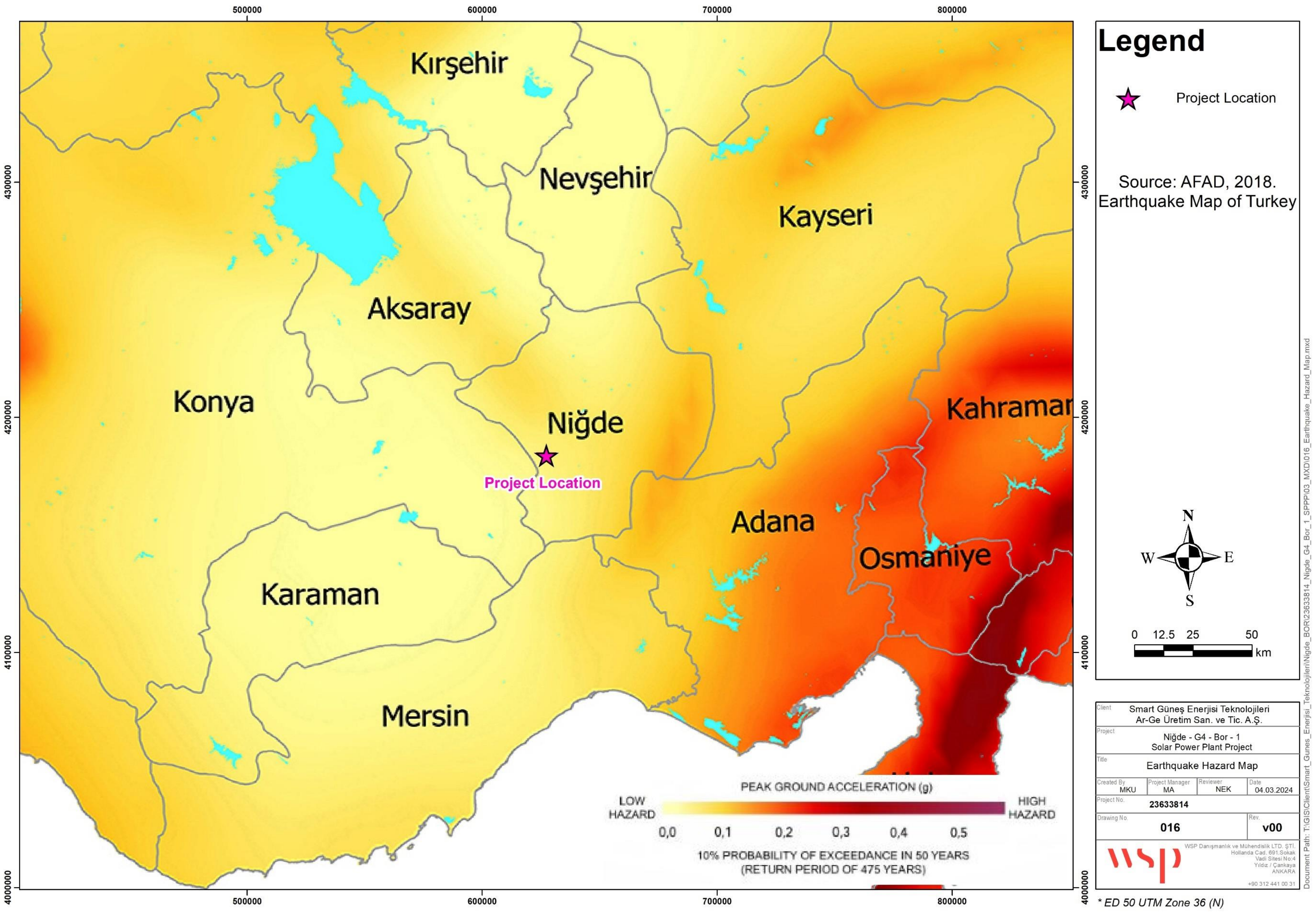


Figure 6-16: Location of the Project Site on the Earthquake Hazard Map

Sensitivity Assessment

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

6.1.6 Soil and Subsoil

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.

The impact of the Project on the soil layer during the Project will be limited to the units mentioned in the project, therefore the Project site have been determined as AoI.

Regional Study Area

The large soil group in the region in which the Project Area is located is classified as Alluvial Soils (see Figure 6-19). The main soil properties of the region are given as follows:

Alluvial soils are formed by the deposition of sediments carried by rivers, streams, or other water bodies. These soils are highly fertile and are found in regions where rivers have deposited rich sediment over time. The composition and properties of alluvial soils can vary widely depending on the parent material, the source of the sediment, and the depositional environment.

Alluvial soils are typically formed in river valleys and floodplains. They are the result of the erosion and weathering of rocks and minerals upstream, carried by the flowing water and deposited as sediment when the water slows down. Over time, these deposits build up and form layers of fertile soil.

Alluvial soils are usually a mixture of sand, silt, clay, and organic matter. The proportions of these components can vary, leading to different soil textures and properties. Generally, alluvial soils are well-drained due to their sandy nature but can retain moisture well because of their clay content.

Stream-length plains in places where valley floors widen consist of alluvial soils and Deltas are the most common alluvial soils. Moreover, the fertile agricultural lands at the bottom of many plains are also alluvial. The main ones are; The depression plains on the North Anatolian fault zone on the Southern Marmara plains, Bakırçay, Gediz, Küçük Menderes and Büyük Menderes plains in the Aegean part, and Erzincan, Erzurum, Pasinler and Muş plains and other plains in Eastern Anatolia.

Alluvial soils are rich in plant nutrients and are deep and permeable soils. They are easily processed as they consist of sand, clay and gravel. Therefore, these are the most fertile agricultural areas of Türkiye.

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 a land occupied by sparsely vegetated areas within Forest and Semi-Natural Areas (Figure 6-18).

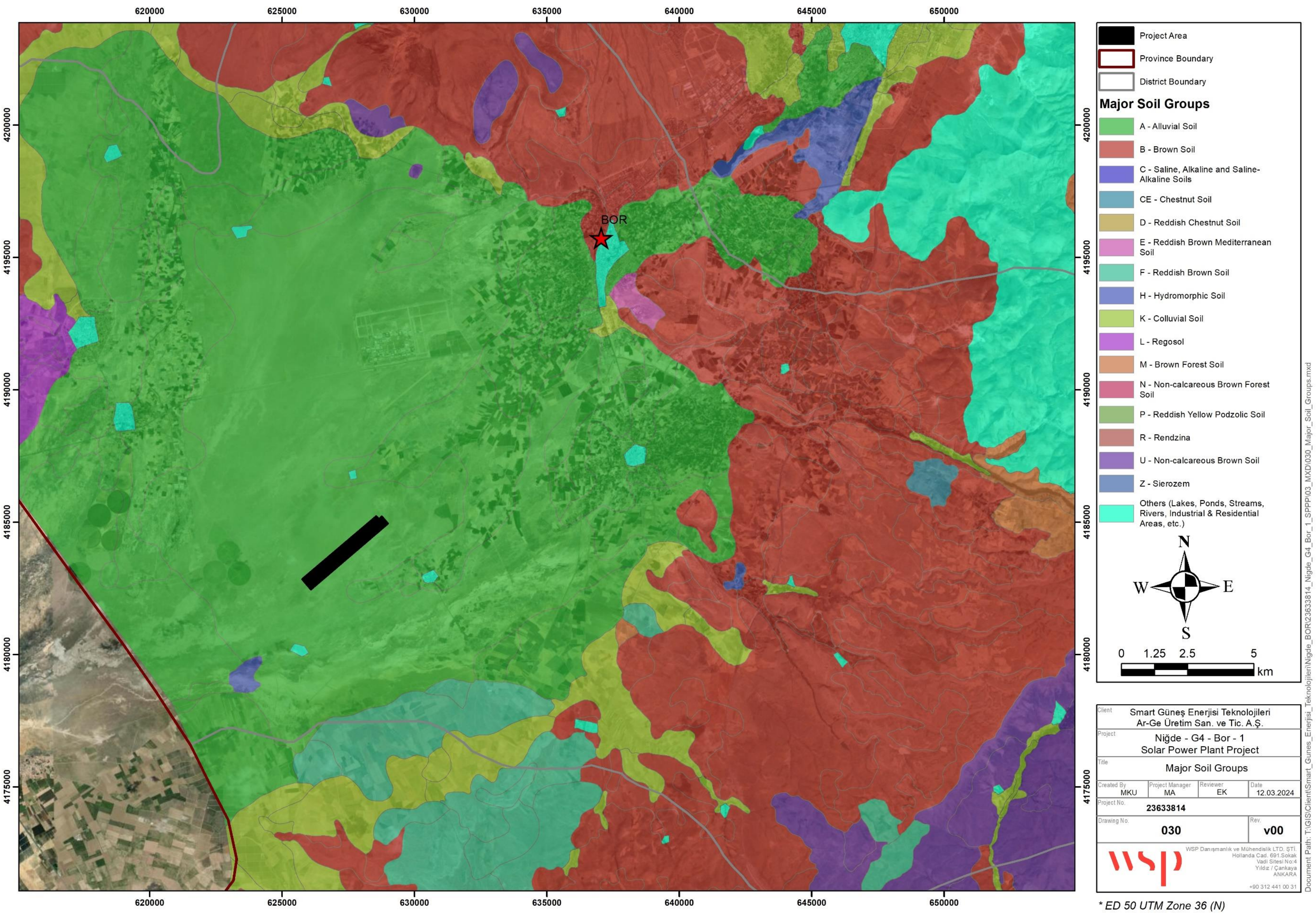


Figure 6-17: Map showing Major Soil Groups around the Project Area

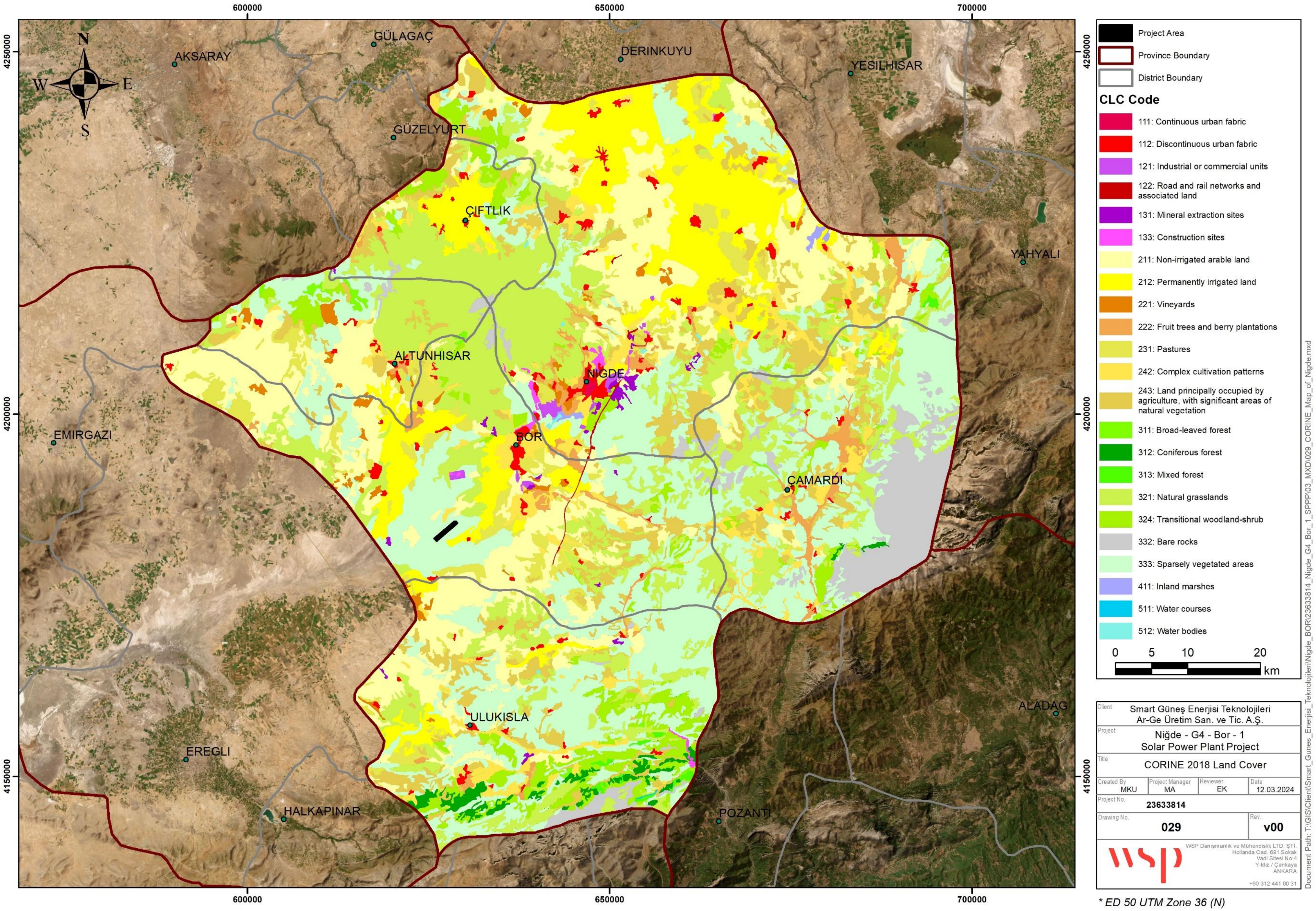


Figure 6-18: CORINE 2018 Map

Area of Influence

According to “Soil Pollution Control and Sites Polluted by Point Source Contamination Regulation” published on June 8. 2010 (Official Gazette: 27605), it is obligatory to prevent pollution, stop pollutant 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, 3 soil samples were taken in December 2023 (see Table 6-16). Based on the current and future activities of the site, the parameters presented in Table 6-17 should be analyzed in soil and samples as required by the Turkish Soil Pollution Control and Sites Polluted by Point Source Contamination Regulation.

Table 6-16: Baseline Soil Sampling Coordinates and Periods

Points	Coordinates (WGS84)		Measurement Period and Date
T-1	34.442517	37.789505	14.12.2023
T -2	34.461159	37.802000	14.12.2023
T -3	34.433483	37.797325	14.12.2023

Table 6-17: Parameters to be Analyzed 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 the Project site have been collected 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 Annex I of the Turkish Soil Pollution Control and Sites Polluted by Point Source Contamination Regulation. Soil sampling locations are shown in Figure 6-19 and the measurement results of the parameters are presented in following tables.

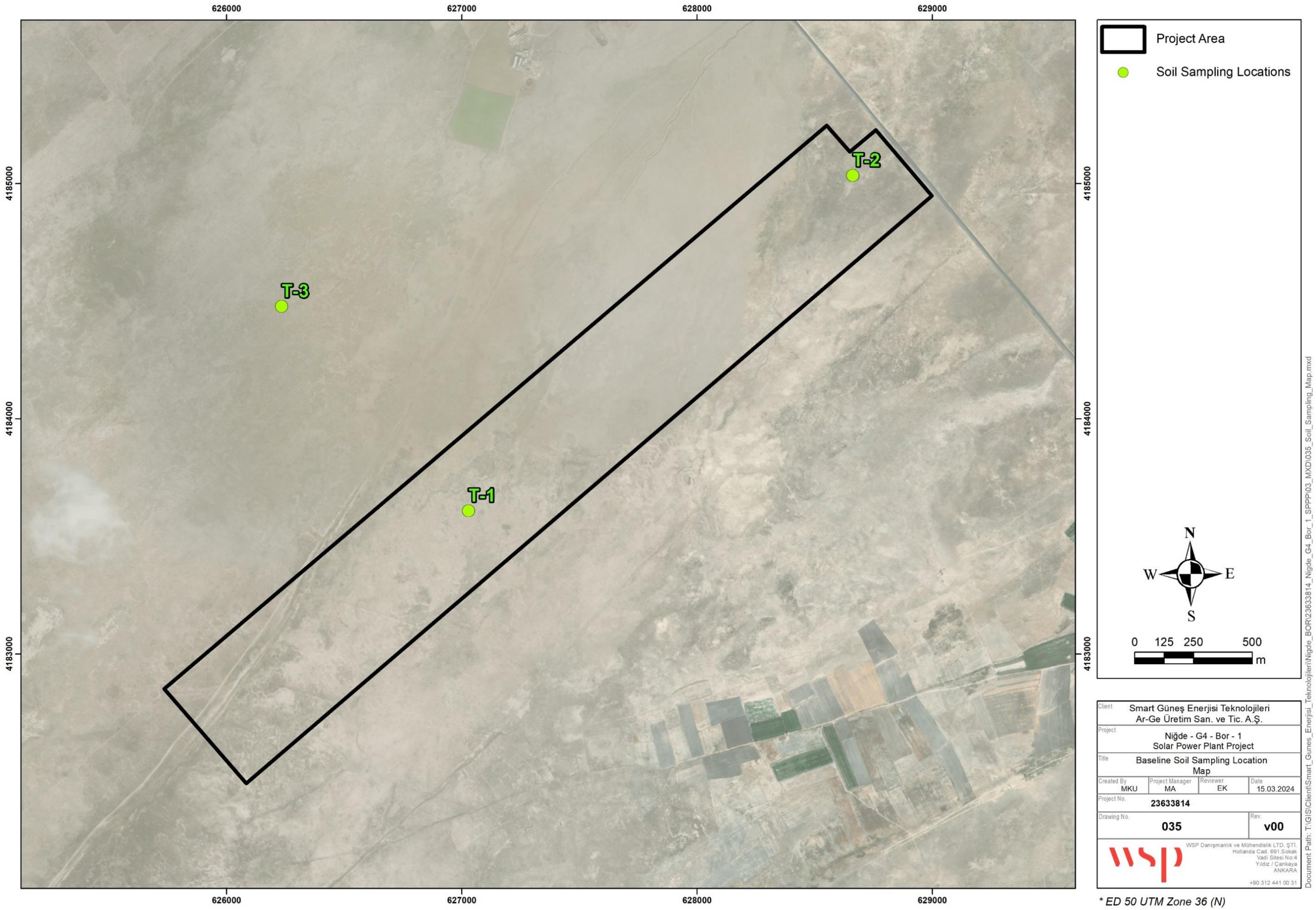


Figure 6-19: Map Showing Baseline Soil Sampling Points

Table 6-18: Baseline Soil Analyses Results

Parameter	Ingestion of soil or dermal contact (mg/kg oven dry soil)	Outdoor inhalation of fugitive dust (mg/kg oven dry soil)	T-1	T-2	T-3
TOX (mg/kg)	-	-	45.6	33.7	34.8
TPH (mg/kg)	-	-	<100	<100	<100
Arsenic (mg/kg)	0.4	471	61.1	296.2	141.7
Boron (mg/kg)	-	-	185.5	145.6	163.0
Barium (mg/kg)	15643	433702	215.8	220.3	218.6
Cadmium (mg/kg)	70	1124	0.137	0.146	0.205
Chromium (mg/kg)	235	24	18.7	20.4	20.3
Copper (mg/kg)	3129	-	9.41	12.70	13.80
Mercury (mg/kg)	23	-	0.586	0.904	1.2
Molybdenum (mg/kg)	391	-	<0,5	<0,5	<0,5
Lead (mg/kg)	400	-	9.51	14.9	16.9
Antimony (mg/kg)	31	-	5.25	16.0	14.9
Selenium (mg/kg)	391	-	2.040	0.447	1.430
Zinc (mg/kg)	23464	-	18.2	25.5	25.3

The findings indicate that the concentration of arsenic exceeds the limits set for "Ingestion of the soil and absorption by means of dermal contact." This elevated arsenic level could be attributed to natural occurrences within the soil background, especially considering the area's history of use as pastureland and the absence of any known historical sources of contamination at the site.

As per the regulation, when determining the limit values mentioned earlier, it is assumed that the site either currently serves or will serve residential purposes in the future. This assumption is made because the generic values provided are more health-protective when compared to other scenarios like commercial or industrial use. This approach is endorsed because in scenarios where the land is designated for residential use, pollutants typically reach individuals through these specific pathways. Additionally, the methods, models, and assumptions used to calculate these generic values for residential pathways are standardized and widely accepted. For each of these pathways, specific limit values have been established to ensure that pollutants do not pose a health risk to individuals. These limit values are set at very low levels, calculated under worst-case scenarios to ensure maximum protection.

During both construction and operational phases, if contamination is suspected, it is recommended to collect soil samples for laboratory analysis. If laboratory tests confirm contamination, it is crucial to handle and dispose of the contaminated soil with utmost care, adhering strictly to Health & Safety and Environmental regulations. Detailed information regarding the impact assessment for soil can be found 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

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.

The Project Area and its surrounding areas are located in the Konya Closed Basin, one of the 25 major basins designated by the Turkish State Hydraulic Works (SHW) taking climate, geography, and stream network into account.

Konya Closed Basin is between 36°51' and 39°29' north latitudes and 31°36' and 34°52' east longitudes in Central Anatolia. Approximately 7% of Türkiye's surface area is in the Konya Basin, with a surface area of 50,073 square kilometres[8]. The basin is surrounded by Sakarya and Kızılırmak Basins in the north, Kızılırmak and Seyhan Basins in the east, the Eastern Mediterranean Basin in the south, and Antalya and Akarçay Basins in the west.

Air movements have formed the Konya closed basin in the middle of Anatolia from an old riverbed[9]. Most of the basin is covered by the alluviums and paleo-lake sediments that have been shaping the Konya Plain, which has an altitude of 900-1050 meters above sea level. As a result of the mountains surrounding the plain, water cannot drain into the sea from the basin, which makes the Konya Basin attain an important closed basin character[10,11]. Meram Stream, Sille Creek, May Creek, Gödet Stream, İvriz Stream and Melendiz Stream are the most significant surface waters in the basin.

Although there are many riverbeds in the Project Area and its immediate vicinity, there has been no flow in these rivers for a long time. According to the national EIA Report of the Project, there are no streams and water resources with natural flow in and around the Project Area and its vicinity. Only noticeable available water resource is Akkaya Dam, which is a dam constructed on the Tabakhane Stream in Niğde between 1964 and 1967 for irrigation purposes, is approximately 20 km northeast of the Project Area. The height of this earth-fill dam is 18,00 m from the riverbed. The lake volume at normal water level is 5,80 hm^3 and the lake area at normal water level is 1,38 km^2. It provides irrigation service to an area of 2,277 hectares. However, from the downstream of the dam, the Tabakhane Stream dries up after a short distance. The location map of both basins and surface water bodies is on Figure 6-20.

[8] General Directorate of Water Management (2022). Update of the Drought Management Plan for Konya Basin. Ankara: Republic of Türkiye Ministry of Agriculture and Forestry, General Directorate of Water Management.

[9] Yılmaz, S. (2010). Project for the Preparation of Watershed Protection Action Plans for Konya Closed Basin. İstanbul: TÜBİTAK Marmara Research Center, Environmental Institute.

[10] Berke, M. Ö., Dıvrak, B. B., & Sarısoy, H. D. (2013). Water Today Report in Konya. WWF Türkiye.

[11] Yılmaz, S. (2010). Project for the Preparation of Watershed Protection Action Plans for Konya Closed Basin. İstanbul: TÜBİTAK Marmara Research Centre Environmental Institute.

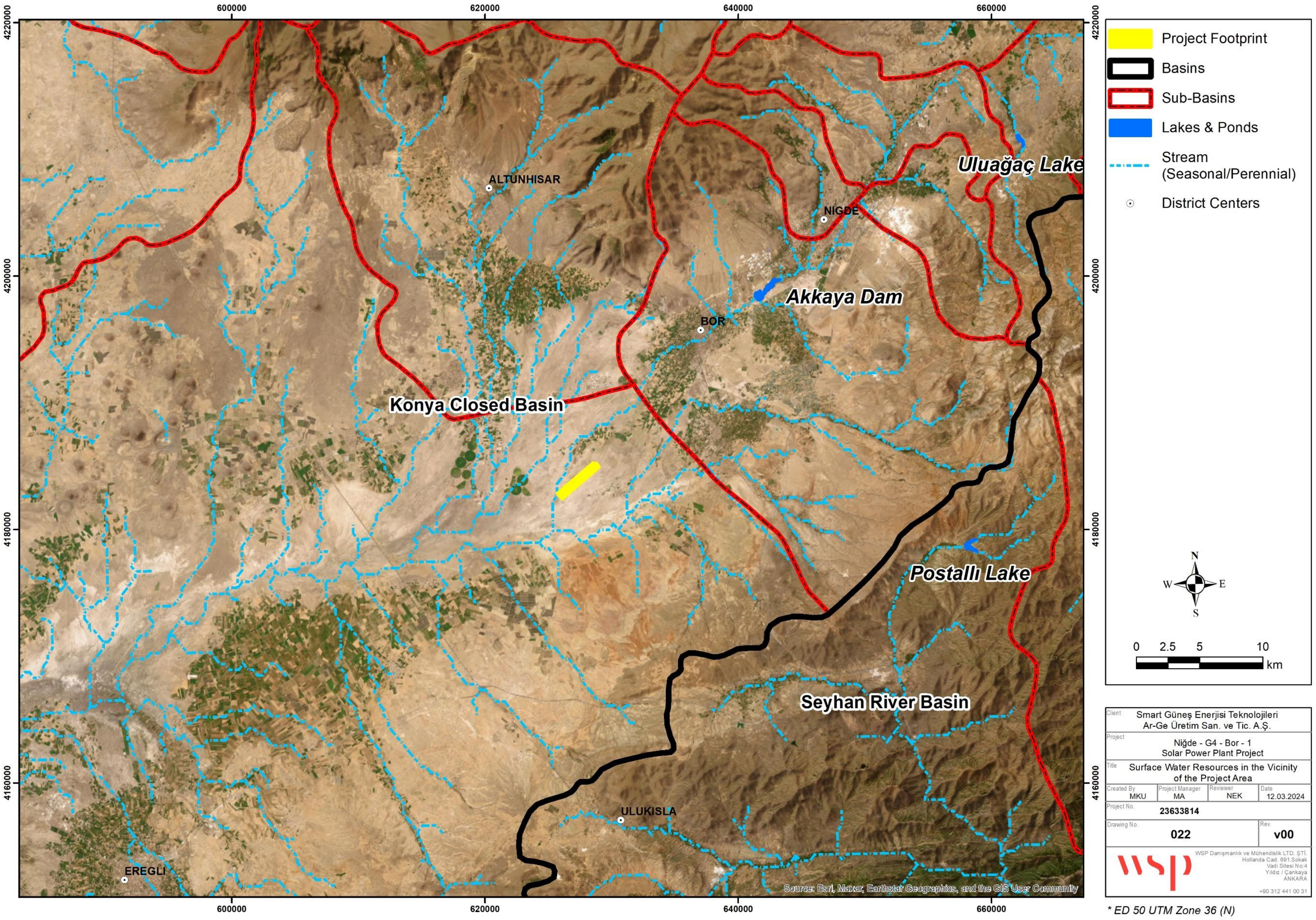


Figure 6-20: The Most Significant Surface Waters Near to the Project Area

Sensitivity Assessment

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

6.1.8 Hydrogeology and Groundwater

Türkiye has been divided into 25 basins by the State Hydraulic Works (SHW) for the management of both surface water and groundwater resources, taking into account geographical factors such as location, climate, and stream network. The Konya Closed Basin, one of these basins, is the focus of the Project. According to the 2019 "Official Water Resources Statistics" from the SHW, the Konya Closed Basin contributes 2597 hm^3/year to Türkiye's total groundwater recharge of 23,032.3 hm^3/year. Additionally, 2023 hm^3/year of Türkiye's 17,815.3 hm^3/year groundwater operating reserve is from this basin.

Despite having only 2% of Türkiye's available surface water resources, the Konya Basin accounts for 17% of the country's groundwater potential. It stands out as the region with the lowest usable surface water but the highest groundwater quantity in Türkiye[12].

The hydrogeology of the Konya Basin is showcased by Bayari et al.'s simplified conceptual model[13] (Figure 6 19). Shallow aquifers and deep aquifers dominate the region. The deep aquifer, which is confined and thermal, consists of Tauride-Anatolite Block and Sakarya Zone Block units overlain by less permeable Paleogene units. The shallow, freshwater aquifer comprises Neogene units and is covered with Quaternary Paleolake Sediments (QPS), with Paleogene and QPS units serving as aquitards[14]. Groundwater flows from the recharge area at the footprints of Taurus Mountains in the southeast towards Salt Lake in the north.

In the Project Area, limestone (Gökbez Formation) is the predominant hydrogeological unit and mostly alternated with clay and sand. The static water level is shallow. The thickness of the limestone (Gökbez Formation) ranges from 50 to 150 meters.

The hydro-stratigraphical map of the Project Area and its surroundings, based on the International Map of Europe (Scale: 1/1,500,000), is given in Figure 6 20.

---

[12] General Directorate of Water Management (2022). Update of the Drought Management Plan for Konya Basin. Ankara: Republic of Türkiye Ministry of Agriculture and Forestry, General Directorate of Water Management.

[13] Bayarı, C. S., Pekkan, E., & Özyurt, N. N. (2008). Obruks, As Giant Collapse Dolines Caused by Hypogenic Karstification in Central Anatolia, Turkey: Analysis of Likely Formation Processes. Hydrogeology Journal.

[14] Bayarı, C. S., Öztürk, N. N., & Kilani, S. (2009). Radiocarbon Age Distribution of Groundwater in the Konya Closed Basin, Central Anatolia, Turkey. Hydrogeology Journal.

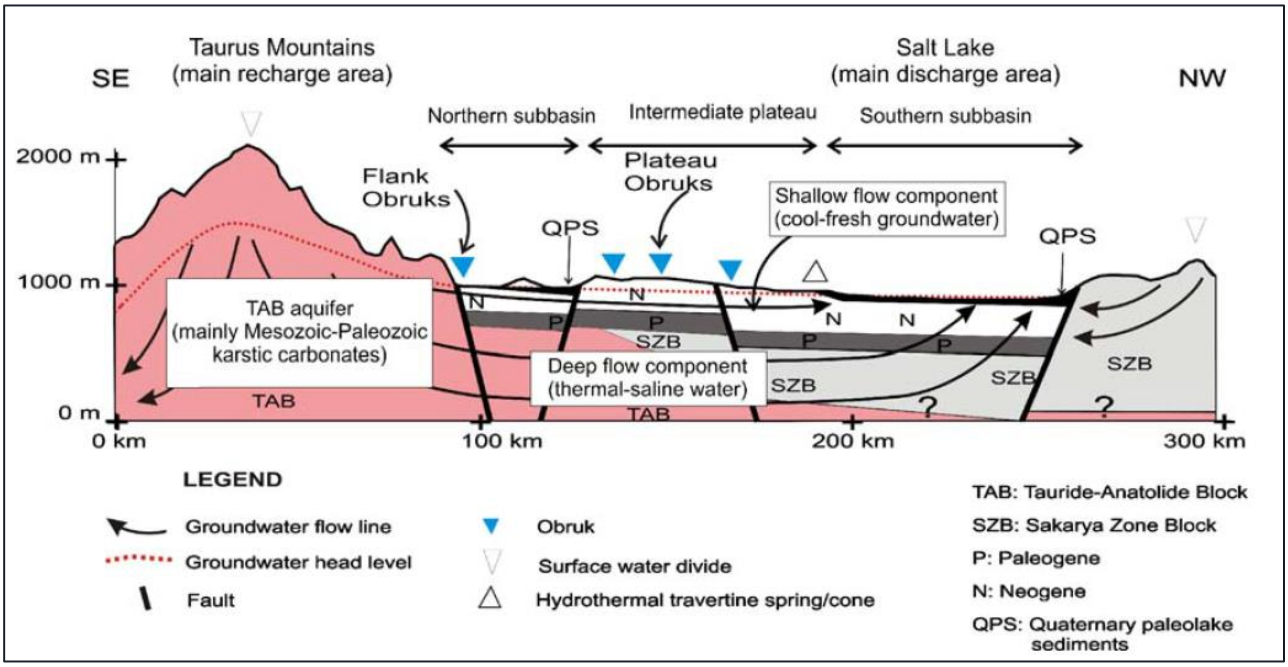


Figure 6-21: Schematic Representation of Groundwater Flow System in the Konya Closed Basin According to Bayarı et al. (2008)

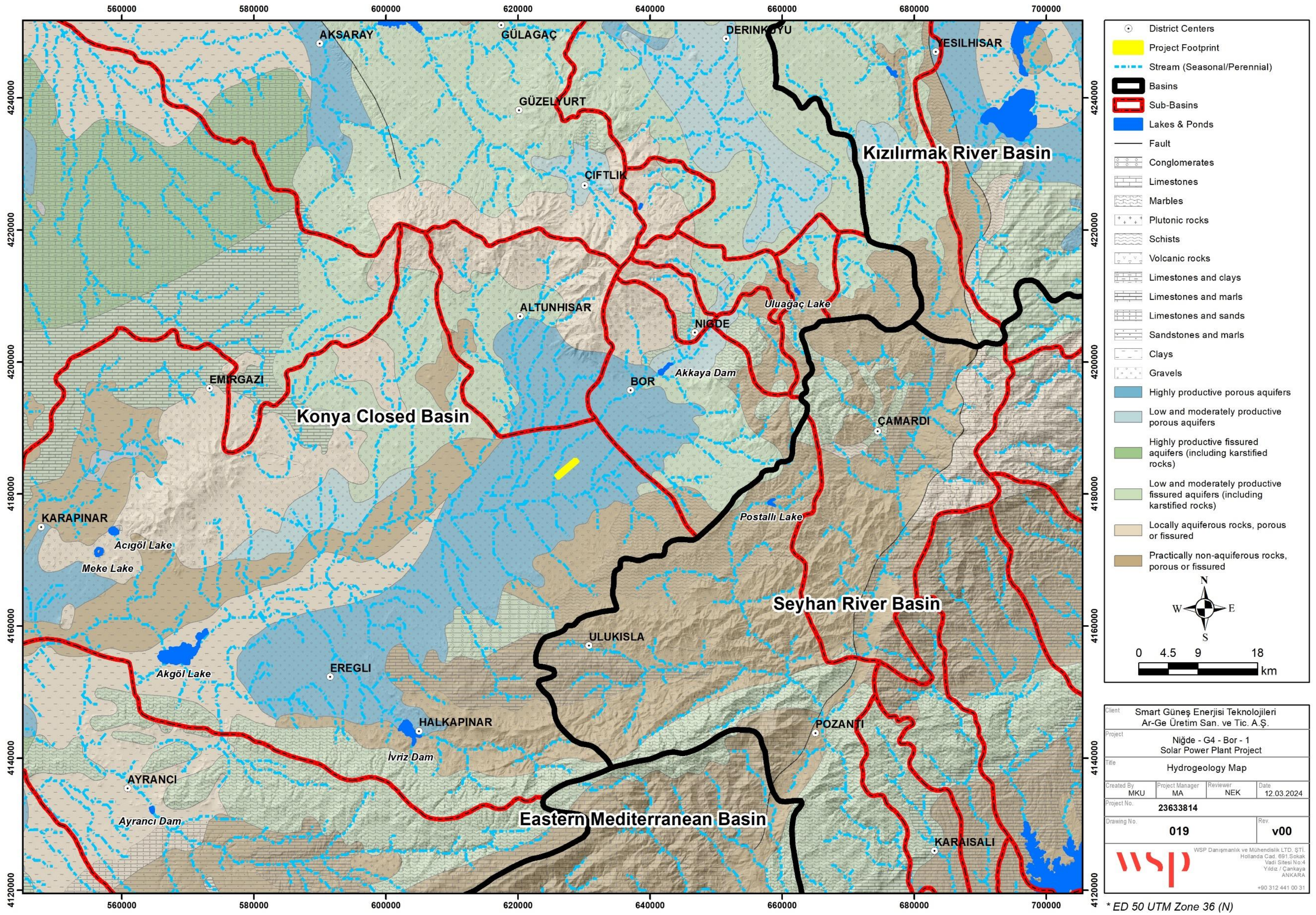


Figure 6-22: Hydrostratigraphical Map of the Project Area and Its Vicinity

According to the Geotechnical Report for the Project, in order to determine the vertical and horizontal distribution of the soil and rocks, 15 boreholes with a depth of 15 m were drilled. Groundwater levels were measured 2 days after the completion of boreholes (Table 6-19).

Within the scope of this baseline, hydraulic head (groundwater elevation above the sea level) contours were drawn using these level measurements (Figure 6-23).

Table 6-19: Groundwater Level Measures from the Geotechnical Boreholes in September 2022

Borehole Name	Coordinates (TUREF TM36, m)		Borehole Depth (m bgs)	Depth to the Water Table (m bgs)	Hydraulic Head (GW Elevation, m ASL)
	X	Y			
SK-1	628557.547	4184990.145	15	3.2	1060.8
SK-2	628114.797	4184660.275	15	3.0	1059.0
SK-3	627701.769	4184296.930	15	2.8	1057.2
SK-4	627310.711	4183962.914	15	2.7	1056.3
SK-5	626924.371	4183663.619	15	2.7	1056.3
SK-6	626578.500	4183354.088	15	2.7	1056.3
SK-7	626295.112	4183063.732	15	2.7	1056.3
SK-8	625948.665	4182771.423	15	2.6	1055.4
SK-9	626797.408	4182253.500	15	2.3	1054.7
SK-10	627168.138	4182684.284	15	2.6	1055.4
SK-11	627578.556	4182950.001	15	2.7	1057.3
SK-12	627861.376	4183257.486	15	2.8	1057.2
SK-13	628341.385	4183502.460	15	2.8	1057.2
SK-14	628640.967	4183821.999	15	2.9	1058.1
SK-15	629053.270	4184208.243	15	3.0	1059.0

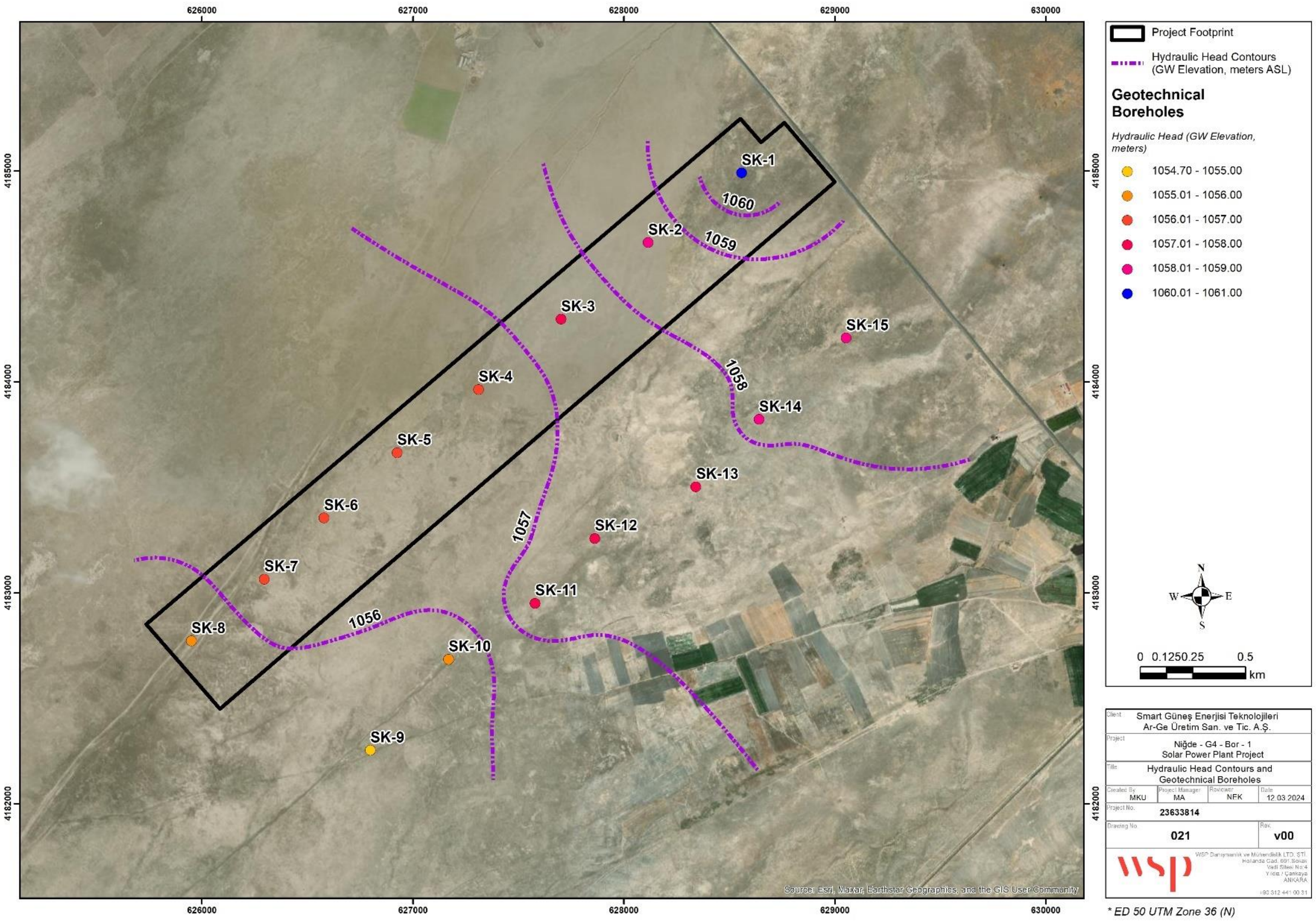


Figure 6-23: Groundwater Level Measurements and Hydraulic Head Distribution According to the Geotechnical Study Conducted

Baseline Groundwater Quality

Within the scope of the Project and its associated facilities, three (3) groundwater wells were selected to evaluate the baseline conditions in the vicinity of the Project Area considering the proximity to the settlements which are likely to be affected. The information on the monitoring points and their locations are provided in Table 6-20. Laboratory analyses were conducted by TÜRKAK accredited FEBAS Laboratory.

Table 6-20: Basic Information on Groundwater Monitoring Locations

Monitoring Location	X (UTM ED50 36N)	Y (UTM ED50 36N)	Type
Organized Industrial Region	629966.442	4192108.135	Fountain of a groundwater supply well
Emen Village	627585.248	4186820.285	Fountain of a groundwater supply well
Seslikaya Village	630575.402	4182938.966	Fountain of a groundwater supply well

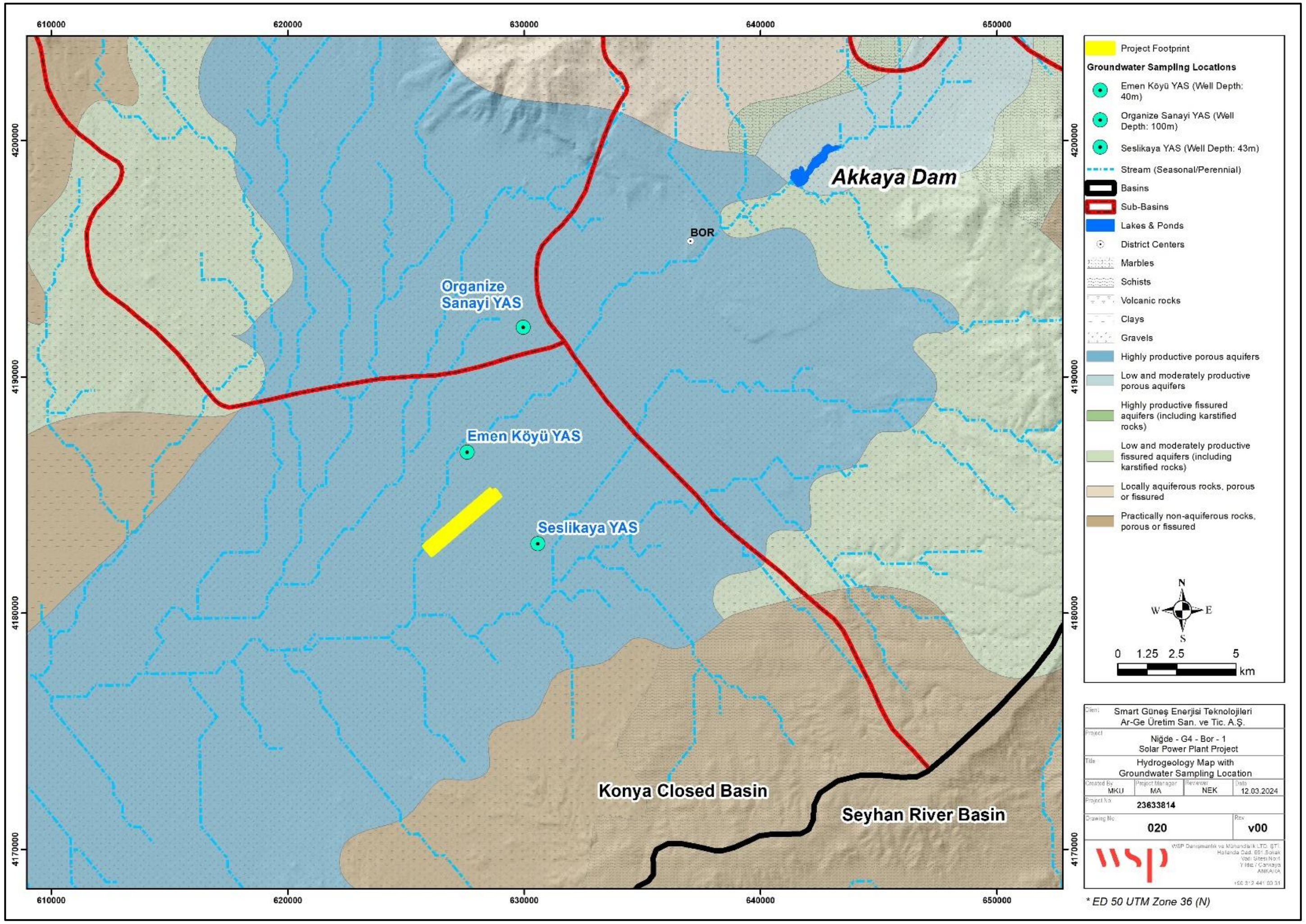


Figure 6-24: Location of the Groundwater Sampling Points

In-Situ Measurements

pH, Temperature, Electrical Conductivity and Dissolved Oxygen were measured by using a multiparameter water quality meter (Table 6-21). According to these measurements, pH values ranged from 7.73 to 8.28. Water temperatures were measured at 13,7°C in Seslikaya Village Supply,14.5°C in Organized Industrial Region and at 14.0 °C at Emen Village. The Electrical Conductivity at 25°C (EC_{25}) values were 1031, 299, and 1317 µS/cm at Seslikaya Village Supply, Organized Industrial Region and Emen Village, respectively. Dissolved Oxygen (DO) values varied between 2,35 and 3,34 mg/L.

Table 6-21: Measured In-Situ Parameters for Groundwater Sampling Locations

Parameter	Seslikaya Village	Organized Industrial Region	Emen Village
Temperature (°C)	13.7	14.5	14.0
pH	8.28	8.26	7.73
Electrical Conductivity @ 25°C (µS/cm)	1031	299	1317
Dissolved Oxygen (mg/L)	2.35	3.34	2.77

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 and drinking water 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
- For drinking water quality standards,
  - “Regulation of Water Intended for Human Consumption” (RWIHC) issued by the Ministry of Health, which was published in the Official Gazette dated 17.02.2005 and numbered 25730 (Amended: RG-20/10/2016-29863)
  - Directive (EU) 2020/2184 of the European Parliament and of the Council of 16 December 2020 on the Quality of Water Intended for Human Consumption (recast)
  - “Guidelines for Drinking Water Quality” developed by World Health Organization (WHO, 2022)

Regulation on the Protection of Groundwater against Pollution and Deterioration

To evaluate groundwater quality, samples were examined in compliance with the Regulation on the Protection of Groundwater against Pollution and Deterioration” (herein after referred as “Groundwater Protection Regulation, GPR”). The 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 condition, 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 6-22.

Table 6-22: Assessment of Groundwater Samples According to GPR

Parameter	Unit	Quality Standards	Seslikaya Village	Organized Industrial Region	Emen Village
Arsenic (Total)	µg/L		76.4	6.14	125
Ammonium	mg/L		<0.026	<0.026	0.026
Cadmium (Total)	µg/L		<0.2	<0.2	<0.2
Chloride	mg/L		4.97	27.3	17.1
Electrical Conductivity @ 20°C	µS/cm		937.27*	271.82*	1197.27*
Lead (Total)	µg/L		<1	<1	<1
Mercury (Total)	µg/L		<1	<1	<1
Nitrite	mg/L		<0.33	<0.33	<0.33
Sulphate	mg/L		13.4	28.2	28.4
Tetrachlorethylene	µg/L		<0.1	<0.1	<0.1
Trichlorethylene	µg/L		<0.1	<0.1	<0.1
Total Phosphorus	mg/L		0.021	0.016	0.050
Nitrate	mg/L	50	18.7	<0.44	30
Total Pesticides	µg/L	0.5	<0.1	<0.1	<0.1

* Calculated by using in-situ measurements of Electrical Conductivity @ 25°C

Drinking Water Standards

In addition to protecting groundwater from deterioration, the drinking water legislation has taken into consideration groundwater that might be used for domestic purposes. The chemical and indicator parameters taken into consideration in the Project Standards and the comparison of limit values with measured concentrations are presented in Table 6-23. In addition to the chemical, physical and radiological parameters of the drinking water, the microbiological parameters also have legislative limits as per RWIHC and the Council Directive 2020/2184.

According to the analysis, arsenic and chromium concentrations exceeded the minimum limit values in Seslikaya Village and Emen Village sampling location. Additionally, the copper concentration in Emen Village and the manganese concentration in Organized Industrial Region exceeded the standard levels. Arsenic values were measured at 76.4 µg/L and 125 µg/L at Seslikaya and Emen Village respectively, chromium values were measured as 34.6 µg/L in both locations. Copper values were measured as 2.45 mg/L at Emen village. Moreover, Taste, Colony count at 22 °C, Colony count at 37 °C, P. Aeruginosa, Sulphite-Reducing Bacteria with Anaerobic Spores and C. perfringens (including spores) values exceeded the standards.

Table 6-23: Groundwater Quality Assessment Summary in Terms of Drinking Water Limits

Parameter	Units	Turkish Standards	EU Standards	WHO Standards	Project Standards	Samples		
						SESLİKAYA VILLAGE	ORGANIZED INDUSTRIAL REGION	EMEN VILLAGE
Chemical Parameters								
1,2-Dichloroethane	mg/L	0.003	0.003	0.03	0.003	<0.0001	<0.0001	<0.0001
Acrylamide	mg/L	0.0001	0.0001	0.0005	0.0001	<0.0001	<0.0001	<0.0001
Antimony	mg/L	0.005	0.01	0.02	0.005	<0.002	<0.002	<0.002
Arsenic	mg/L	0.01	0.01	0.01	0.01	0.0764	0.00614	0.125
Barium	mg/L	-	-	0.7	0.7	0.09	0.033	0.074
Benzene	mg/L	0.001	0.001	0.01	0.001	<0.0001	<0.0001	<0.0001
Benzo(a)pyrene	µg/L	0.01	0.01	0.07	0.01	<0.01	<0.01	<0.01
Bisphenol A	mg/L	-	0.0025	-	0.0025	<0.00032	<0.00032	<0.00032
Boron	mg/L	1	1.5	2.4	1	0.542	0.065	0.62
Bromate	mg/L	0.01	0.01	0.01	0.01	<0.01	<0.01	<0.01
Cadmium	mg/L	0.005	0.005	0.003	0.003	<0.0002	<0.0002	<0.0002
Chlorate	mg/L	-	0.25	0.7	0.25	<0.1	<0.1	<0.1
Chloride	mg/L	250	250	200-300	250	4.97	27.3	17.1
Chlorine	mg/L	-	-	5	5	<0.02	<0.02	<0.02
Chlorite	mg/L			0.7	0.7	<0.1	<0.1	<0.1
Chromium	mg/L	0.05	0.025	0.05	0.025	0.0346	0.011	0.0346
Copper	mg/L	2	2	2	2	0.003	0.011	2.45
Cyanide	mg/L	0.05	0.05	0.07	0.05	<0.005	<0.005	<0.005
Epichlorohydrin	mg/L	0.0001	0.0001	0.0004	0.0001	<0.0001	<0.0001	<0.0001

Parameter	Units	Turkish Standards	EU Standards	WHO Standards	Project Standards	Samples		
						SESLİKAYA VILLAGE	ORGANIZED INDUSTRIAL REGION	EMEN VILLAGE
Fluoride	mg/L	1.5	1.5	1.5	1.5	<0.1	<0.1	<0.1
Haloacetic Acids (HAAs)	mg/L		0.06		0.06	<0.1	<0.1	<0.1
Lead	mg/L	0.01	0.005	0.01	0.005	<0.001	<0.001	<0.001
Mercury	mg/L	0.001	0.001	0.006	0.001	<0.001	<0.001	<0.001
Nickel	mg/L	0.02	0.02	0.07	0.02	<0.002	<0.002	<0.002
Nitrate (as NO_3^-)	mg/L	50	50	50	50	18.7	<0.44	30
Nitrite (as NO_2^-)	mg/L	0.5	0.5	3	0.5	<0.33	<0.33	<0.33
Pesticides Total	mg/L	0.0005	0.0005	-	0.0005	<0.0001	<0.0001	<0.0001
PFAS Total	mg/L	0.0001				0	0	0
Selenium	mg/L	0.01	0.02	0.04	0.01	0.00223	0.00262	<0.001
Tetrachloroethylene	mg/L	0.01	0.01	0.04	0.01	<0.0001	<0.0001	<0.0001
Trichloroethylene	mg/L	0.01	0.01	0.02	0.01	<0.0001	<0.0001	<0.0001
Trihalomethanes Total	mg/L	0.1	0.1	-	0.1	<0.0001	<0.0001	<0.0001
Vinyl Chloride	mg/L	0.0005	0.0005	0.0003	0.0003	<0.0001	<0.0001	<0.0001
Indicator Parameters								
Aluminum	mg/L	0.2	0.2	-	0.2	<0.002	<0.002	<0.002
Ammonium	mg/L	0.5	0.5	-	0.5	<0.026	<0.026	<0.026
Colour		Acceptable to consumers and no abnormal change	Acceptable to consumers and no abnormal change	-		<5	<5	<5

Parameter	Units	Turkish Standards	EU Standards	WHO Standards	Project Standards	Samples		
						SESLİKAYA VILLAGE	ORGANIZED INDUSTRIAL REGION	EMEN VILLAGE
Electrical Conductivity at 20°C (EC_{20})	µS/cm	2500	2500	-	2500	937.27*	271.82*	1197.27*
pH		6.5 - 9.5	6.5 - 9.5		6.5 - 9.5	8.28	8.26	7.73
Iron	mg/L	0.2	0.2		0.2	<0.01	<0.01	<0.01
Manganese	mg/L	0.05	0.05	0.4	0.05	0.025	<0.001	0.00455
Odour		Acceptable to consumers and no abnormal change	Acceptable to consumers and no abnormal change		Acceptable to consumers and no abnormal change	Odourless	Odourless	Odourless
Oxidisability	mg/L O_2	5	5		5	<1	<1	<1
Sulphate	mg/L	250	250		250	13.4	28.2	28.4
Sodium	mg/L	200	200		200	43.4	8.25	54.5
Taste		Acceptable to consumers and no abnormal change	Acceptable to consumers and no abnormal change		Acceptable to consumers and no abnormal change	**Bitter**	Normal	Normal
Total organic carbon (TOC)	mg/L	No abnormal change	No abnormal change		No abnormal change	<4	<4	<4
Turbidity		Acceptable to consumers and no abnormal change	Acceptable to consumers and no abnormal change		Acceptable to consumers and no abnormal change	1.49	0.44	0.57

Parameter	Units	Turkish Standards	EU Standards	WHO Standards	Project Standards	Samples		
						SESLİKAYA VILLAGE	ORGANIZED INDUSTRIAL REGION	EMEN VILLAGE
Microbiologic Parameters								
Colony count at 22 °C	number/mL	20	-	-	20	25	25	5
Colony count at 37 °C	number/mL	5	-	-	5	>300	70	2
E.coli	number/100 mL	0	0	-	0	0	0	0
Enterococcus	number/100 mL	0	0	-	0	0	0	0
P. Aeruginosa	number/100 mL	0	-	-	0	2	0	0
Parasites	number/5 L	0	-	-	0	0	0	0
Pathogenic Staphylococcus	number/100 mL	0	-	-	0	0	0	0
Sulfite-reducing bacteria with anaerobic spores	number/50mL	0	-	-	0	0	6	0
Total Coliform Bacteria	number/100 mL	0	0	-	0	0	0	0
Fecal Coliform Bacteria	number/100 mL	0	0	-	0	0	0	0
C. perfringens (including spores)	number/100 mL	0	0	-	0	1	0	0
Parazites	0/5L	0			0	0	0	0

Irrigation Water Quality Regulations

Both surface waters and groundwater in the AoI have been used as irrigation water by the surrounding villages. Therefore, its quality for use as irrigation water should also be monitored. Soil salinity, as measured by the sodium adsorption ratio (SAR), can have negative impacts on soil permeability and infiltration. When sodium ions are present in soil in exchangeable form, they can replace calcium and magnesium ions that are adsorbed on soil clays. This replacement can cause soil particles to become dispersed, leading to the breakdown of soil aggregates. As a result, the soil may become hard and compact when dry, reducing the infiltration rates of water and air into the soil and negatively affecting its structure. The SAR is a useful metric for quantifying the impact of high sodium ion levels on soil, and is calculated as follows:

$$SAR = \frac{Na^{+}}{\sqrt{\frac{1}{2}(Ca^{2+} + Mg^{2+})}}$$

The salinity diagram developed by the US Salinity Laboratory[15] (Richards, 1954) is widely used for classification of the irrigation waters. According to this diagram, the irrigation waters are classified according to the Sodium Absorption Ratio (SAR) and the electrical conductivity values thereof as presented in Table 6-24.

Based on the groundwater samples, the water in Organized Industrial Region is categorized as C1S1 (low-saline, low-sodium)), while at Seslikaya and Emen Villages is classified as C3S1 (high-saline, low-sodium). (Figure 6-25).

Table 6-24: Irrigation Water Classification

Salinity Hazard Class	EC µS/cm	Irrigation Water Class	Sodium Hazard Class	SAR	Irrigation Water Class
C1	100-250	Low Salinity	**S1**	<10	Low Sodium
C2	250-750	Medium Salinity	**S2**	10-18	Medium Sodium
C3	750-2250	High Salinity	**S3**	18-26	High Sodium
C4	>2250	Very High Salinity	**S4**	>26	Very High Sodium

[15] Richards, L. A. (1954). Diagnosis and Improvement of Saline and Alkali Soils. Washington D.C.: US Department of Agriculture.

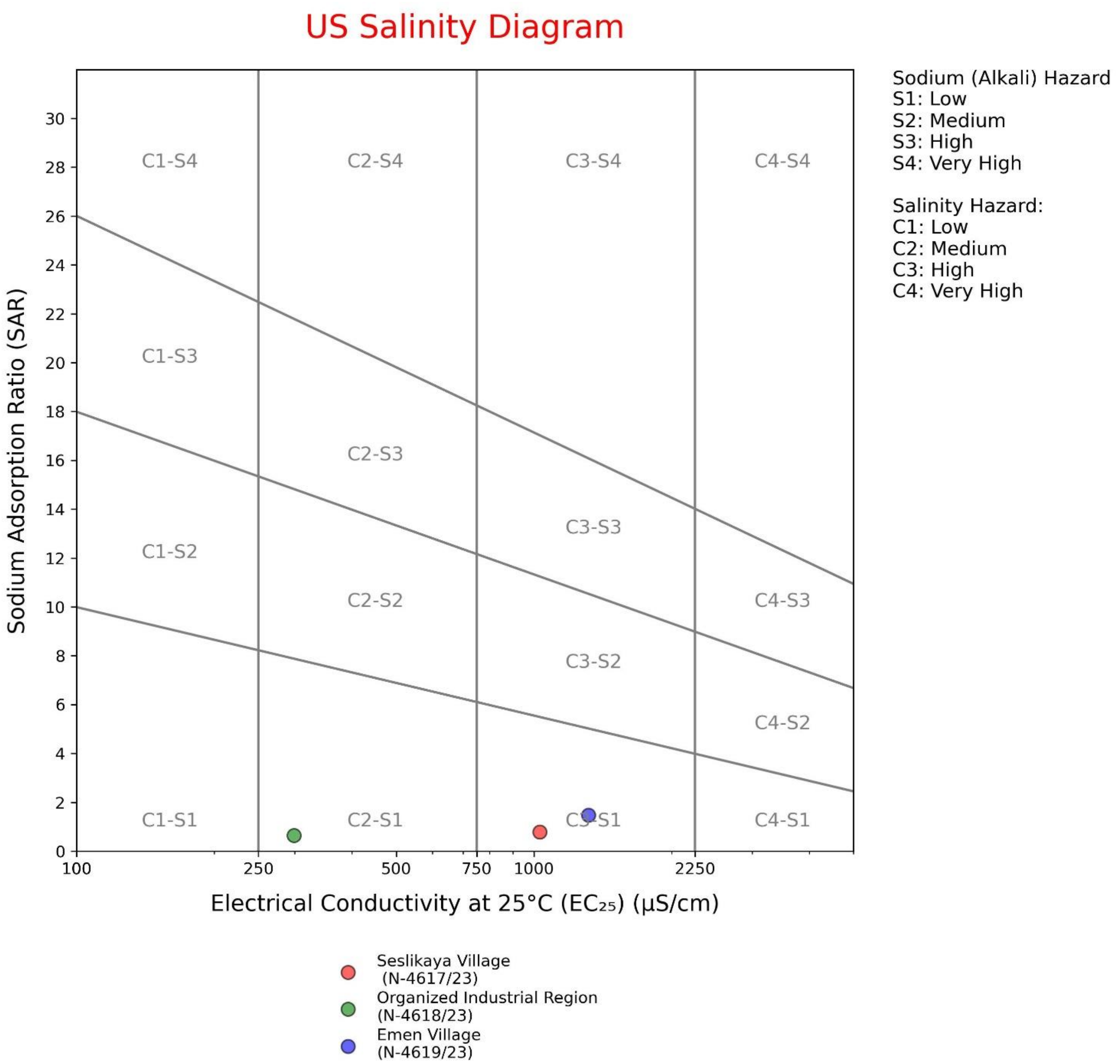


Figure 6-25: US Salinity Diagram for Surface Water Samples

Hydrochemical Characteristics of Groundwaters

In hydrochemistry, several different graphical approaches can depict the abundance or relative abundance of ions in individual water samples. The most common diagram is the Piper diagram, which includes three (3) separate diagrams. The relative abundance of cations with the % meq/L of Na^+ + K^+, Ca^{+2} and Mg^{+2} assumed to equal %100 is first plotted on the cation triangle. Similarly, the anion triangle displays the relative abundance of HCO_3^- + CO_3^{2-}, Cl^- and SO_4^{2-}. Straight lines projected from the two triangles into the quadrilateral field define a point on the third field. To provide some indication of the size of the data point it is sometimes related to Total Dissolved Solids (TDS). With the Piper diagram, samples can be classified according to facies[16] (Figure 6-25).

In light of this information, the concentration values at 3 sampling points (Seslikaya Village, Organized Industrial Region, Emen Village) where major ions were analyzed (Figure 6-26) were plotted on the Piper diagram (Figure 6-27). Before plotting, percentage differences were calculated as they should be less than

[16] Domenico, P. A., & Schwartz, F. W. (1997). Physical and Chemical Hydrogeology - 2nd ed. John Wiley & Sons.

10% for each sample. Accordingly, Seslikaya Village, and Organized Industrial Region samples can be classified as the calcium-carbonate bicarbonate (Ca-CO_3 HCO_3) facies. On the other hand, Emen Village appear to be mixed water.

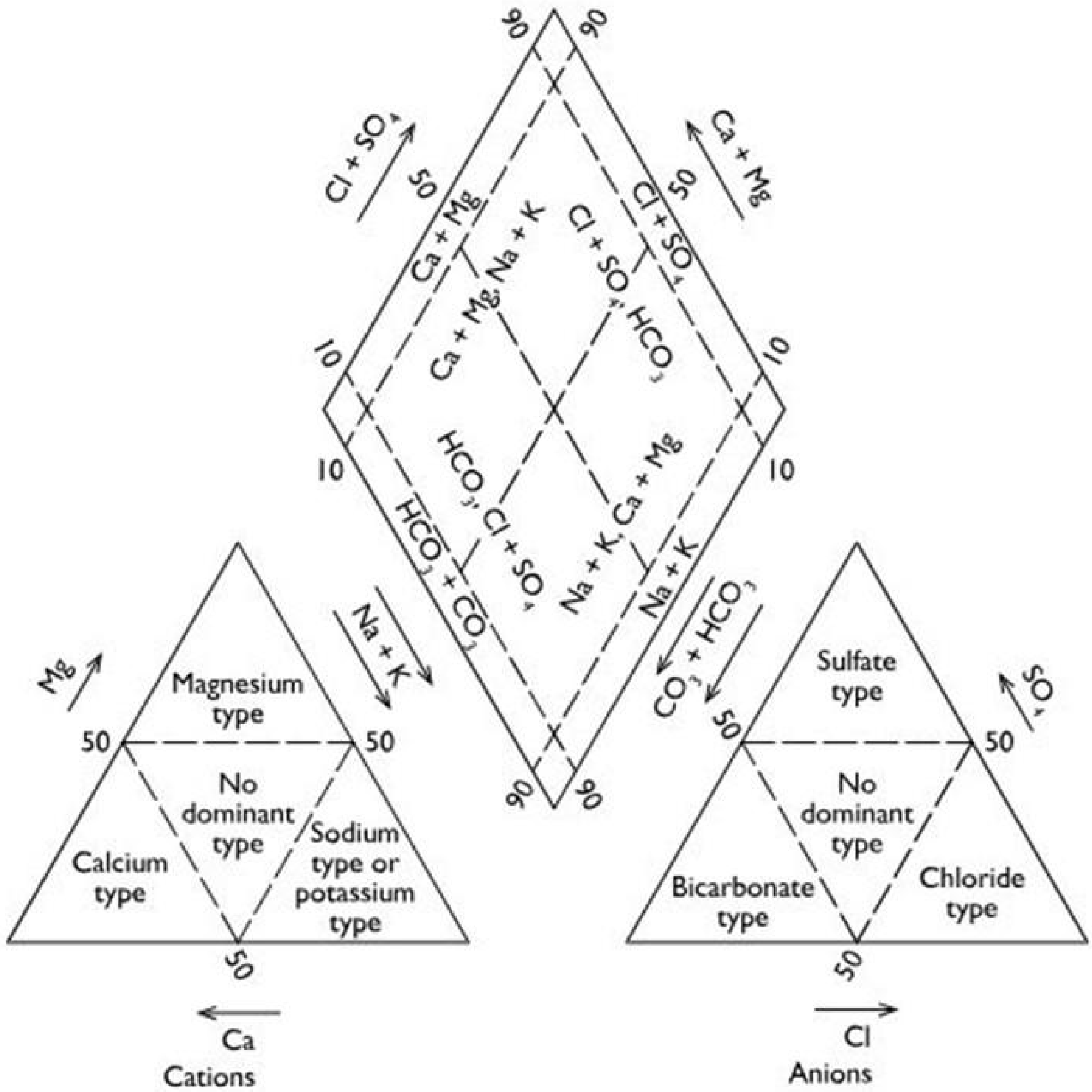


Figure 6-26: Hydrochemical Facies in the Piper Diagram

Table 6-25: Measured Major Ions and TDS for Groundwater Monitoring Points, and Calculated Percentage Difference

Sampling Point	Cations							
	Ca^{2+}		Mg^{2+}		Na^{+}		K^{+}	
	mg/L	meq/L	mg/L	meq/L	mg/L	meq/L	mg/L	meq/L
SESLİKAYA VILLAGE	112	5.59	29.3	2.41	36.1	1.57	6.93	0.18
ORGANIZED INDUSTRIAL REGION	94.1	4.7	18.3	1.51	25.8	1.12	7.64	0.2
EMEN VILLAGE	108	5.39	35.5	2.92	68.7	2.99	14.4	0.37

Sampling Point	Anions							
	HCO_3^-		CO_3^{2-}		Cl^-		SO_4^{2-}	
	mg/L	meq/L	mg/L	meq/L	mg/L	meq/L	mg/L	meq/L
SESLİKAYA VILLAGE	493	8.08	0	0	67.5	1.9	87	1.81
ORGANIZED INDUSTRIAL REGION	355	5.82	0	0	35.8	1.01	33.8	0.7
EMEN VILLAGE	544	8.92	0	0	46	1.3	55	1.15

Sampling Point	Total Cations	Total Anions	%Difference Anion/Cation
	meq/L	meq/L	
SESLİKAYA VILLAGE	9.75	11.79	-9.47
ORGANIZED INDUSTRIAL REGION	7.53	7.53	0
EMEN VILLAGE	11.67	11.37	1.3

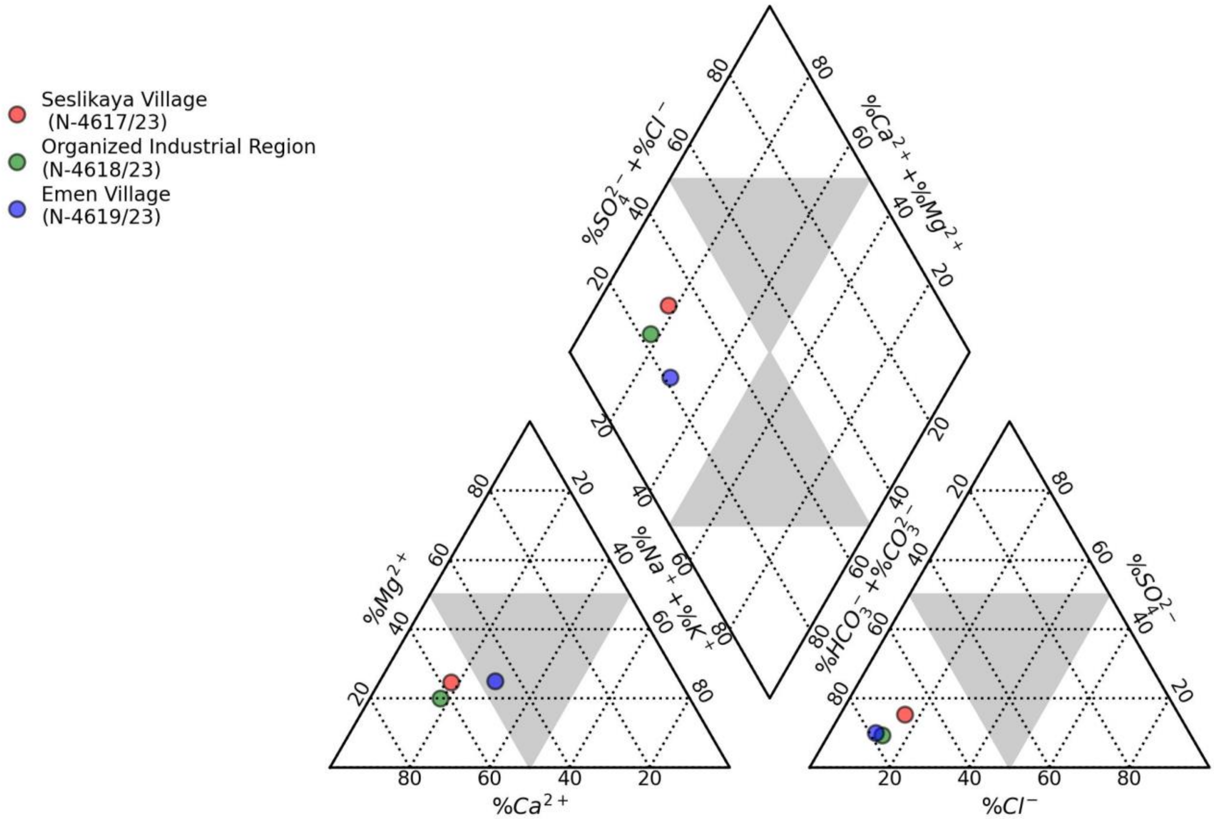


Figure 6-27: Piper Diagram for Surface Water Monitoring Points

Sensitivity Assessment

Sensitivity Features	Supported by	Sensitivity Value
Hydrogeology and Groundwater	Primary Data and Secondary Data	Low

6.1.9 Traffic

Traffic can be defined as activities including transport of materials and people from one location to another location which may lead to traffic load. The nearby receptors (i.e., communities), around the Project Site, potentially exposed to traffic and pollutant emissions.

The Project Area is approximately 26 km away from Niğde City Center and 2.64 km away from Seslikaya district by road.

The distance of the Project Area to the D330 highway, which is the nearest highway to the Project Area, is approximately 5.6 km. Information about the distance to the highways around the Project Area is given in Table 6-26 and Figure 6-28

Table 6-26: Highways around the Project Area

Name of the Highway	Direction	Distance to the Project Area (km)
D330 Niğde-Malatya Road	Northeast	5.6
D805 Niğde-Ulukışla Road	Southeast	10.5
E-90 Adana-Aksaray Highway	Southwest	16.1
O-21 Niğde-Ankara Highway	Southeast	14.9

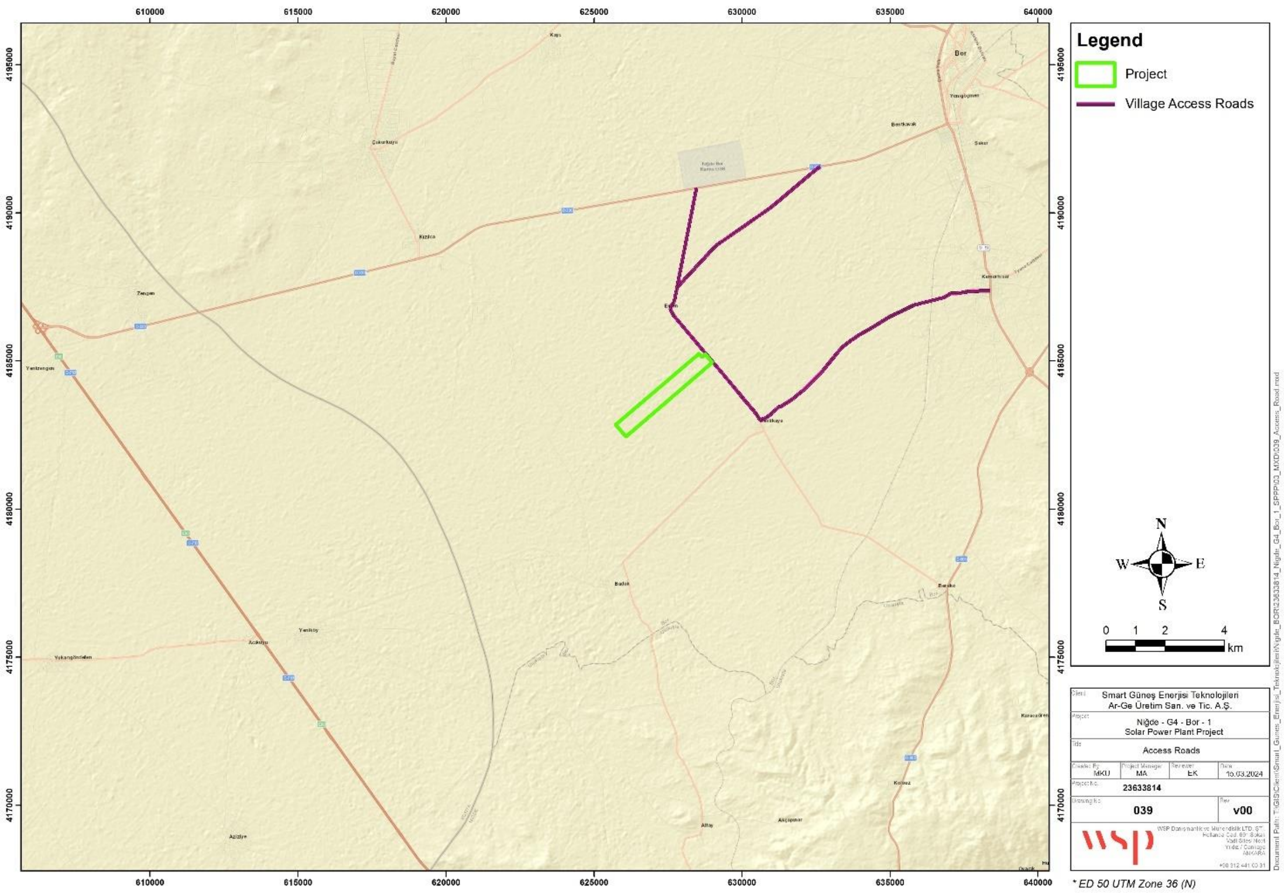


Figure 6-28: Map Showing the Roads to be used to Access the Site

The closest highways providing access to the Project Area are the D330 Niğde - Malatya and D805 Niğde - Ulukışla highways. The Project intends to utilize the D330 Highway within its scope. Figure 6-29 illustrates the existing routes to access the D330 Highway, which passes through the Emen Neighborhood. Residents primarily from Emen, Seslikaya, and Badak Neighborhoods utilize this route. Additionally, neighboring SPP Projects, namely G4-Bor-2 and G4-Bor-3, also utilize the Emen Neighborhood Road to access their respective lands. This road is double-laned with asphalt pavement, hence no road enhancements are anticipated. However, to mitigate risks within the Emen Neighborhood, measures such as speed bumps and convex mirrors are already implemented.

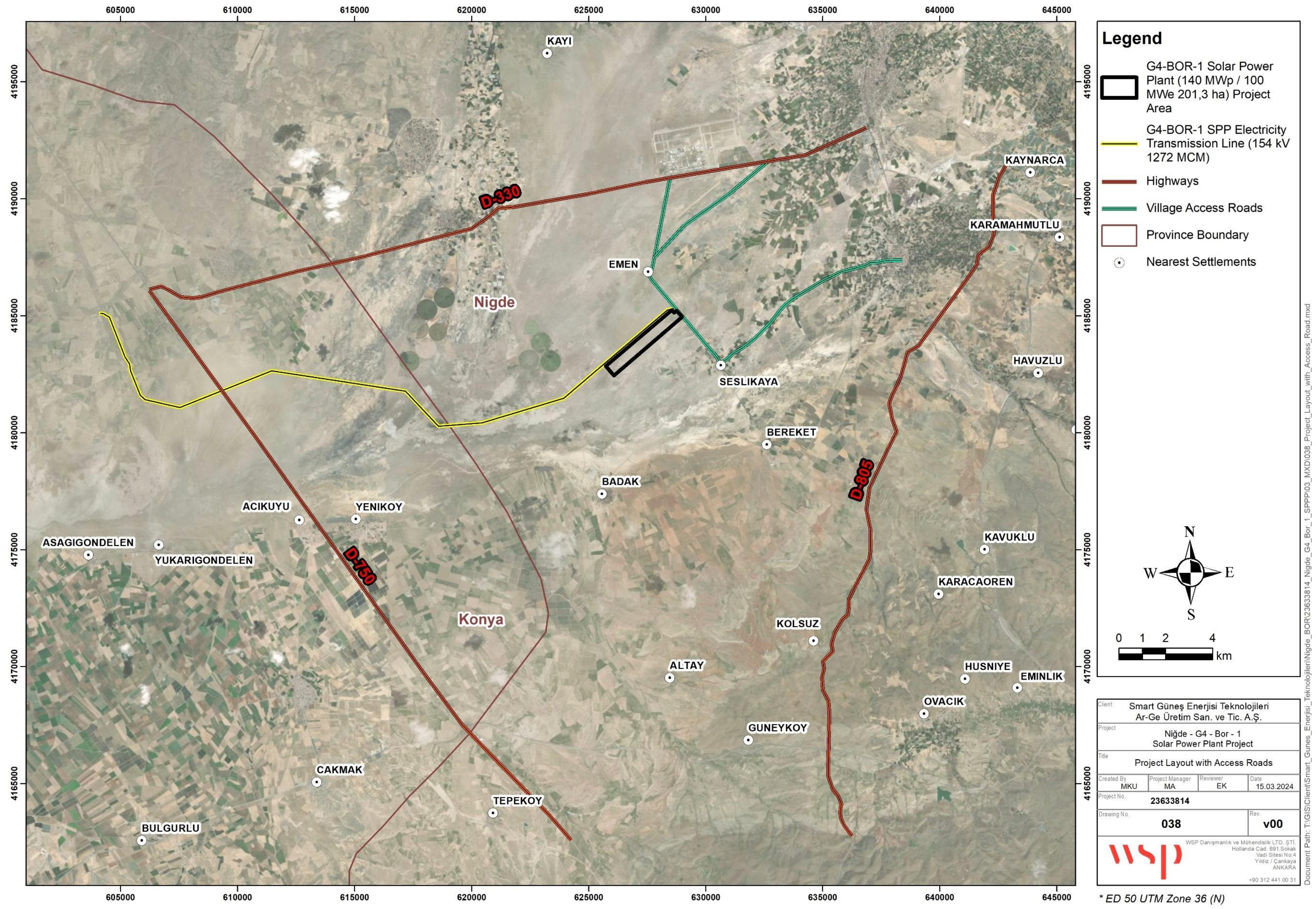


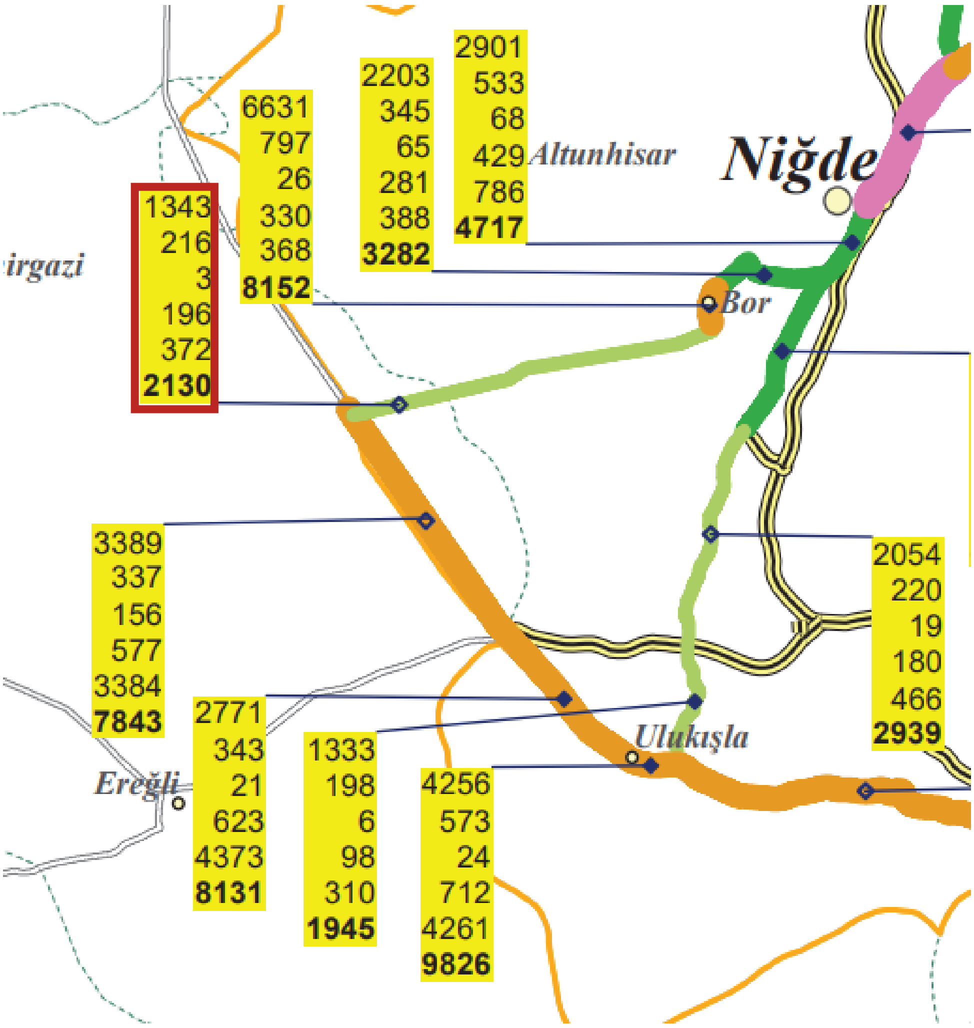
Figure 6-29: Existing Access Roads to the Highways

The General Directorate of Highways releases a regular "Traffic and Access Information" report, which includes yearly average daily traffic figures and transportation details categorized by motorways and state roads. The most recent edition of this report was issued in 2022.The traffic volumes of the nearby highways are given in Table 6-27 and Figure 6-30. Cars, commercial vehicles, buses, trucks and trailers are the main user of these roads.

Table 6-27: The Annual Average Daily Traffic Data of Nearby Highways

Roadway	Car	Medium-Duty Commercial Vehicle	Bus	Truck	Truck+Trailer +Tow Truck + Side Trailer	Total
D330	1343	216	3	196	372	2130
E90	3389	337	156	577	3384	7843

Source:https://www.kgm.gov.tr/SiteCollectionDocuments/KGMdocuments/Istatistikler/TrafikveUlasimBilgileri/22TrafikUlasimBilgileri.pdf



Source:https://www.kgm.gov.tr/SiteCollectionDocuments/KGMdocuments/Istatistikler/TrafikveUlasimBilgileri/22TrafikUlasimBilgileri.pdf

Figure 6-30: Traffic Volume Map

Sensitivity Assessment

Sensitivity features	Supported by	Sensitivity value
Residential Areas in Emen and Seslikaya Neighborhoods The existing roads will be used for access to the site	Primary and secondary data	Medium-High

6.2 Social Components

Social Impact Assessment (SIA) and related baseline collection methodology was developed in accordance with the standards and the requirements of the International Finance Corporation (IFC) Performance Standards (PSs). 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 IFC defines social impact areas as specific areas of focus that encompass the social aspects of a project's impact. These areas are considered crucial for assessing and managing the social sustainability of projects.

Typically, social impact areas include but are not limited to:

Labor and Working Conditions: This area focuses on ensuring fair labor practices, safe working conditions, and decent wages for workers involved in the project.

Community Engagement and Development: It involves engaging with local communities, understanding their needs and concerns, and implementing measures to enhance their well-being and development.

Health and Safety: This area addresses the health and safety risks associated with the project, both for workers and nearby communities, and includes measures to mitigate these risks.

Gender Equality and Social Inclusion: It emphasizes promoting gender equality and social inclusion by ensuring equal opportunities for all stakeholders, regardless of gender, ethnicity, religion, or other characteristics.

Indigenous Peoples' Rights: For projects affecting Indigenous communities, this area focuses on respecting their rights, traditional knowledge, and cultural heritage, and ensuring their meaningful participation and benefit-sharing.

Land Acquisition and Resettlement: In cases where projects require land acquisition or resettlement of communities, this area deals with ensuring fair compensation, livelihood restoration, and community empowerment throughout the process.

Biodiversity and Natural Resources: It involves minimizing the project's impact on biodiversity, ecosystems, and natural resources and implementing conservation and sustainable management practices.

These social impact areas help organizations like the IFC assess the potential social risks and opportunities associated with a project and develop strategies to maximize positive impacts while minimizing negative ones.

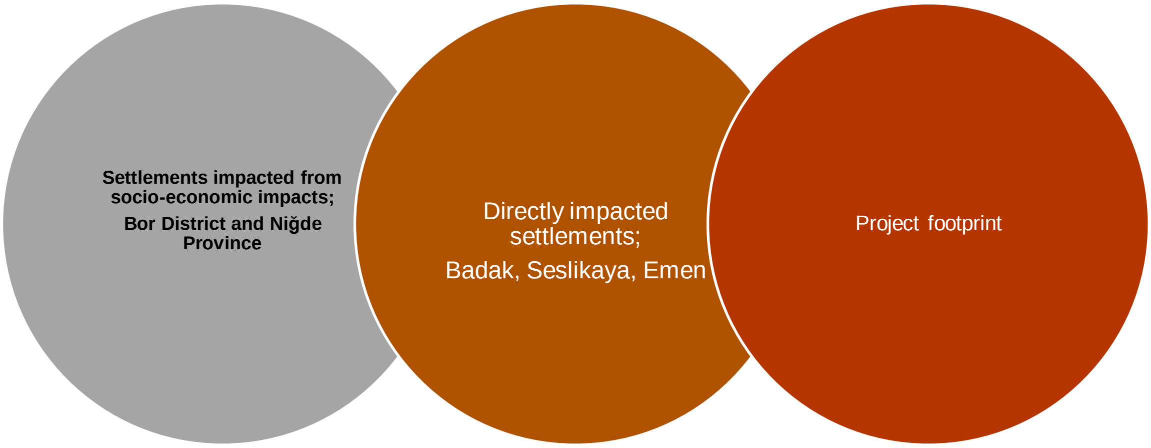


Figure 6-31: Project Area of Influence for G4-Bor-3 SPP, Bor District, Niğde Province

The nearest settlements located in the social area of influence of the Project are presented the figure above.

The social Area of Influence map is provided in Figure 6-32.

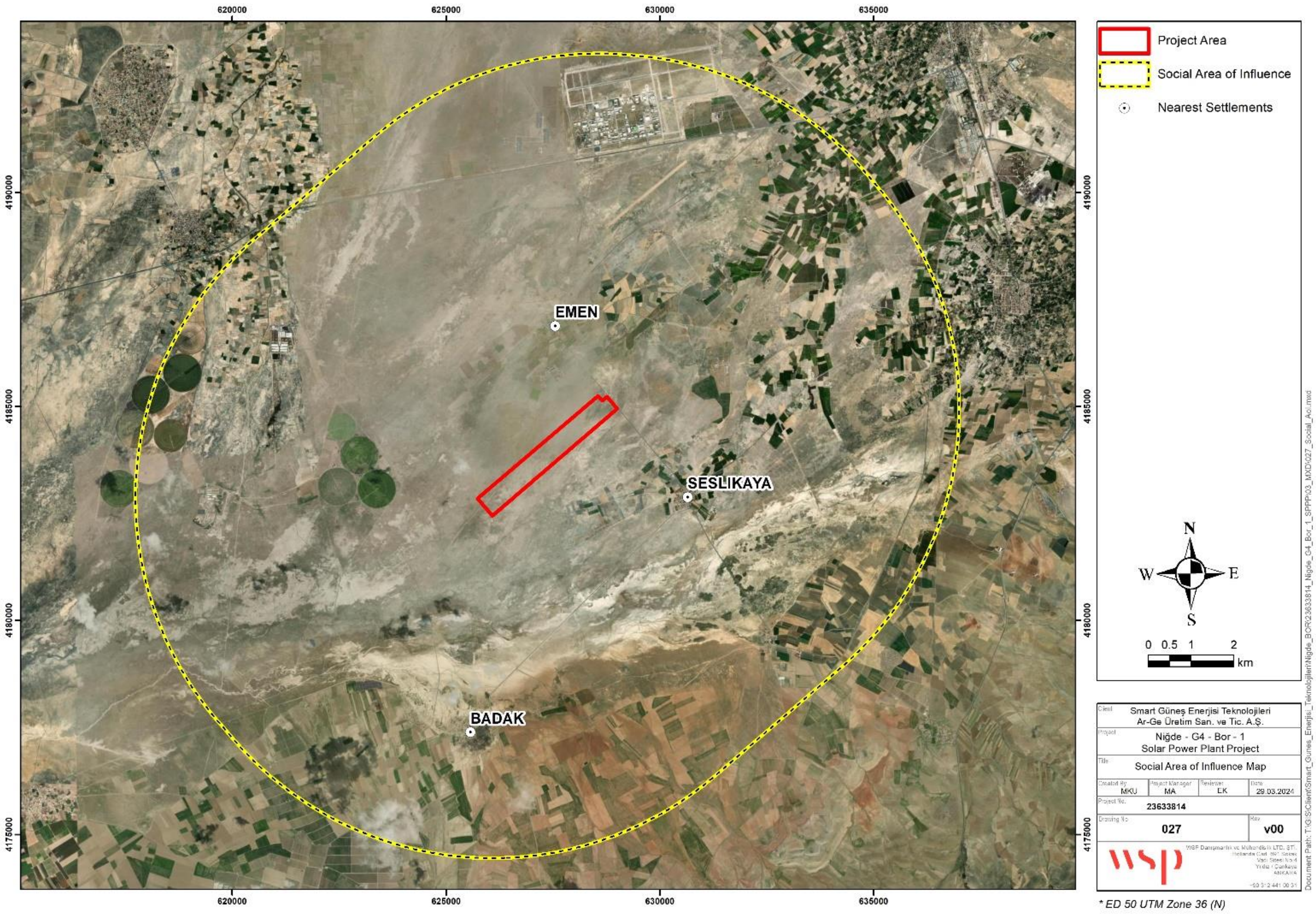


Figure 6-32: Social Area of Influence

6.2.2 Data Collection

6.2.2.1 *Desktop Study (Secondary Data)*

The secondary data used in this study was sourced from various national institutions, including ministries, research institutes, universities, national and local censuses, as well as web-based published reports, assessment reports from local and national non-governmental organizations (NGOs), and project-specific documents such as national Environmental Impact Assessment (EIA) The analysis of this secondary data played a significant role in establishing a common understanding of the Project.

The data was collected from a range of institutional websites, including but not limited to the Niğde Governorship, Niğde Municipality, Turkish Statistical Institution, Niğde Provincial Directorate of Environment and Urbanization and Climate Change, Niğde Directorate of Agriculture and Forestry, and Development Agencies. Field Surveys (Primary Data).

Field surveys were undertaken between March 6th and March 8th, 2024, where institutions, households, and village heads were interviewed.

A total of 37 household surveys were successfully completed during the field visit. These surveys encompassed households from the villages of Seslikaya, Badak, and Emen. Surveyed households represent approximately 17% of the total households.

The total population and the number of households in the settlements collected through the Community Level Surveys are presented in the table below.

Table 6-28: Total population and number of households of the villages

Province	District	Village/Neighborhood	Total Population	Number of Households	Surveyed Households
Niğde	Bor	Seslikaya	180	50	16
		Emen	398	110	11
		Badak	120	58	10
TOTAL				218	37

The field visit provided valuable insights into the local communities and their perspectives on various aspects related to the project. Interactions with households and village heads allowed for a deeper understanding of their needs and challenges.

6.2.2.1.1 Focus Group Discussions (FGD)

FGDs have been designed to engage with specific segments of the community that might require special attention in consultation, e.g., women, youth, elderly, vulnerable people, beekeepers etc. FGDs were used as an effective way to bring together people with similar features to discuss a specific concern/impact related to the Project.

As a result of the desktop review of the current Project, women only FGDs were conducted.

6.2.2.1.2 Site Observations

In addition to the consultation methods mentioned above, social experts also utilize site observations to analyze current practices at the site. This includes examining aspects such as land use, visual impacts, interactions between the client and local communities, management of complaints, and current labor conditions.

6.2.3 Administrative Structure

Provincial Governors: Provincial governors serve as the highest-ranking administrative authority within their respective provinces. They are appointed by the central government and are responsible for overseeing the implementation of policies and directives at the provincial level.

Special Provincial Administrations: Special provincial administrations operate in provinces designated as special administrative regions. They have specific mandates and responsibilities tailored to the needs of these regions, often focusing on economic development, infrastructure, and social welfare programs.

Municipalities: Municipalities within the province are responsible for local governance and service delivery to residents. They manage various aspects of urban and rural development, including infrastructure, public services, and environmental management.

District Governors: District governors are appointed by the provincial governors and serve as the chief administrative officers within their respective districts. They oversee the implementation of government policies and programs at the district level, ensuring efficient governance and service delivery.

District Municipalities: District municipalities operate at the district level and are responsible for local governance within their jurisdictions. They manage municipal services, infrastructure projects, and community development initiatives to meet the needs of residents.

Villages/Neighborhoods: Villages and Neighborhoods serve as sub-administrative units within the districts. They are governed by local councils or leaders who address community-specific issues and represent the interests of their residents.

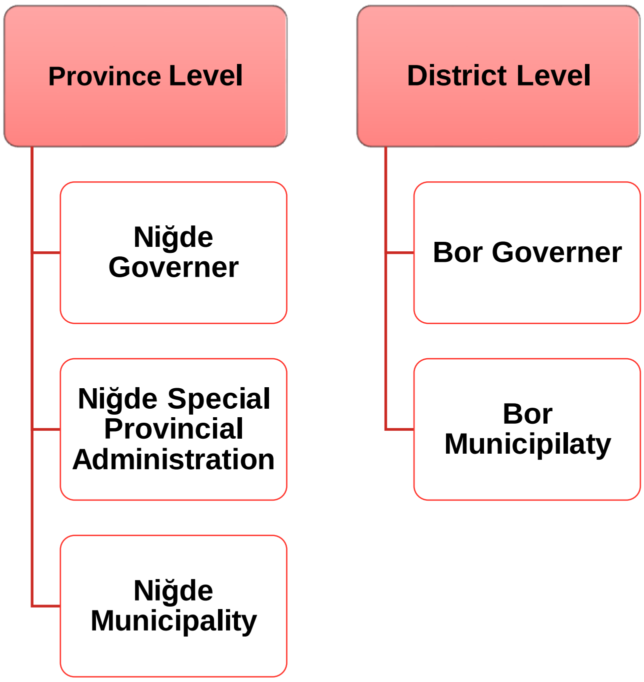


Figure 6-33: Administrative Structure

In reference to Figure 6-33, the following sections expand on the administrative structure.

6.2.4 Population and Demography

6.2.4.1 Introduction

Understanding the population and demography is crucial for comprehending the community's characteristics. Data regarding demographic profiles at both provincial and district levels was gathered from secondary resources. Additionally, information concerning village demographics was acquired through community-level surveys conducted with the Mukhtars.

6.2.4.2 Province and District Level

The population of Niğde in 2023 is 377,080 and has increased by 11,661 compared to the previous year. This population consists of 188,774 males (50.06%) and 188,306 females (49.94%). The Project is situated within the Bor district of Niğde province. The population of Bor was 62,553 in 2023, of which 49.64% is male and 50.36% is female.

In 2023, 59.55% (224,536) of the total population lived in city and town centers, while 40.45% (152,544) resided in villages and towns. Compared to the results of 2022, the number of individuals living in cities decreased by 4,713 in 2023.

The table provides the population of Niğde according to districts in the year 2023, along with the breakdown by gender and the percentage of the total population each district represents.

Table 6-29: Population According to the Districts

Year	District	District Population	Male Population	Female Population	Population Percentage
2023	Merkez	236,864	117,782	119,082	62.82%
2023	Bor	62,553	31,054	31,499	16.59%
2023	Çiftlik	28,780	14,988	13,792	7.63%
2023	Ulukışla	21,044	10,730	10,314	5.58%
2023	Altunhisar	14,225	7,487	6,738	3.77%
2023	Çamardı	13,614	6,733	6,881	3.61%

This table shows the distribution of the population across different districts within Niğde in 2023. The highest population concentration is observed in the central district (Merkez), which constitutes approximately 62.82% of the total population. Bor follows with a population of 16.59%. Çiftlik, Ulukışla, Altunhisar, and Çamardı have comparatively smaller populations, each representing between 3.61% and 7.63% of the total population.

In general, the population of the province consist of individuals from various ethnic groups and cultural backgrounds. Niğde's demographic structure is significantly influenced by a rural population engaged in agriculture and animal husbandry. In contrast, the urban center hosts the population employed in trade, industry, and service sectors.

Another significant factor affecting Niğde's demographic structure is migration. The city serves as a hub for migration from surrounding provinces and rural areas, driven by both employment opportunities and access to education and healthcare services.

Niğde also has a high percentage of youth population, particularly due to the presence of universities, which increase the proportion of young people in the city. This aspect influences cultural and social life in the city, promoting participation in various activities.

6.2.4.3 Village Level

The village level population indicators are provided in the below table.

Table 6-30: Village Level Population Figures

Village	Permanent Residents	Seasonal Residents	Seasonal Change	The reason of the seasonal change	Population change in last 5 years
Seslikaya	50	180	Yes	During the summer, individuals from outside the region come to work as seasonal labourers. However, in the winter months, they reside in Bor center due to heating issues in their villages and to ensure their children have continuous access to educational facilities.	Same
Emen	58	120	Yes		Decreased
Badak	110	398	No	N/A	Increased

Seasonal Population Change and Migration

- Livestock farmers have been observed selling their animals and relocating from Bor town to purchase homes elsewhere. This migration trend has been influenced by various factors, including economic considerations, high inflation rates and housing affordability.
- Increasing the rent prices and increased inflation rates have made it challenging for livestock farmers to afford housing in Bor.
- Due to the inadequacy of minimum wages coupled with increased living costs, many individuals found it financially unsustainable to stay in Bor, prompting their return to rural areas.
- Interestingly, amidst these migration trends, there has been a noticeable shift in the profitability of dairy farming. Dairy farming has become increasingly lucrative in recent times, potentially influencing farmers' decisions regarding their livestock enterprises.

6.2.5 Land issues

6.2.5.1 Introduction

Understanding land use patterns helps identify the types of activities conducted on the land and the common forms of land tenure in the area of influence (AoI). The aim of this section is to reflect on existing land use, including residential areas, existing industry, agricultural areas of Niğde and Bor 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.

6.2.5.2 Province and District Level

Land use patterns

The total land area utilized in Niğde Province amounts to 703,966 hectares. Among the districts within Niğde, the central district stands out as the largest in terms of surface area. The most recent data regarding land use in Niğde is sourced from the 2018 data of the CORINE Land Use Classification System. A breakdown of the land use distribution in Niğde, based on the latest available data, is illustrated in Figure 6-34.

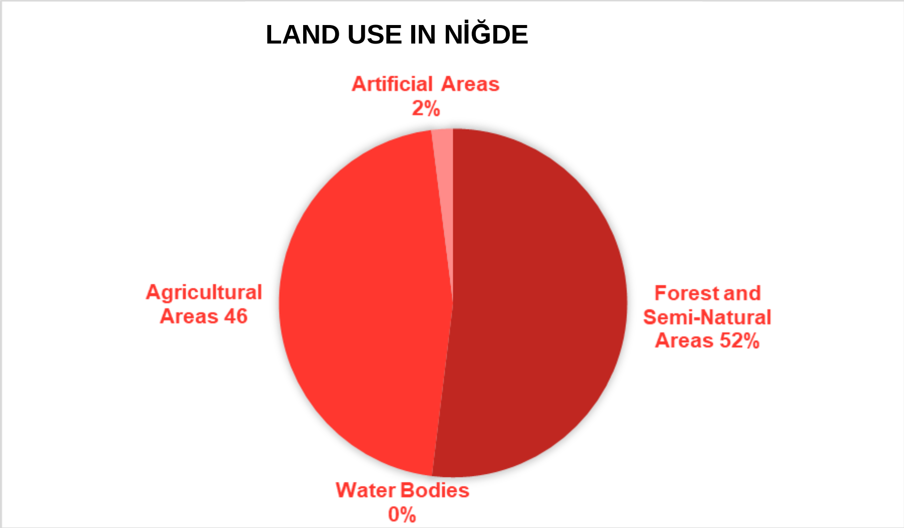


Figure 6-34: Land use in Niğde

In Niğde, the predominant land types include forests, semi-natural landscapes, and agricultural areas, which collectively occupy the majority of the land. Water bodies represent a minor fraction, accounting for only 0.17% of the total land area.

The land use distribution in Bor, based on the 2018 data from the CORINE Land Use Classification System, is depicted in the following figure.

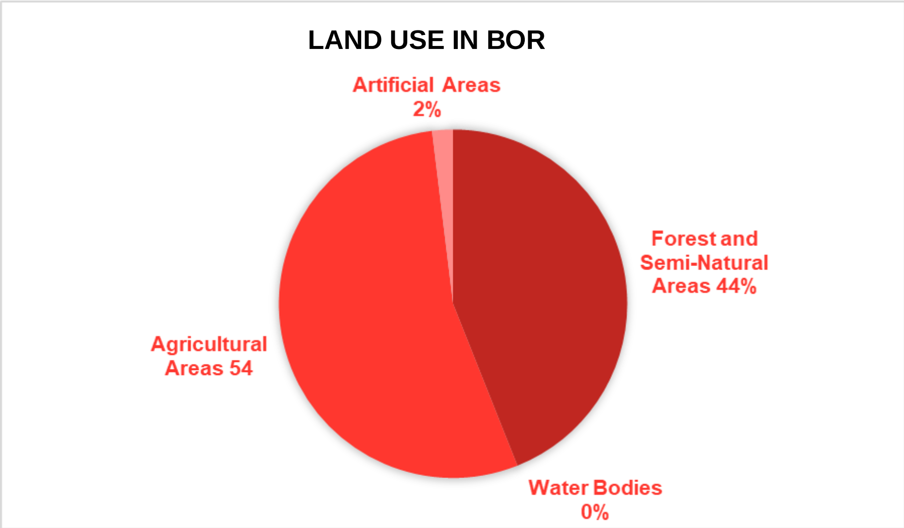


Figure 6-35: Land use in Bor

In Bor, the majority of the land consists of agricultural areas, highlighting the dominance of agriculture in the region. For detailed information on the specific land types in Niğde province (see Table 6-31).

Table 6-31: Land Types in Niğde

Layer	Area (ha)	Percent (%)
Sparse Plant Areas	174,790.20	24.16
Natural Grasslands	128,527.15	17.76
Unirrigated Arable Lands	120,577.84	16.67
Continuously Irrigated Areas	71,086.74	9.83
Mixed Agricultural Fields with Natural Vegetation	61,007.60	8.43
Bare Cliff	33,471.08	4.63
Pasture Lands	32,848.89	4.54
Plant Exchange Areas	31,196.99	4.31
Irrigated Mixed Agricultural Fields	17,282.68	2.39
Unirrigated Mixed Agricultural Lands	12,749.97	1.76
Irrigated Fruit Areas	10,757.82	1.49
Non-Continuous Settlements	6,658.56	0.92
Vineyards	5,632.22	0.78
Coniferous Forests	4,898.73	0.68
Non-Continuous Rural Settlements	2,485.14	0.34
Mineral Extraction Sites	1,654.55	0.23
Broad Leaf Forests	1,452.17	0.20
Industrial and Commercial Units	1,377.94	0.19
Construction Sites	1,246.15	0.17
Mixed Forests	1,172.18	0.16
Marshes	798.14	0.11
Highways, Railways and Related Fields	598.13	0.08
Water Bodies	504.01	0.07
Unirrigated Fruit Fields	441.01	0.06
Continuous City Structure	248.52	0.03
Waterways	52.32	0.01

Source: (Niğde Land Use, 2018)

The Bor district encompasses a total land area of 152,209 hectares, of which 2,931 hectares are designated for settlement. The majority of the Bor district consists of forest and semi-natural areas, accounting for 54% of the total land, while agricultural lands cover approximately 44% (see Table 6-32).

Table 6-32: Land Distribution inf Bor District

Layer	Area (ha)	Percent (%)
Sparse Plant Areas	38,828.02	25.51
Unirrigated Arable Lands	35,962.91	23.63
Natural Grasslands	25,645.95	16.85
Pasture Lands	16,076.57	10.56
Continuously Irrigated Areas	13,649.72	8.97
Mixed Agricultural Fields with Natural Vegetation	6,773.14	4.45
Irrigated Mixed Agricultural Fields	3,767.12	2.47
Vineyards	2,262.34	1.49
Irrigated Fruit Areas	2,239.63	1.47
Plant Exchange Areas	2,195.64	1.44
Unirrigated Mixed Agricultural Lands	1,606.38	1.06
Discontinued Rural Settlements	995.63	0.65
Non-Continuous Settlements	904.25	0.59
Industrial and Commercial Units	356.66	0.23
Mineral Extraction Sites	343.68	0.23
Highways, Railways and Related Fields	190.42	0.13
Bare Cliff	144.83	0.10
Construction Sites	140.84	0.09
Unirrigated Fruit Fields	127.07	0.08

Source: (Niğde Land Use, 2018)

6.2.5.3 Village Level

The Project will be in Türkiye, Niğde Province, in the Bor District, Seslikaya neighbourhood. Project location map is given in Figure 3-5

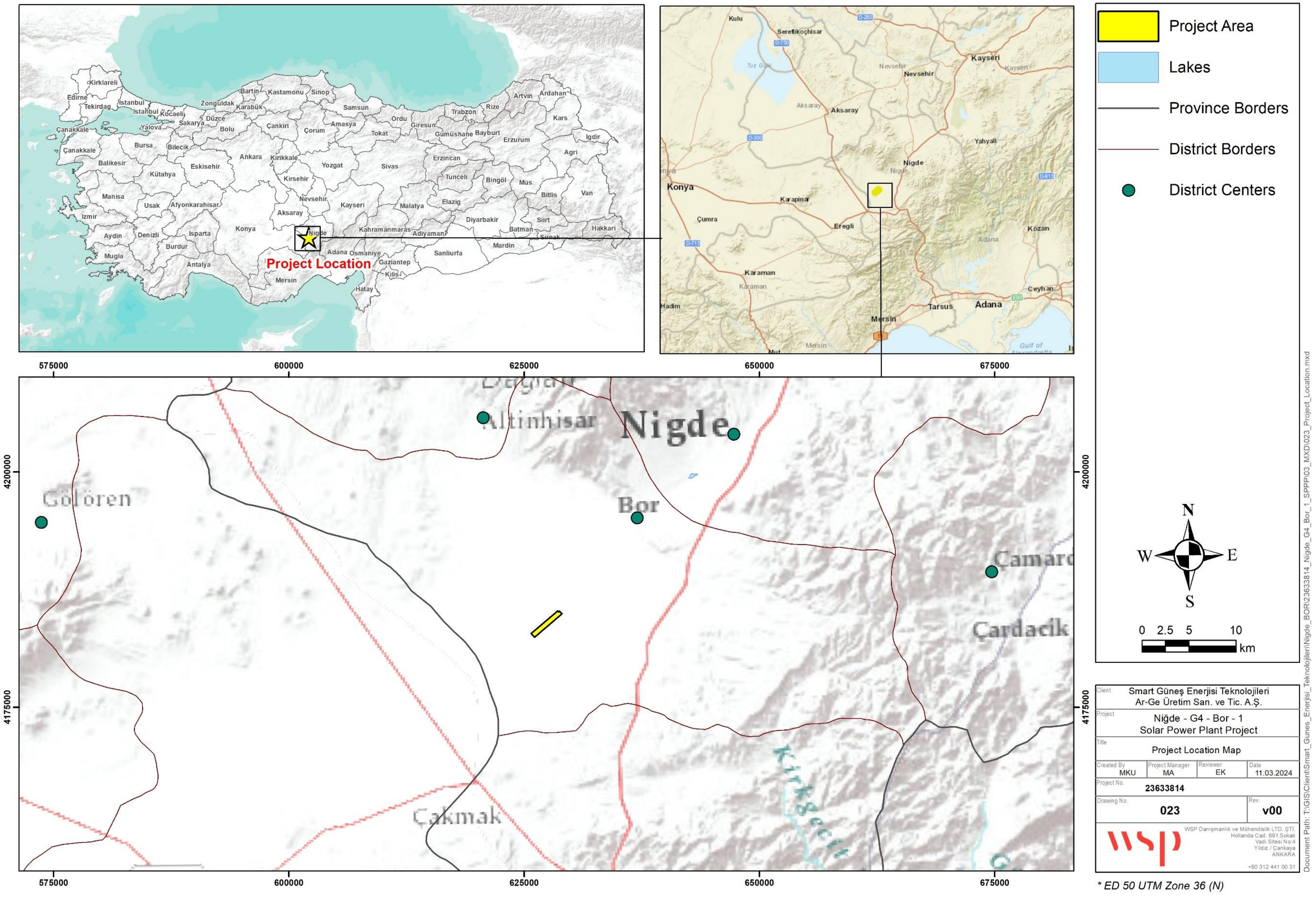


Figure 6-36: Project Location

The Project is set to be developed on a 201.3 ha of former pastureland. Designated as an "Industrial Zone" in the 1/100,000 Scale Environmental Plan, the Project site falls within the borders of the "Niğde-Bor Energy Specialized Industrial Zone."

The existing roads will be used during construction and operation phases of the Project and no link road is planned (see Figure 3-6). Since no heavy-load transportation beyond the standard road transportation limitations is planned within the scope of the Project, road improvements requiring construction are not considered necessary for the transportation of construction materials and equipment. The Project will include the design and construction of permanent on-site roads within the project area, intended for operational use throughout the project's lifespan.

The closest settlements to the Project area, Seslikaya Neighbourhood (2.64 km away), Emen Neighbourhood (1.92 km away), and Badak Neighbourhood (5.08 km away) and their proximity to the Project are presented in Figure 3-6.

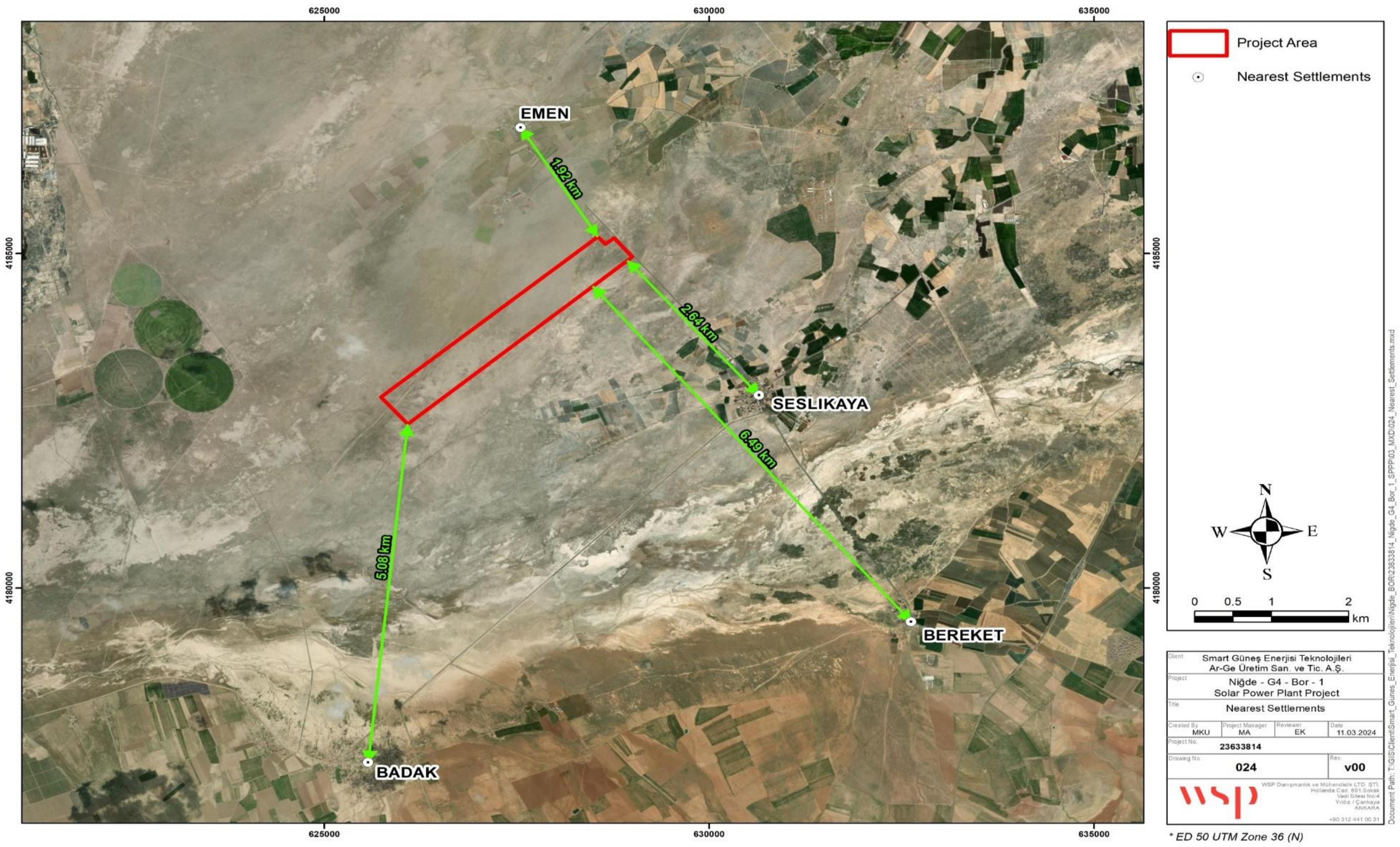


Figure 6-37: Nearest Settlements to the Project Area

6.2.6 Economy and Livelihoods

6.2.6.1 Introduction

This section of the report provides primary and secondary economic activities, utilization of ecosystem services, employment patterns, and pertinent issues concerning the economy and livelihoods within the AoI. The data presented herein has been sourced from reports issued by TURKSTAT and the Turkish Employment Agency, supplemented by Community Level Surveys and Household Surveys. The economy and employment constitute pivotal social facets essential for comprehending the living conditions of the local populace and discerning prevailing economic trajectories. Within this section, an exposition of the economic landscape and employment trends within Niğde province and the Bor district is provided.

6.2.6.2 Province and District Level

In Niğde province, as of 2023, there are a total of 604 industrial establishments registered in the Industrial Registry System. According to the 2022 Annual Business Register data, the industrial sector in the province reached a total turnover of 18,519,875,621.39 TL. Out of this turnover, 73,848,144.12 TL was generated from foreign sales. The prominent sectors in the region have been identified as follows: food industry (22.27%), textile product manufacturing (12.74%), mining and quarrying (14.12%), and plastics, chemical products, and recycling industry (14.90%).

In 2023, the export products from Niğde province include fresh fruits and vegetables, calcite, yarn, and plant protection products (pesticides). The top export destinations are Azerbaijan, Ukraine, EU countries, Iraq, and Syria.

The imported products to Niğde province in 2023 include cotton, copper pipes, soapstone, and yarn. The top importing countries are Azerbaijan, EU countries, Iran, Uzbekistan, and Greece.

Mining exploration studies conducted in Niğde and its vicinity have resulted in the discovery of metallic ores such as gold, antimony, copper-lead-zinc, mercury, iron, and tungsten deposits, as well as industrial raw materials including diatomite, gypsum, marble, and brick-tile materials.

In Niğde province, 47.99% of the cultivated areas are used for irrigated agriculture. According to the 2023 TURKSTAT data, Niğde ranks first in potato production, second in wheat and cabbage, third in dry beans and apples, sixth in tomato paste production, seventh in cherry production, eighth in nectarine and pumpkin production in terms of production quantity in Türkiye.

6.2.6.3 Village Level

The table below outlines the primary, secondary, and tertiary income sources for the villages of Seslikaya, Emen, and Badak.

Table 6-33: Income Sources of the villages

Village	1st Income	2nd Income	3rd Income
Seslikaya	Agriculture	Livestock	Pension
Emen	Agriculture	Livestock	Pension
Badak	Livestock	Agriculture	Pension

- Seslikaya: Agriculture and livestock farming are the primary sources of income in Seslikaya, with pension being a supplementary source. This indicates a reliance on traditional agricultural practices for livelihood, supplemented by retirement benefits.
- Emen: Similar to Seslikaya, Emen relies heavily on agriculture and livestock farming as primary income sources. Pension serves as an additional income stream, suggesting a reliance on retirement benefits to support household finances.
- Badak: Livestock farming takes precedence as the primary income source in Badak, followed by agriculture. Pension serves as a supplementary income source, indicating a reliance on retirement benefits alongside agriculture and livestock farming.

Agricultural products cultivated at each village are presented in the below table.

Table 6-34: Agricultural Products Cultivated at the Villages

Villages	Beet	Barley	Wheat
Seslikaya	4000 ton	150 ton	150 ton
Emen	5000 ton		
Badak	1000 ton	500 ton	400 ton

Number of the animals at each village is provided in the below table.

Table 6-35: Number of Animals per Village

Villages	Bovine	Sheep
Seslikaya	100	700
Emen	500	1000
Badak	700	1500

6.2.7 Vulnerable Groups

6.2.7.1 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.

6.2.7.2 Province and District Level

According to the report published by the Niğde Governorate in 2024, both in-kind and cash assistance have been provided to the following categorized vulnerable groups. The number of individuals, households, and the amount of assistance provided are presented in the table below.

Table 6-36: Vulnerable Groups in Niğde

Assistance Type	Aid Type	Number of Individuals	Number of Households	Assistance Amount (TL)
Conditional Education Aid	Cash	4,648	2,588	2,394,095.00
Conditional Health Aid	Cash	1,786	1,280	1,010,625.00
Other Family Aid	Cash	1,411	397	412,800.00
Conditional Pregnancy Aid	Cash	26	26	23,100.00
Food Aid	Cash	7,614	2,111	2,770,500.00
Aid to Needy Soldier Families	Cash	53	53	108,500.00
Assistance Program for Women whose Husbands Passed Away	Cash	319	317	1,621,500.00
Disabled Relative Allowance	Cash	164	148	1,480,004.26
Education Material Aid	Cash	1	1	1,000.00
National Household Visit Assistance Program	Cash	50	14	7,000.00
Disability Allowance	Cash	1,343	1,223	15,637,162.05
Elderly Allowance	Cash	2,473	2,012	30,579,334.00
Electricity Consumption Support Aid	Cash	8,173	8,170	7,229,761.86
One-Time Aid	Cash	23	0	13,300.00
One-Time Aid	In-kind	965	0	1,188.59
Social Integration Aid for Foreigners	Cash	789	786	6,712,700.00
Transportation Expenses Support Program	Cash	87	84	31,707.00
Contribution Payment Aid	Cash	3	3	797.02
Natural Gas Consumption Support	Cash	1,984	1,984	1,803,600.00
Emergency Basic Needs Aid (Earthquake)	Cash	2,104	525	995,000.00
Funeral Aid	Cash	42	42	51,462.63
One-Time Education Material Aid	Cash	2	0	1,000.00
Other Education Aid	Cash	927	919	760,700.00

Assistance Type	Aid Type	Number of Individuals	Number of Households	Assistance Amount (TL)
Household Goods Aid (Shelter Aid)	Cash	9	2	13,500.00
Full Closure Social Aid Program	Cash	3	3	3,300.00
Pandemic Social Support Program	Cash	20	20	20,000.00
General Support Project	Cash	56	56	56,000.00
Türkiye Family Supports Program	Cash	8,521	8,503	51,380,050.00
Fire Aid	Cash	9	9	18,200.00
Starting Work Aid	Cash	2	2	6,672.00
Aid for Needy Soldier's Child	Cash	1	1	350.00
Orphan Aid	Cash	63	37	179,400.00

6.2.7.3 Village and Neighbourhood Level

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

Table 6-37: Vulnerable groups in the Villages located in the AoI

Settlement	Illiterate	Cannot speak Turkish	Seasonal worker	Mobile beekeeper	Afghan Residents	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.)
Emen	1	0	5	0	0	3	5	0	0	0	1	0	0	0	6
Seslikaya	5	0	35	0	4 households (approximately 20 people in total and 5 of them became Turkish citizen)	6	5	0	0	0	1	1	2 households (temporary)	2	0
Badak	2	0	15	0	0	7	4	0	2	0	1	0	20 people (temporary)	20	

6.2.8 Education

6.2.8.1 Introduction

This section offers foundational data concerning the Project's impact area, encompassing education facilities, personnel, education quality, literacy levels, access to higher education, and local challenges. Baseline information is presented from the provincial to the Project's impact level. Data from secondary sources and Ministry of Education reports are utilized for provincial and district-level data, while primary information is employed for establishing the baseline of education at the village level.

6.2.8.2 Province and District Level

At the provincial level, there are five national education directorates providing services in Bor, Altunhisar, Çamardı, Çiftlik, and Ulukışla. The numbers of schools operating in the province are as follows:

Table 6-38: District Level Education Figures

District	Number of Schools	Number of Students	Number of Classes	Branch	Teacher	Student per Class	Student per Branch	Student per teacher
Center	205	50,223	2,425	2,935	3,698	20	23	13
Altunhisar	20	1,728	170	100	153	10	17	11
Bor	71	12,126	795	604	1055	15	20	11
Çamardı	22	1,503	142	119	148	10	12	10
Çiftlik	39	4,921	317	233	343	15	21	14
Ulukışla	25	1,608	151	127	172	10	12	9
Total	382	72,109	4,000	4,118	5,569	18	21	12

The province also has a university which was established in 1992. The university boasts a wide range of academic and administrative staff, along with numerous faculties, colleges, vocational schools, institutes, and a conservatory. Niğde Ömer Halisdemir University has 12 faculties, 3 colleges, and 6 vocational schools offering education in various disciplines. Additionally, it hosts 4 institutes where academic research and postgraduate programs, including master's and doctoral degrees, are conducted. With approximately 960 academic staff and 507 administrative staff, the university provides services to support educational and research activities in various fields and manage administrative tasks. Moreover, University accommodates over 28,000 students. These students pursue undergraduate, graduate, and doctoral programs and participate in various academic and social events.

6.2.8.3 Village and Neighbourhood Level

There are no schools in the village of Seslikaya. The 8 students in the village rely on a transportation-assisted educational system to attend schools in Bor district.

Similarly, Emen Village does not have a school. All 20 students in the village continue their education through a transportation-assisted system, traveling to schools outside the village.

Due to its larger population compared to other villages, Badak Village hosts both a kindergarten and a primary school. However, students go to Bor for middle and high school education. The total number of students in Badak Village is 24.

6.2.9 Health

6.2.9.1 Introduction

The analysis of health issues and facilities is geared towards identifying the primary health determinants within the AoI, assessing the presence of healthcare structures, and evaluating the level of services extended to local communities. This section presents the health indicators specific to Niğde, Bor, and the surrounding local Area of Influence. The data presented herein has been compiled from household surveys, key informant interviews, and pertinent secondary data sources.

6.2.9.2 Province and District Level

Healthcare facilities and personnel

In Niğde, healthcare services are provided through institutions owned and operated by the Ministry of Health as well as private healthcare facilities. Statistical information pertaining to healthcare personnel is summarized in the table below.

Table 6-39: Healthcare Personnel Distribution in Niğde: Private Hospitals vs. Ministry of Health Facilities

Healthcare professionals	Ministry of Health	Private Facilities	Total
Physician	210	46	256
General practitioner	262	8	270
Total physician	472	54	562
Dentist	56	40	96
Nurse	1182	23	1205
Pharmacist	23	121	144
Medical personnel	1098	34	1132
Other staff	370	115	485

6.2.9.3 Village Level

During the social field study, inquiries were made regarding the quality of healthcare services at the local level. It was observed that there are no primary healthcare units in Emen, Seslikaya, and Badak. Physicians visit these villages every 15 days; however, those who were interviewed consider these visits insufficient, as the service is available for only a few days each month. Consequently, residents seek healthcare services in Bor. There are no common health diseases, reported during the interviews, in the villages located in AoI.

6.2.10 Utilities, infrastructure, and services

6.2.10.1 Introduction

This section presents data concerning the infrastructure and services within the Project's AoI, encompassing housing, water sources, wastewater and sanitation systems, electricity, heating sources, waste disposal facilities, fire services, police services, telecommunication networks, transportation systems, and public spaces and recreational amenities. Infrastructure and services serve as pivotal social components that facilitate the understanding of the existing infrastructure within the AoI, accessibility for local communities, and the quality of services provided. Baseline information regarding Niğde and Bor districts situated within the AoI is presented based on data collected from both secondary and primary sources.

6.2.10.2 Province and District Level

Water sources (drinking, utility, irrigation)

- All of the drinking water supplied to the central district of the Niğde province is sourced from underground aquifers. Currently, there are 40 active wells in operation.
- All of the drinking water supplied to the Bor district center is sourced from underground aquifers. There are currently 13 active wells in operation, from which all of the drinking water is extracted.

Waste disposal

Currently, solid waste generated within Niğde province is transported to the Hıdırlık site Solid Waste Landfill Facility, located 7 km from the city center, utilizing the sanitary landfill method. The Solid Waste Landfill Facility has been completed and was commissioned in 2013. The facility comprises three lots, all of which are ready for use. Presently, only the first lot is operational. Waste distribution of the solid wastes of the province is provided in the below chart.

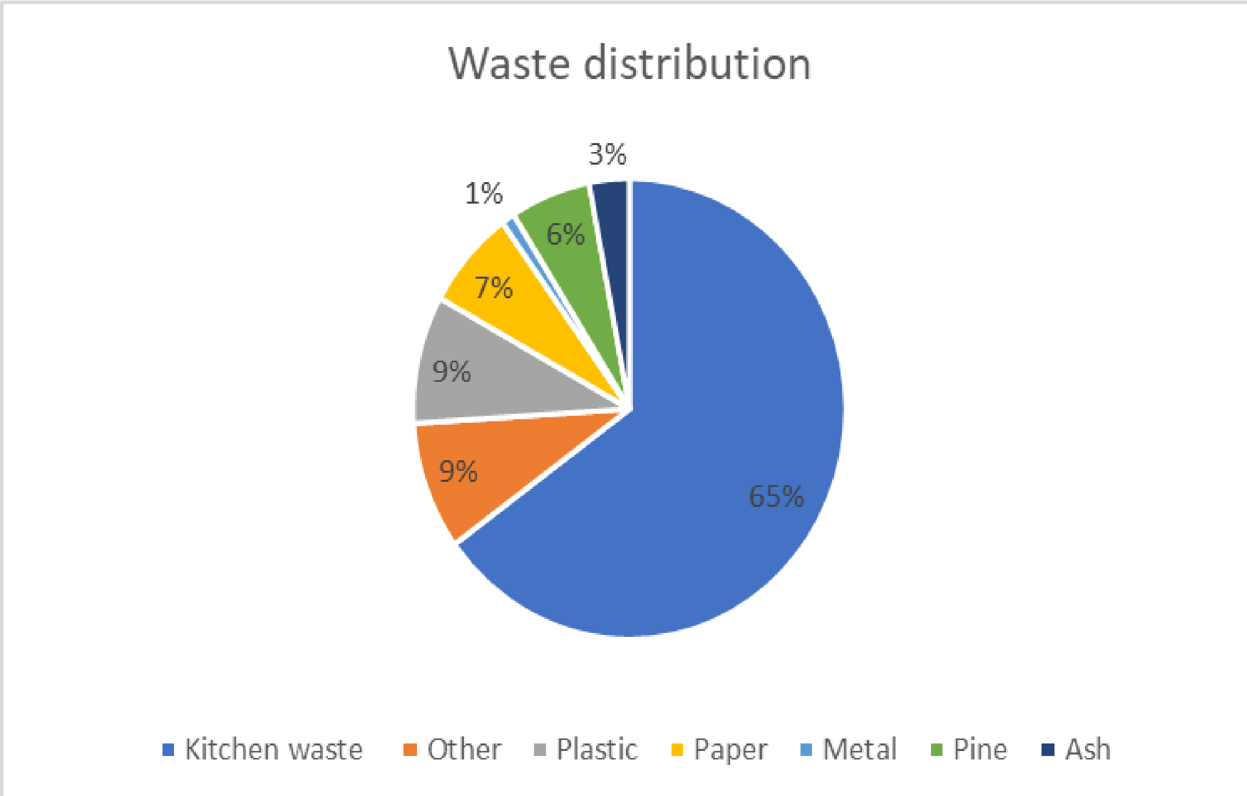


Figure 6-38: Waste distribution in Niğde

Transportation

Highway

Niğde falls under the jurisdiction of the 6th Regional Directorate of Highways, encompassing an area of 52,560 km². This region includes the provinces of Kayseri, Kırşehir, Nevşehir, Niğde, and Yozgat, as well as portions of Konya, Aksaray, Sivas, Kırıkkale, Malatya, and Adana. According to the official website of the 6th Regional Directorate of the General Directorate of Highways, the region is responsible for maintaining 165 km of motorways, 212.3 km of state roads, 245 km of provincial roads, totalling 593 km of road infrastructure. The population of the TR71 region stands at 1,630,050, with a density of 51 individuals per km² and 72 vehicles per km². The total number of registered vehicles within the region's boundaries is 725,000.

Table 6-40: Road Network in Niğde Province

Road Network by Surface Type (km)								
	Asphalt Roads			Parquet	Stabilized	Soil	Other Roads	Network Length
	Asphalt Concrete	Surface Coating	Total					
Motorway	163	-	163	-	-	-	-	163
State Road	113.4	98.9	212.3	-	-	-	-	212.3
Provincial Road	48.2	191.6	238.8	-	-	-	-	241.9
Total	324.6	290.5	615.1	-	-	-	-	617.2

Source: (General Directorate of Highways, 2023)

Railway

The railway in Niğde province was constructed in 1932. The Ulukışla station serves as a significant junction point. With approximately 200 kilometers of railway throughout the province, according to Turkish State Railways data, around 173 thousand people have utilized this line within the year 2023**.**

Airway

Due to the absence of an airport in Niğde, passengers utilize Kayseri Airport, located 140 kilometers away from the city. With direct or connecting transportation options from the airport, it is possible to reach the center of Niğde in approximately 1 hour and 50 minutes.

6.2.10.3 Village Level

The table below presents the findings from the Community Level Surveys regarding the presence and adequacy of infrastructure, utilities, and services in the settlements.

Table 6-41: Infrastructure, utilities and services in the Villages – Community Level Survey Outcomes

Village	Electricity	Drinking Water	Domestic water source	Irrigation source	Sewage	Heating Source	Waste disposal	Mobile phone network	Internet infrastructure	Roads	Health quarry	School	Mosque	Cemetery
Seslikaya	After the construction of the new Energy Transmission line, it became sufficient.	The water quality of the well water which has been used for drinking is not sufficient. As a result, all households have water treatment systems	Same with the drinking water source	The village has an irrigation cooperative and it has 20 active members. Well water has been used for irrigation.	Sufficient	Turf Coal Wood	Provincial special administration is collecting weekly and it is sufficient	Sufficient	Sufficient	Sufficient	Family doctor visits twice in a month	None	Sufficient	Sufficient
Emen	Daily electric outages are a problem	Sufficient	Same with the drinking water source	Each household has wells in their agricultural lands.	Sufficient	Turf	Provincial special administration is collecting weekly and it is sufficient	Network is not working sufficiently	There is no internet network	Village roads are narrow and damaged due to the construction of the previous Solar Power Plant projects. Since Smart is planning to start construction, and the roads are still not repaired and the villagers have complaints.	Family doctor visits twice in a month	None	Some parts of the mosque is damaged and the villagers request it is repaired, as a CSR project	Sufficient
Badak	Daily electric outage is a problem	The water level of the village is decreased. Currently the village is using solar as an electricity source for the well water however considering the decreased water levels, electricity costs increased considerably. The villagers requested a battery for the solar power of the well as a corporate social responsibility project	Same with the drinking water source	Each household has wells in their agricultural lands.	Sufficient	Coal	Provincial special administration is collecting weekly and it is sufficient	Network is not working sufficiently	There is no internet network	Sufficient	Family doctor visits twice in a month	None	Sufficient	Sufficient

6.2.11 Cultural Heritage

During the assessment of potential impacts of the Project on cultural heritage, Project footprint including access roads and ETL (as an associated facility) are considered. According to EIA report of the Project, no potential impacts on cultural heritage are expected inside the Project footprint including access roads. Also, there is no overlap of ETL with archaeological sites based on the information acquired from the official letter (numbered 3101278) of Konya Cultural Heritage Conservation Regional Board Directorate in 02.11.2024 which was presented in EIA Report of ETL. The details regarding opinions are as explained below.

According to Environmental Impact Assessment (EIA) Report prepared for the Project in 21.10.2022, it is determined that within the scope of Annex-V Sensitive Areas of the EIA Regulation; national parks, nature parks, wetlands, wetlands, natural areas, biogenetic reserve areas, biosphere reserves, **natural sites and monuments, archaeological, historical and cultural sites,** special environmental protection areas, etc. are not located within the project area.

On the other hand, according to EIA Report (dated 24.05.2023) prepared for the ETL that will be the associated facility of the Project, an official letter (numbered 3101278) has been acquired from Konya Cultural Heritage Conservation Regional Board Directorate in 02.11.2024. According to this letter following statements are presented as EIA Opinion;

"In the report dated 02.11.2022, registration number 1694013, prepared by the experts of our Directorate as a result of the research of our archive records and on-site examinations; It has been stated that there are no movable and immovable cultural assets that need to be protected that can be evaluated within the scope of Law No. 2863 on the section of the energy transmission line within the borders of Konya Province, Ereğli District.

However, it is stated that within the working corridor around the line, there is Mezarlı Höyük (Yeni Zengen Mezarlı Höyük), which was registered as a Grade I Archaeological Site with the decision of the Konya Regional Board for the Protection of Cultural Assets dated 30/06/2014 and numbered 2099, and Mezarlı Höyük, which was registered as a Grade I Archaeological Site with the decision of the same board dated 20.10.2017 and numbered 4829. It has been stated that there is no objection in terms of Law No. 2863 and the relevant Legislation in the implementation of the part of the energy transmission line within the borders of Konya Province, Ereğli District, and that if any cultural heritage is encountered during the applications to be made, the relevant local authority or museum directorate should be notified within three days at the latest in accordance with Article 4 of the same law. In the event that the line is relocated for any reason and hits registered mounds, since the issue will be evaluated by the Board, information and documents indicating the reasons for the change were requested to be sent to our Directorate."

With the evaluation of this opinion in EIA Report (2023), it is stated that in the event that any cultural heritage is encountered during the applications to be carried out, the relevant local authority or museum directorate would be notified within three days at the latest in accordance with Article 4 of Law No. 2863, and in case the line was relocated for any reason and hits registered mounds, information and documents indicating the reasons for the change would be submitted to the Konya Regional Directorate for the Protection of Cultural Assets, since the issue would be evaluated by the Konya Regional Directorate for the Protection of Cultural Assets.

Currently, the construction of the power transmission line has been completed and no cultural heritage assets was encountered during the construction phase.

Sensitivity assessment

Sensitivity features	Supported by	Sensitivity value
Absence of archaeological heritage in the AoI	Secondary data	Low

6.2.12 Visual Aesthetics

Visual aesthetics encompass the attractiveness perceived through visual elements, reflecting the beauty and appeal of a subject. In this context, the Project focuses on specific areas, utilizing visual aesthetic criteria as significant measures of the visual excellence within these locations.

The Project area and its surrounding are consisting of pastureland and village settlements that are 2 neighbourhoods within 2 km of Project area, namely Seslikaya and Emen Neighbourhoods. The general visual status of Project area and its surroundings ranges from natural to modified. For determining baseline visual view of the visual receptors, 4 viewpoints were selected (see Table 6-42 and Figure 6-38) and the photos from these areas were added to the report for understanding landscape around these viewpoints (see Figure 6-40-Figure 6-43).

Table 6-42: Selected Viewpoints

No	Description	Distance to the Project Area
1	Farm Area in Emen Neighbourhood	~1300 m
2	Nearest Residential Area across the road in Seslikaya Neighbourhood	~1500 m
3	Nearest Residential Area in Seslikaya Neighbourhood	~1400 m
4	Yertaş Firework Facility	~2500 m

Figure 6-39: Selected Viewpoints

Figure 6-40: Viewpoint 1

Figure 6-41: Viewpoint 2

Figure 6-42: Viewpoint 3

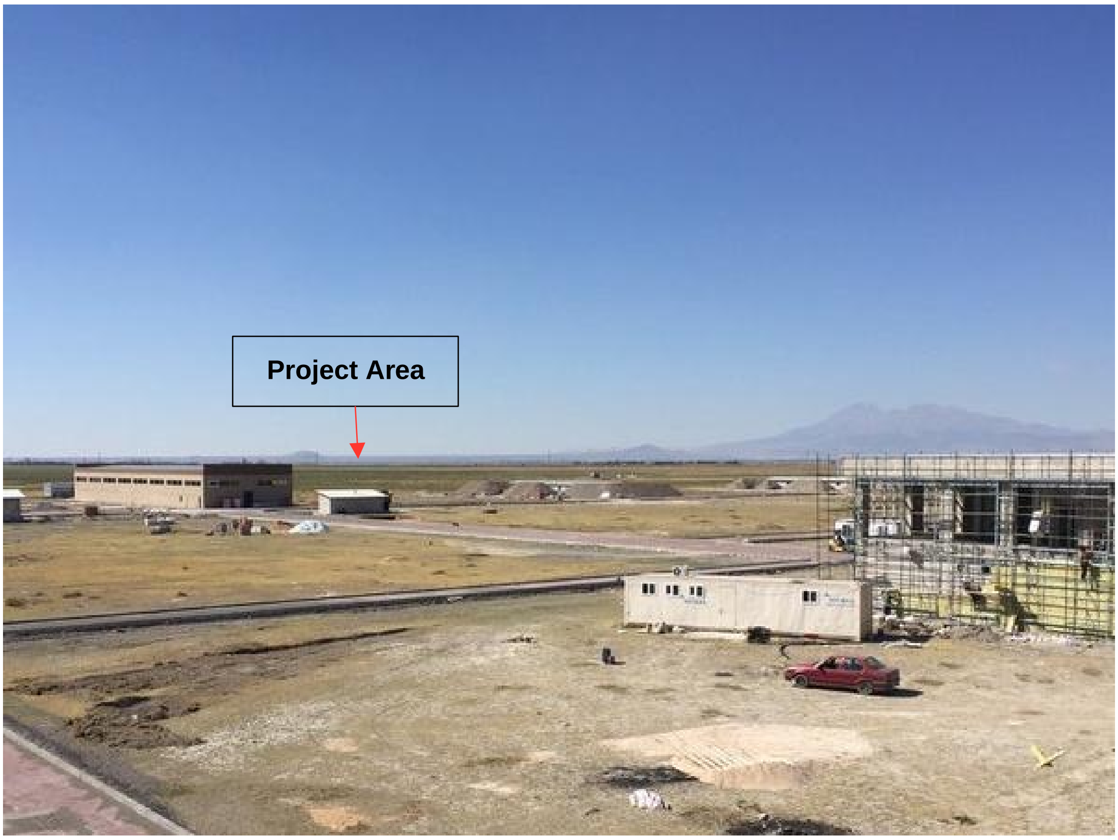


Figure 6-43: Viewpoint 4

Sensitivity Assessment

The table below summarizes the analysis of sensitivity related to the Visual Aesthetics component.

Sensitivity features	Supported by	Sensitivity value
Presence of two settlement within 2 km of Project Area. Absence of areas of touristic interest within the visual zone of visual influence. Presence of other solar power plants, 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

The assessment identified two separate types of study areas. In the initial literature review, an expanded Regional Study Area was identified and taken into account to assess the potential presence of species and habitats in the vicinity of the project area. In parallel, a more specific Local Study Area was determined to guide subsequent comprehensive research within the Project Area. The descriptions of these areas are as follows.

6.3.1.1 Regional Study Area (RSA)

The biodiversity Regional Study Area (RSA) includes an extensive territory and contains a geographically distinct variety of species, ecosystems, and habitats. The RSA permits the utilisation of a literature review as the foundational method for ascertaining the potential species and habitats that may inhabit the area surrounding the project.

In this project, the terrestrial RSA has been recognized by aligning with bio-geographic characteristics that correspond to the terrestrial ecoregion known as **"Central Anatolian Steppes and Woodlands - PA0410."** This ecoregion is classified within the broader category of "Temperate Broadleaf & Mixed Forests" (Olson et al., 2001[17]) (see Figure 6-44).

[17] 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.

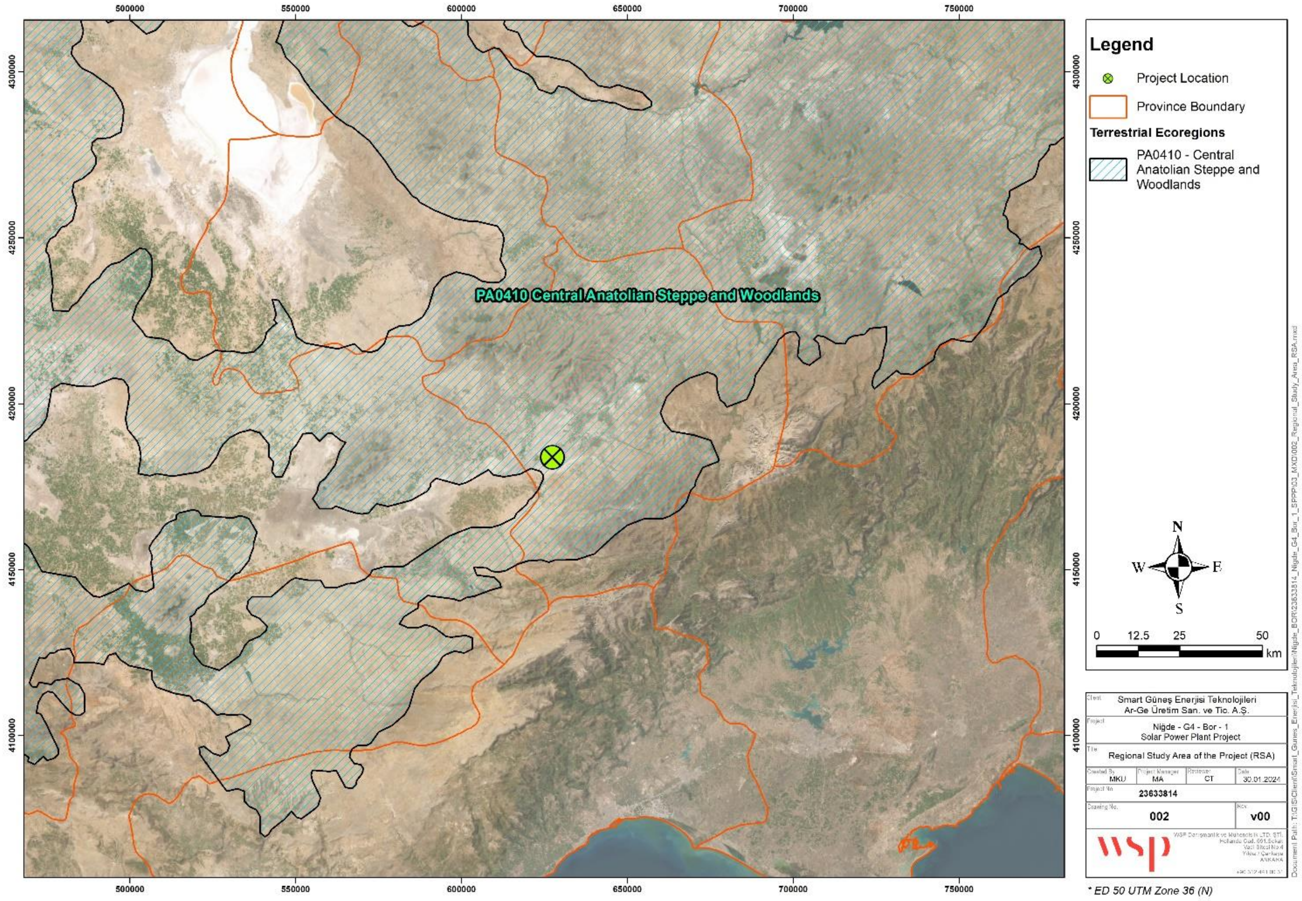


Figure 6-44: Regional Study Area of the Project (RSA)

6.3.1.2 Local Study Area (LSA)

The Local Study Area (LSA) was identified for terrestrial and freshwater habitats to include all the Project components, including associated facilities, both permanent and temporary, as well as the expected Area of Influence of the Project (i.e. the area beyond which no detectable effects on biodiversity are expected) and also include an appropriate ecological unit to support the design of a Biodiversity Management Plan. Biodiversity LSA is included in the wider RSA.

The LSA was configured as a 1 km buffer surrounding all sides of the project, as illustrated in Figure 6-45. This buffer serves as the boundary beyond which no discernible effects on biodiversity are anticipated. The LSA is located at elevations between 1055 m and 1065 m, reaching an extension of about 201.3 ha.

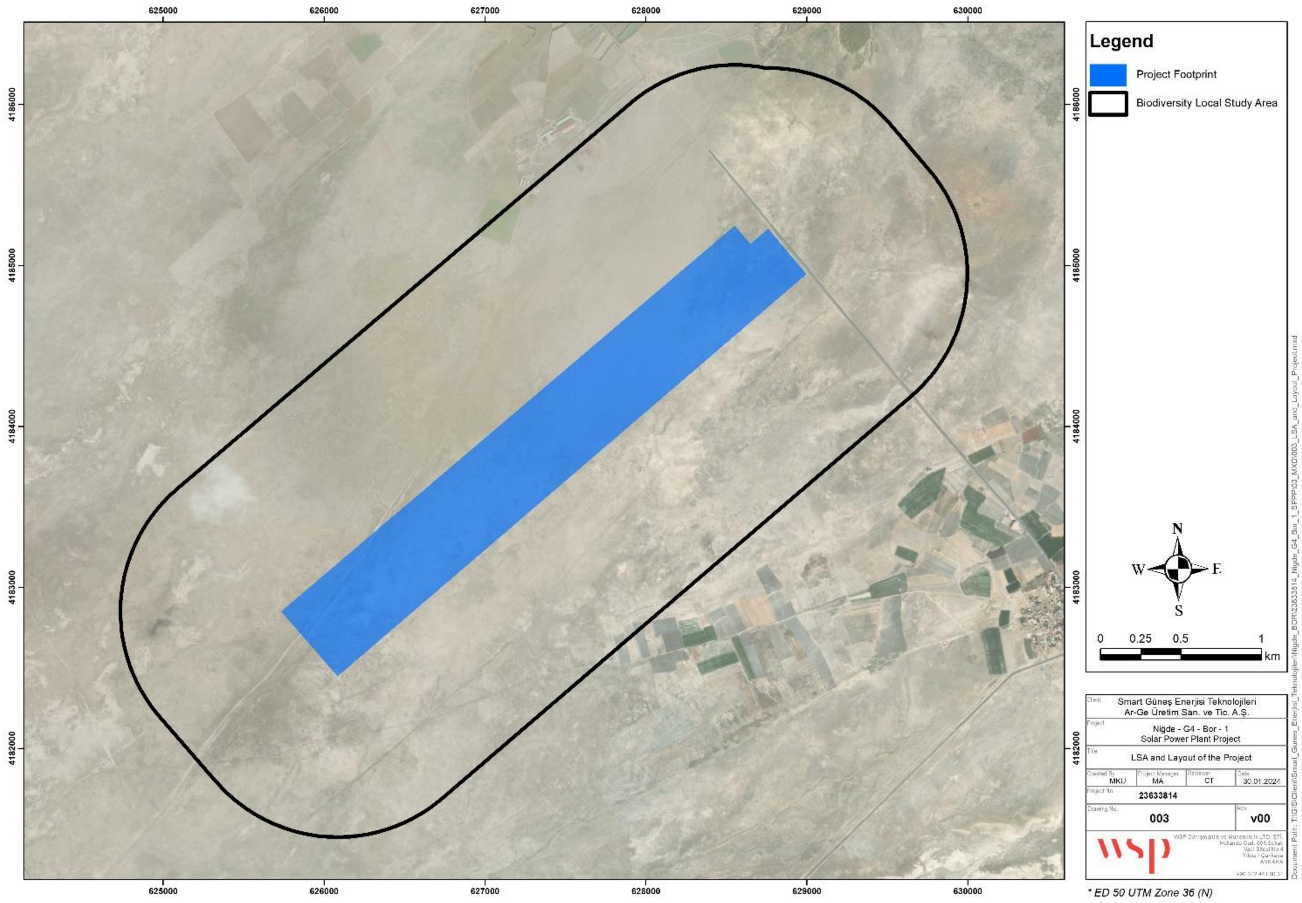


Figure 6-45: LSA and layout of the Project

6.3.2 Methodology

6.3.2.1 Desktop studies

The literature review concentrated on the terrestrial RSA, aiming to compile existing data on species and habitats of conservation significance. This included information on local and global distribution, conservation status, ecological niche, phenology, life cycle, etc. To provide an overview of potentially sensitive biodiversity elements in the area, scientific literature and official websites were consulted. Moreover, prior reports prepared for the Project were also taken into account.

To compile available data on terrestrial species and habitats of conservation concern, including local and global distribution, conservation status, ecological niche, phenology, life cycle, and so forth, the literature review centred on the terrestrial RSA. An examination was conducted on scientific literature and official websites to provide a comprehensive overview of the biodiversity-sensitive elements that may be present in the area. Furthermore, prior reports that had been generated for the undertaking were duly considered.

A chronological inventory of the literature review, prior studies, and web sources that were taken into account is provided below.

- **Previous studies**
  - G4-BOR-1 Solar Power Plant (140 MWp /100 MWe, 201,3 ha) Project – Local EIA report (include Ecosystem Assessment Report), 2022

- G4-BOR-1 Electrical Transmission Line (154 kV 1272 MCM 154 kV) Project – Local EIA report (include Ecosystem Assessment Report), 2023

- **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 Türkiye: 122 Key Turkish Botanical Sites. WWF Türkiye, Istanbul.
- Davis, P.H. (ed.). (1965-1988) Flora of Türkiye 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 Türkiye, 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.
- Kirwan, G.M, K.A. Boyla, P. Castell, B. Demirci, M. Ozen, H. Welch and T. Marlow., 2008. The birds of Türkiye: a study of the distribution, taxonomy and breeding of Turkish birds. Christopher Helm. London.
- 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.
- 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/)

- Doğa dernegi (https://www.dogadernegi.org/)
- European Environment Agency (https://eunis.eea.europa.eu/index.jsp)
- European Environment Agency (https://eunis.eea.europa.eu/index.jsp)
- Freshwater Ecoregions of the World (http://www.feow.org/)
- Invasive Species specialist Group (IUCN) (http://issg.org)
- IUCN Red List of Threatened Species (https://www.iucnredlist.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)
- Turkish Plants Data Service (TÜBİVES) - Version 2.0 BETA (http://194.27.225.161/yasin/tubives/index.php)
- 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/)

6.3.2.2 Field studies

On October 18, 2023, field surveys were undertaken in accordance with the work instructions developed after the gap analysis in the scoping report. The primary aim of these surveys was to provide a comprehensive description of the biodiversity status in the designated area of interest for the project. Therefore, the subsequent elements were the focus of the field research: terrestrial fauna; terrestrial flora and habitats.

The following section describes the field methodology for each of these components.

In addition, EIA studies have been carried out for both ETL and SPP in accordance with local legislation.

SPP-EIA studies were carried out in 2022. Within the scope of EIA studies, flora studies and fauna components such as herpetofauna, mammals, and aves were identified. Flora studies were conducted by Dr. İlker Çinlibilgel while fauna studies were carried out by Prof. Dr. Ali Erdoğan (Ornithology and Ecology Expert), Prof. Dr. Hakan Sert (Mammalian Expert) and M. Süleyman Kaçar (Wildlife Expert). The studies are presented both in the EIA report and in Annex-5 of the same report as Ecosystem Assessment Report.

ETL-EIA studies were carried out in 2023. Within the scope of EIA studies, flora studies and fauna components were identified. Flora studies were conducted by Mehmet Gül while fauna studies were carried out by Dr. Emrah Çelik and Mehmet Akif Bilir (Ornithology Expert), Mehmet Akif Bozkurt (Zoologist / Hunting and Wildlife Expert). The studies are presented both in the EIA report and in Annex-5 of the same report as Ecosystem Assessment Report.

The results of these studies were additionally included in the preparation of a species inventory that is either present or potentially present and work instructions for ESIA within the LSA.

6.3.2.2.1 Terrestrial Flora and Habitat survey

Field survey was carried out at 9 Sampling Points (SPs) determined in order to identify the flora characteristics of the LSA. It was conducted 18 October 2023 by the expert botanist Prof. Dr. Hayri Duman of University of Gazi, Türkiye.

Each SP was selected in order to include diverse habitats, aiming, to identify the flora and vegetation structure of the Project Area and potential critical species or habitats. Priority was given to selecting sampling points in areas that include natural habitats and are to critical species.

The width of each SP was determined as approximately 500 x 400 meters in detail to directly identify flora species and habitats. Field notes, GPS coordinates (WGS84 UTM Zone 36S), and photographic documentation were also gathered. Table 6-43 provides the relative coordinates of the nine sampling stations, whereas Figure 6-46 illustrates their precise locations.

A list of flora species observed and identified was compiled at each SP. If a global assessment by the IUCN was absent (e.g., Not Evaluated NE or Data Deficient DD), the species status was determined using the threat categories outlined in local assessments (e.g., Red Data Book for Turkish Plants). The local expert (Prof. Hayri Duman), utilising the most recent information on the species distribution and IUCN 2001 criteria, reassessed these threat categories. The key habitat categories were identified and classified in accordance with the EUNIS classification system, as per the Natural Habitats and Modified Habitats definitions[18].

Previous field studies were also conducted in October 2022 and May 2023 for the preparation of the Local EIAs SPP and ETL, respectively. Flora species and habitats were recognized both directly in the field and through the collection of some specimen. For the identification of the flora species, the main literature data such as Flora of Türkiye and the East Aegean Islands[19,20,21], Flora Europaea[22], Botanical Latin[23], Dictionary of Plant Science Terms[24] and List of Plants of Türkiye[25] were used.

Table 6-43: Terrestrial flora and habitats, sampling points and coordinates

Sampling Points (SPs)	Survey Date	Coordinate, habitat, and altitude		
SP1	18.11.2023	36 S	628813 E	4184750 N
SP2	18.11.2023	36 S	628402 E	4185100 N
SP3	18.11.2023	36 S	628615 E	41856647 N
SP4	18.11.2023	36 S	627963 E	4184218 N
SP5	18.11.2023	36 S	627300 E	4183623 N
SP6	18.11.2023	36 S	626083 E	4182448 N
SP7	18.11.2023	36 S	625591 E	4182038 N
SP8	18.11.2023	36 S	625602 E	4183218 N
SP9	18.11.2023	36 S	627549 E	4184359 N

[18] https://www.ifc.org/content/dam/ifc/doc/2010/2012-ifc-performance-standard-6-en.pdf

[19] Güner, A., Özhatay, N., Ekim, T. and Başer, K.H.C. 2000. Flora of Turkey and the East Aegean Islands. Vol: 11, Edinburgh Univ. Pres., Edinburgh.

[20] Davıs, P.H., Mill, R.R. and Tan, K. 1988. Flora of Turkey and the East Aegean Islands. Vol: 10, Edinburgh Univ. Press., Edinburgh.

[21] Davıs, P.H. 1965-1985. Flora of Turkey and the East Aegean Islands. Vol: 1-9, Edinburgh Univ. Press., Edinburgh.

[22] Tutın, T.G., Heywood, V.H., Burges, N.A., Valentına, D.H., Walters, S.M. and Webb, D.A. (eds). 1964-1980. Flora Europaea. Vol:1-5, Cambridge: Cambridge Univ. Pres.

[23] Stearn, T.W. 1966. Botanical Latin. 566 pp, Edinburgh.

[24] Altınayar, G. 1987. Bitki Bilimi Terimleri Sözlüğü. Devlet Su İşleri Basım ve Foto-Film İşletme Müdürlüğü Matbaası, 308 ss, Ankara.

[25] Güner A., 2012. Türkiye Bitkileri Listesi. ANG Vakfı/Nezahat Gökyiğit

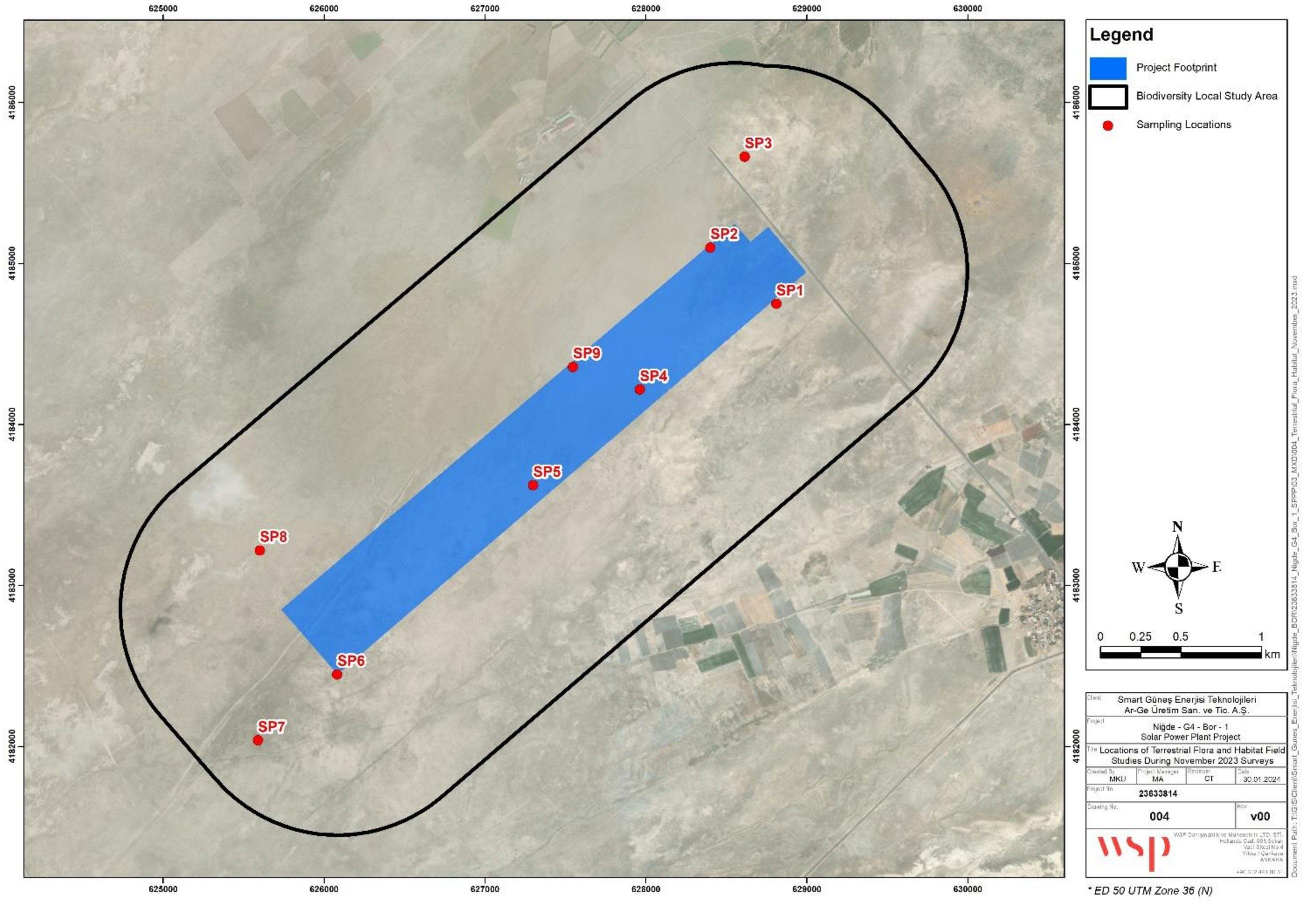


Figure 6-46: Locations of terrestrial flora and habitat field studies during October 2023 surveys

6.3.2.2.2 Terrestrial fauna survey

Field study on terrestrial fauna were carried out within the LSA by fauna expert Dr. Şafak Bulut on 18 October 2023.

Walk over surveys were conducted in the vicinity of all sampling points and along linear transects targeting all habitat types within the project site for the presence of any endemic or globally/locally threatened terrestrial fauna species (Herpetofauna, Aves, and Mammals).

Throughout the field investigation, every sampling point and transect were examined using direct observations and indirect indicators, including tracks, burrows, scats, droppings, calls and sings. The observations were conducted using a Nikon Aculon 16x50 binocular and a Sony A7RIV camera body with a Sony 200-600 mm lens.

A compilation of identified fauna species and/or evidence of their presence was made. The GPS coordinates were documented for every sampling point and linear transect, and their precise locations are indicated in Figure 6-46.

6.3.2.3 *Habitat mapping*

The entire LSA was thoroughly surveyed, and habitat types were accurately recognised and mapped at a scale of 1:10,000 using the EUNIS classification approach. This categorization was based on satellite imagery and information from literature sources, including the Corine Land Cover dataset.

The following main steps were used for the habitat mapping procedure:

1. A comprehensive land cover map was generated utilizing the Corine Land Cover 2018 v.2020_20u1 dataset accessible on the Copernicus website;

2. The CORINE Land Cover classes were meticulously transformed into EUNIS Habitat categories, employing the highest achievable definition level (at least level 3) that was based on the analysis of relevant satellite imagery and consideration of pertinent previous studies conducted in the area;

3. The outcomes of flora and habitat surveys conducted in October 2023 were utilized to validate the EUNIS habitat mapping;

4. Subsequently, the EUNIS habitat types were classified into either modified or natural habitats, adhering to the criteria outlined in PS6 of IFC(2019).

6.3.3 Results

6.3.3.1 Landscape overview

The Project LSA's elevation is between 1054 and 1065 m a.s.l. within the "**Central Anatolian Steppes and Woodlands**" **(PA0410)** terrestrial ecoregion (Olson et al., 2001)[26], which is part of the broader biome category "Temperate Broadleaf and Mixed Forests". This ecoregion covers Central Türkiye, bounded by the Pontic Mountains in the north and the Taurus Mountains in the south (see Figure 6-44). Its vegetation is characterized by natural and semi-natural steppes and grasslands.

The characteristic landscape features of Central Anatolia (Türkiye) include large basins, which are naturally bare of forests and woodlands, but were formerly occupied by steppe vegetation. These steppes evolve under a pronounced continental climate, which is extremely cold in winter and dry and hot during summer. Rainfall is less than 300 mm/year, favouring treeless steppe vegetation dominated by well-adapted dwarf-shrubs, a few herbs, and a larger number of geophytes and annuals. We review the present knowledge on Central Anatolian steppe vegetation (Onobrychido armenae-Thymetalia leucostomi, Astragalo-Brometea) and provide insight into the complex structure and species composition of today's primary and secondary steppes and their replacement communities. In addition, the changes in vegetation due to the long-lasting human impact such as grazing and agricultural activities (ca. one-third of Türkiye's grain production concentrates in the former steppe area) are shown, which generally led to a loss of species and a massive decline of the diversity in the area[27].

The Project LSA is not covered within the boundaries of a legally protected area. However, the LSA falls within the boundaries of the Ereğli Plain Key Biodiversity Area (KBA) and Important Bird Area (IBA). Another internationally recognized areas of importance for biodiversity situated within 13 km from the LSA is Hasan Dağı KBA, Important Plant Area (IPA) and an IBA (see Figure 6-47). Akkaya Pond KBA is also situated at about 17 km northeastern of the LSA.

---

[26] 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

[27] Kürschner, H., & Parolly, G. (2012). The central Anatolian steppe. In Eurasian steppes. Ecological problems and livelihoods in a changing world (pp. 149-171). Dordrecht: Springer Netherlands.

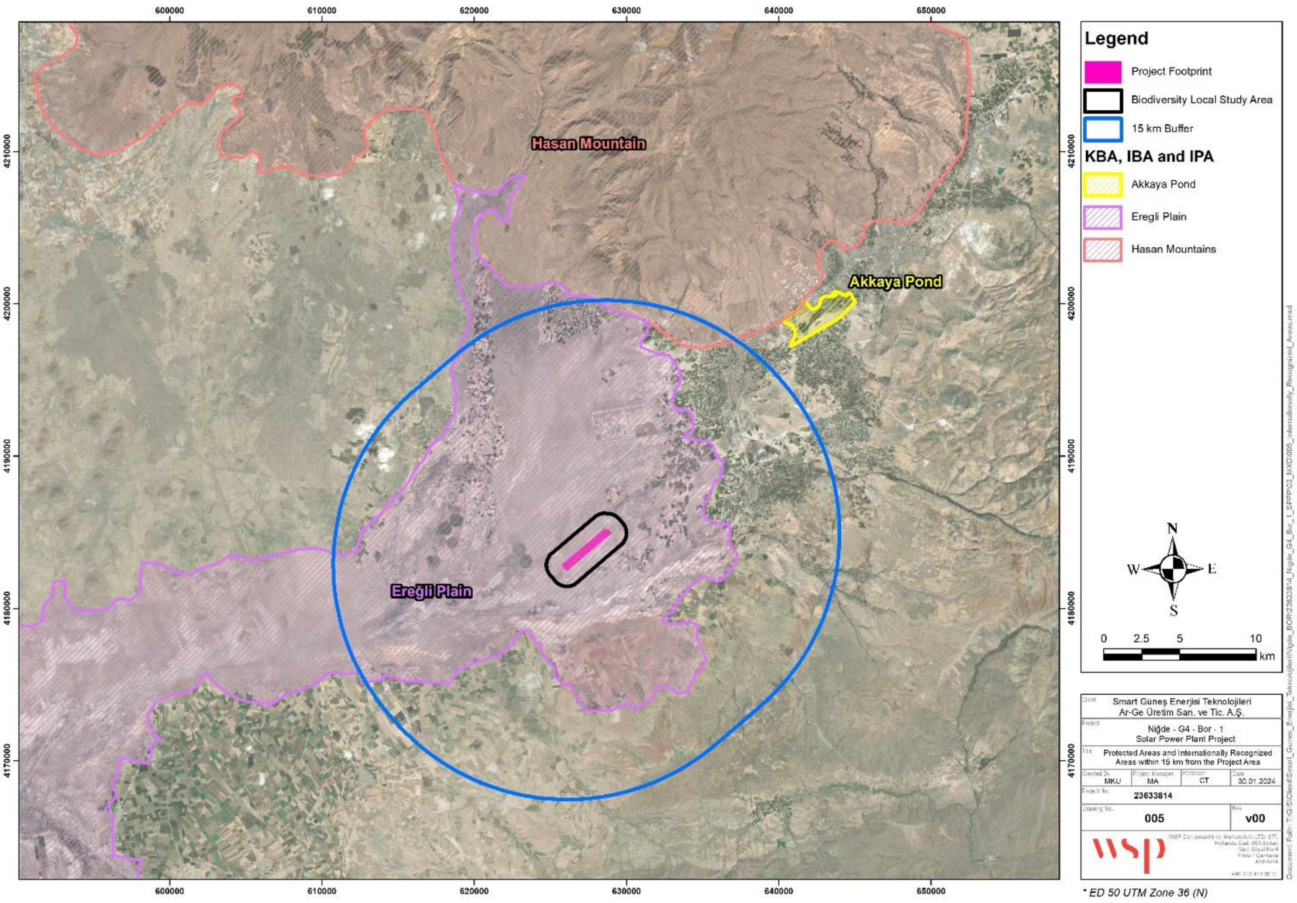


Figure 6-47: Protected areas and Internationally Recognized Areas within 15 km from the Project LSA

Ereğli Plain KBA and IBA

It is a large plain located in the southeast of Central Anatolia, north of the Bolkar Mountains. The area consists of shallow marshes, reeds, freshwater lakes, and wide lowland steppes, most of which are saline (see Figure 6-48). Akgöl in the west of the KBA has largely dried up since the second half of the 1990s. Towards the east, especially in the Zengen region, there are vast and untouched lowland steppes rich in rare plants. Once the largest reed beds in Central Anatolia, these areas have almost completely disappeared due to the dams constructed by the State Hydraulic Works (DSİ) and the illegal use of groundwater. The wetland zone of KBA consists of lakes, reeds, and marshy areas. The rest of the area consists of saline lowland steppes and Yavşan plains.

The steppes in the area harbour many endangered and narrowly distributed endemic plant species. *Chrgsocamela elliptica* is the rarest and most vulnerable among them. KBA has been the centre of attention of local and foreign birdwatchers and researchers for many years, and therefore many bird data on the wetland ecosystem have been collected. Among the birds that are still known to breed in the area are the lesser kestrel (*Falco naumanni*), the White-headed duck (*Oxyura leucocephala*), the Black-winged stilt (*Himantopus himantopus*), and many other waterfowl. In addition, many birds in the area are extinct or their numbers have decreased significantly. Ereğli Reeds are important for inland fish as well as birds and fulfil the KBA criteria for five fish species. The world distribution of *Barbatula eregliensis*, a single-point endemic, is limited to Ereğli Reedbeds. It is believed that the species is completely extinct in the area due to drying.

The habitats inside the G4-Bor-1 SPP installation region consist of flat grasslands and lack any aquatic species.

Animal husbandry is intensively practised in KBA. Cattle breeding is the main source of livelihood in reedbed areas and ovine breeding in other areas. Dry agriculture is also partially practised in the area. In the areas just outside the KBA, irrigated agriculture, especially fruit growing, is intensively practised. Reed farming, which was once intensive in the lake, continues in small amounts today. Threats: The dams built on the rivers feeding the area in the past and the groundwater.

Due to the dams built on the rivers feeding the area in the past and the excessive use of groundwater, serious drying has occurred in the area. A large part of Ereğli Reeds, once one of the largest and most productive reeds in our country, has disappeared. Although there is not enough water for agriculture, ploughing the steppes and opening them to agriculture is another factor threatening the area. Although domestic and industrial wastes cause pollution of the reeds, they are the only surface water sources in the area. Overgrazing poses a significant threat to plant species in the region, and the decrease in groundwater has led to wind erosion in the area.[28].

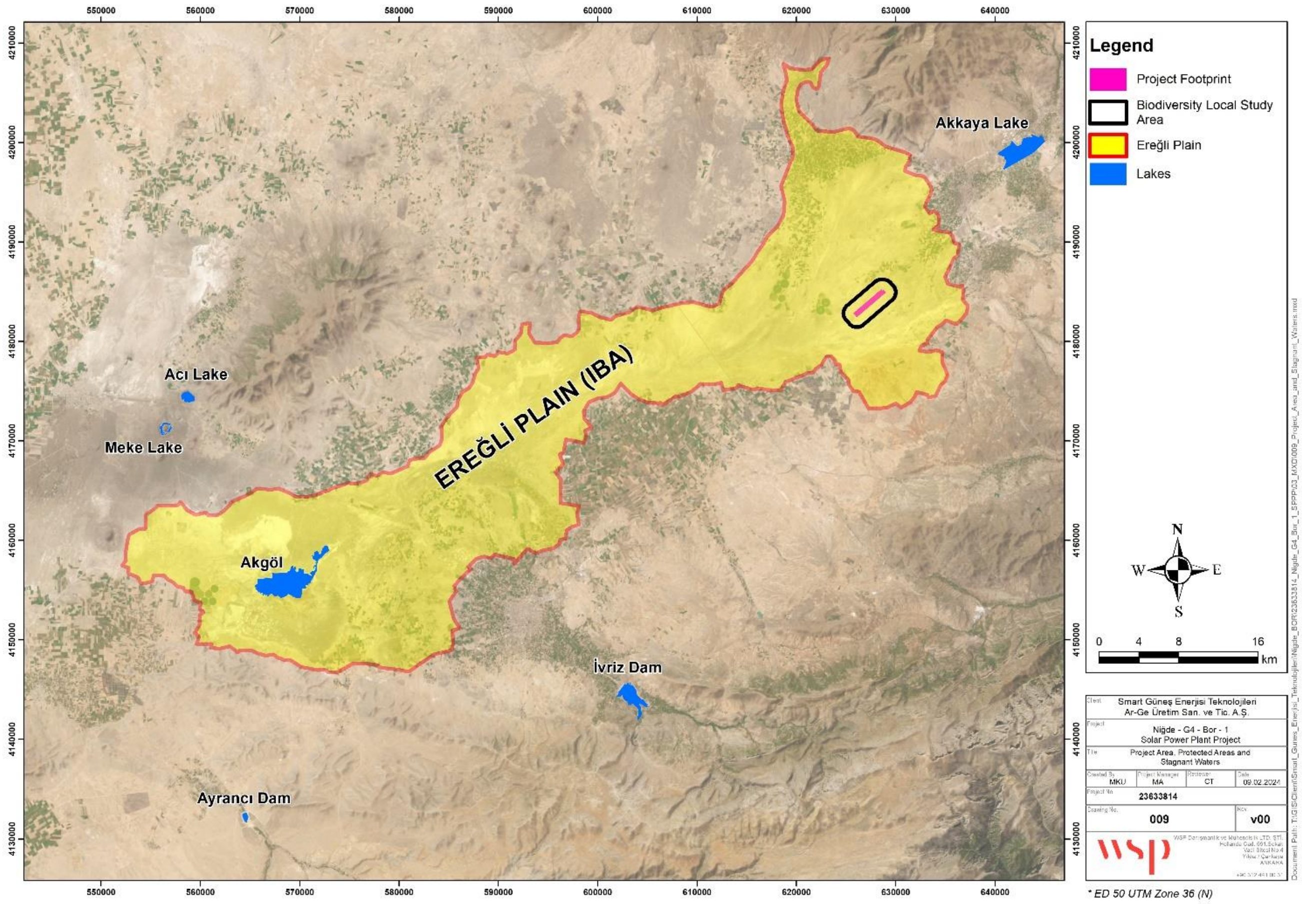


Figure 6-48: Map showing the Project Area, protected areas and stagnant waters.

[28] https://dogadernegi.org/en/turkeys-kbas/# Key Biodiversity Areas of Turkey Book

6.3.3.2 Natural and Modified habitats

The Natural and Modified habitats within the terrestrial LSA were identified based on the literature review, the analysis of satellite images on Google Earth, and field surveys conducted in October 2023 during flora field studies.

The largest percentage of habitats in the LSA consist of modified habitats, specifically rural industrial and commercial sites that are still in use (25.5%), as well as mixed crops of market gardens and horticulture (2% and 0.2% respectively, categorised as J2.3 and J4.2).

The predominant natural habitats consisting of continental inland salt steppes comprise 72% of the LSA's natural habitats.

The continental inland salt steppes (E 6.2) are defined by the existence of a limited number of endemic species (plants and animals) and are particularly vulnerable to anthropic disturbance. This habitat type is primarily found in the LSA.

Natural habitats in the LSA are marked by moderate to high levels of human disturbance, primarily as a result of pressure (grazing) on saline habitat and the subsequent ongoing habitat loss.

The habitat map of the LSA, based on the EUNIS habitat classification system, can be found in Table 6-44. The corresponding calculations are displayed in Figure 6-49. Below is a concise description of the EUNIS natural habitat that has been identified in the area.

Table 6-44: EUNIS habitat types present in the LSA

EUNIS Code	EUNIS Habitat Type	Total LSA	
		ha	%
Natural habitat			
E6.2	Continental Inland Salt Steppes	994.182	72.092
	Subtotal	994.182	72.092
Modified habitat			
I1.2	Mixed Crops of Market Gardens and Horticulture	28.860	2.093
J2.3	Rural Industrial and Commercial Sites Still in Active Use	351.892	25.517
J4.2	Road Networks	4.103	0.298
	Subtotal	384.855	27.908
	Total	1379.040	100.000

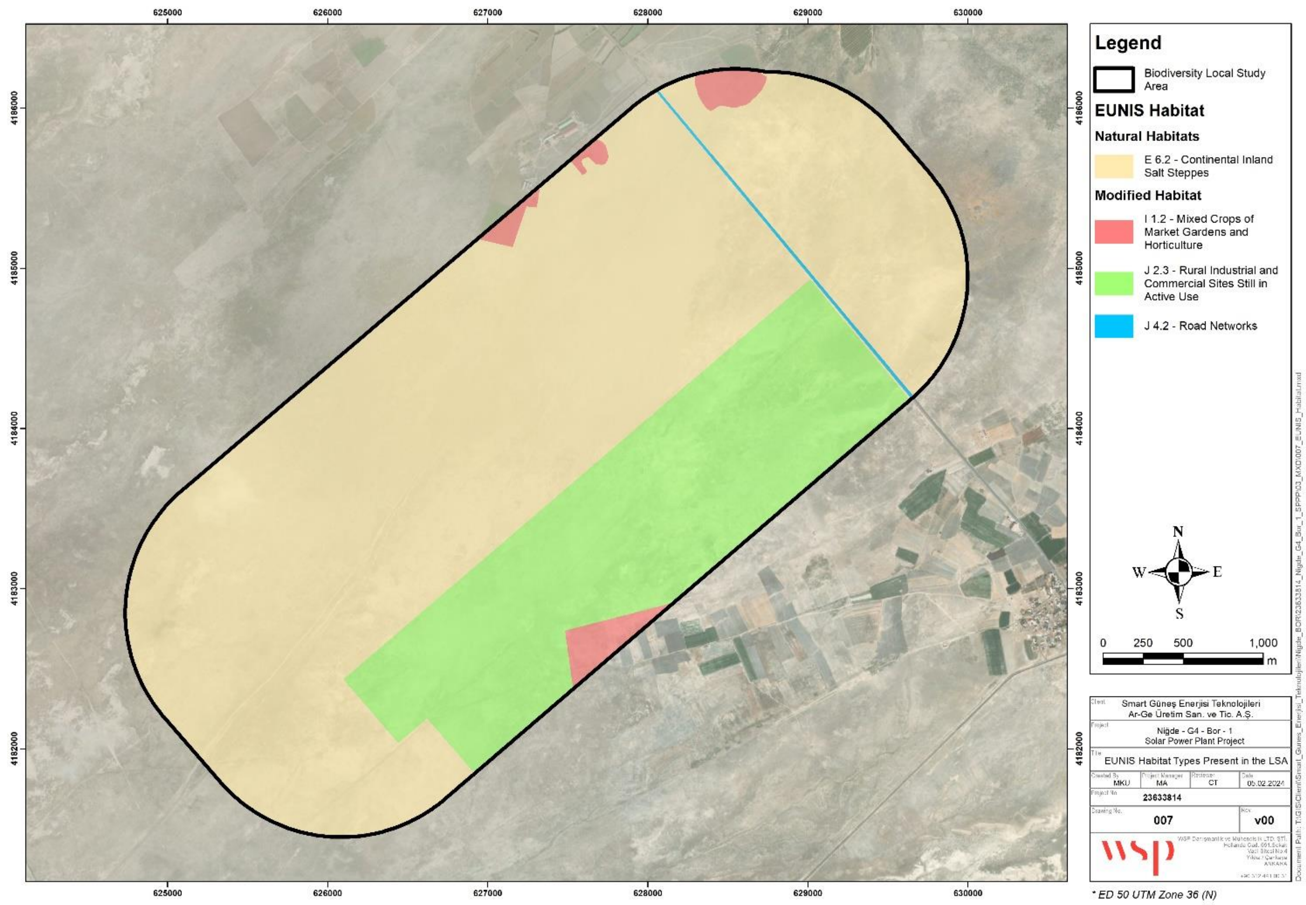


Figure 6-49: EUNIS habitat map of the LSA

E6.2 Continental inland salt steppes

Salt steppes (also called alkali steppes) occur on plains in the Eurasian steppe and forest-steppe zones from the Great Hungarian Plain and adjacent areas through the Danube Lowland in Romania and Bulgaria to Ukraine, Russia, Kazakhstan and Mongolia.

This ecoregion is comprised of five distinct areas in the Central Anatolian region of Türkiye. These lowlands host salt steppes, marshes, rivers, and saline lakes, and are typified by a continental climate of cold winters and hot, dry summers (see Figure 6-50). Annual precipitation ranges from 400 to 500 mm, decreasing to 300 mm in certain places depending on the micro-topography. There are no mountains or highlands here, and the average altitude is around 1,000 m.

The focal species of the habitat are *Camporosma monspeliaca, Bolboschoenus maritimus, Taraxacum farinosum, Frankenia hirsuta, Suaeda* sp., *Halimione verrucifera Puccinellia koeieana, Limonium lilacinum, Limonium iconicum, Aeluropus littoralis.*

Figure 6-50: Continental inland salt steppes (E6.2) identified in the LSA

6.3.3.3 Flora species

Prof. Hayri Duman conducted the literature analysis and field study on October 18, 2023, and observed a total of 24 flora species in the LSA. A full list of flora species was not compiled due to the incomplete or unreliable nature of the information gathered from the literature. There are eight species of conservation concern, which are mentioned in below. The whole list of species can be viewed in Appendix C.

Table 6-45: Flora species of conservation concern present within the LSA.

Family	Species	Global IUCN Status	National IUCN status	End./ RR	Station code	Lit./ Obs.*
Asteraceae	*Onopordum davisii*	NE	NT	Regional Endemic	SP1, SP2, SP3, SP4, SP5, SP6, SP7	O 2023
Caryophyllaceae	*Gypsophila oblanceolate*	NE	VU	Regional Endemic	SP1, SP5, SP8	O 2023
Chenopodiaceae	*Petrosimonia nigdeensis*	NE	VU	Regional Endemic	SP1, SP9	O 2023
Scrophulariaceae	*Verbascum helianthemoides*	NE	VU	Widespread endemic	SP8	O 2023
Plumbaginaceae	*Limonium tamaricoides*	NE	EN	Regional Endemic	SP2, SP4, SP5, SP6, SP7, SP8, SP9	O 2023

Family	Species	Global IUCN Status	National IUCN status	End./ RR	Station code	Lit./ Obs.*
Amaranthaceae	*Salsola stenoptera*	NE	VU	Widespread endemic	SP1, SP2, SP3, SP4, SP5, SP6, SP7, SP9	O 2023

*L:Literature A:Field, G: Interview with locals, O: Observation, H: Habitat

According to the National Red List (Turkish Red Data Book of Plants – T-RDB) re-evaluated by Prof. Hayri Duman (the local expert) based on the latest available information on the species distribution and IUCN 2001 criteria, *Gypsophila oblanceolata* (see Figure 6-51), *Verbascum helianthemoides* (see Figure 6-51), *Salsola stenoptera* (see Figure 6-52) and *Petrosimonia nigdeensis* (see Figure 6-52) are classified as Vulnerable (VU), while *Onopordum davisii* (see Figure 6-53) is classified as Near Threatened (NT). *Limonium tamaricoides* (see Figure 6-53) is classified as Endangered (EN). These four species (*Onopordum davisii, Gypsophila oblanceolate, Petrosimonia nigdeensis, Limonium tamaricoides*) are also considered as regional endemic species. These four species are also classified as Regional Endemic species. All other species are classified as Least Concern (LC).

Figure 6-51: *Gypsophila oblanceolata* (left side) and *Verbascum helianthemoides* (right side) within the LSA

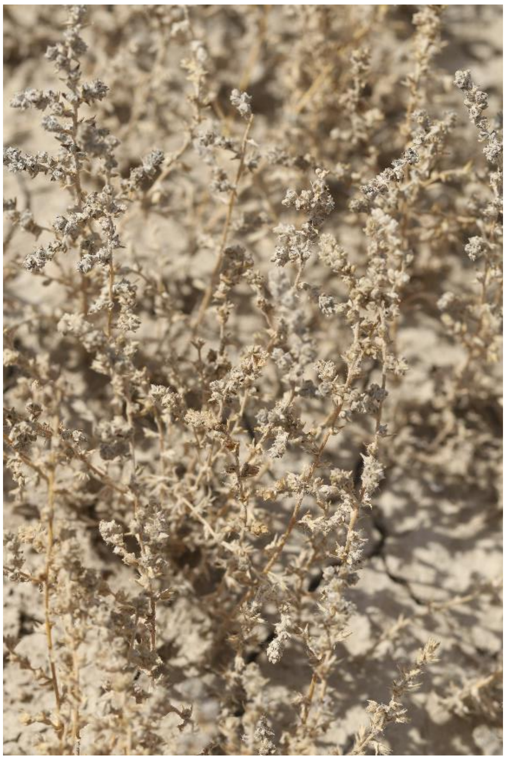



Figure 6-52: ***Salsola stenoptera*** **(left side) and** ***Petrosimonia nigdeensis*** **(right side) within the within the LSA**

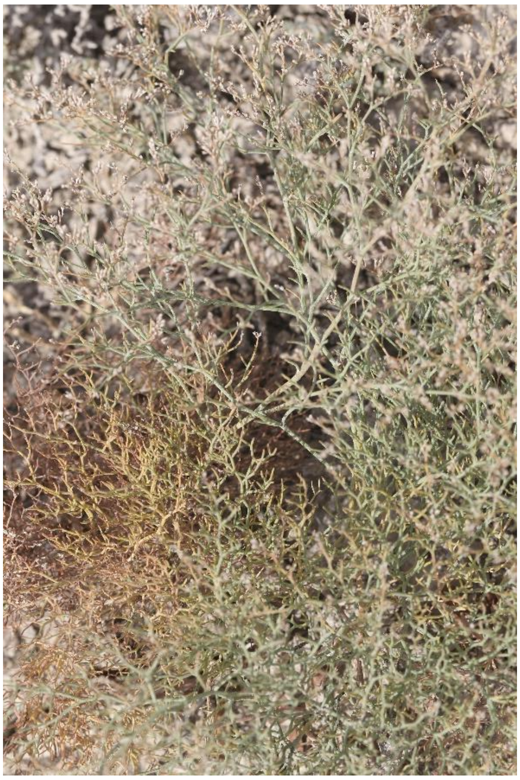



Figure 6-53: ***Onopordum davisii*** **(left side) and** ***Limonium tamaricoides*** **(right side) within the within the LSA**

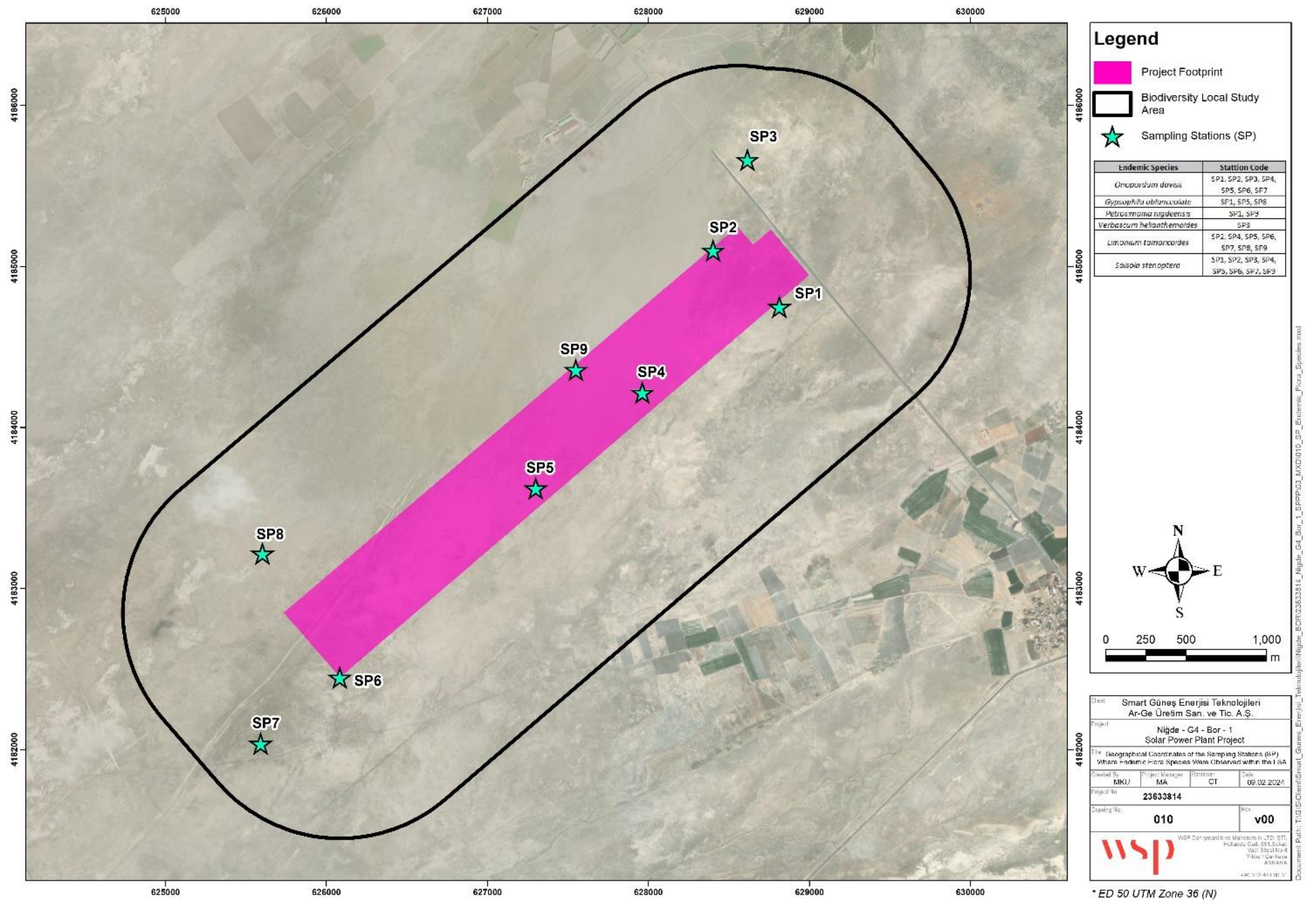


Figure 6-54: Geographical coordinates of the sampling stations (SP) where endemic flora species were observed within the LSA

6.3.3.4 Fauna species

19 mammal species, 47 bird species, 9 reptiles and 2 amphibians have been observed or potentially present in LSA. A total of 77 species were identified.

Within the LSA, there are several fauna species that have been identified as either present or potentially present. Among these species, one reptile species (*Testudo graeca*) is classified as Vulnerable (VU), while two bird species (*Aquila nipalensis* and *Falco cherrug*) are classified as Endangered (EN). Additionally, two other bird species (*Aquila heliaca* and *Otis tarda*) are classified as Vulnerable (VU).

Furthermore, the Global IUCN Red List assessment classifies one mammal species (*Vormela peregusna*) as Vulnerable (VU), five mammal species (*Barbastella barbastellus, Mesocricetus brandti*, and *Spermophilus xanthoprymnus*) as Near Threatened (NT), and two species (*Microtus anatolicus and Nannospalax xanthodon*) as Data Deficient (DD).

6.3.3.4.1 Herpetofauna

Based on a comprehensive assessment of the literature and extensive field studies, it has been concluded that there are potentially three species of amphibians and nine species of reptiles existing in the LSA.

Two species (*Bufotes variabilis* and *Bufotes sitibundus*) are classified as Data Deficient (DD), while the third one (*Pelophylax ridibundus*) is classified as Least Concern (LC) according to the Global IUCN Red List assessment. No endemic species were identified. The complete list of the amphibian species potentially present is reported in the Table 6-46 below and in Appendix C.

Testudo graeca is categorised as Vulnerable (VU) based on the IUCN Global Red List evaluation, whilst the remaining species are categorised as Least Concern (LC). No species that are native or limited to a certain geographic area were found.

Table 6-46: Herpetofauna species present or potentially present within the LSA

Order	Species	English Name	IUCN Global	Obs./Lit.*
Anura	*Bufotes variabilis*	Varying Toad	DD	G-L
Anura	*Pelophylax ridibundus*	Marsh Frog	LC	G-L
Lacertidae	*Ophisops elegans*	Snake-eyed Lizard	LC	G-L
Lacertidae	*Parvilacerta parva*	Dwarf Lizard	LC	G-L
Agamidae	*Stellagama stellio*	Roughtail Rock Agama	LC	L
Scincidae	*Heremites vittatus*	Bridled Mabuya	LC	L
Gekkonidae	*Mediodactylus orientalis* **	Mediterranean Thin-toed gecko	LC	L
Colubridae	*Natrix natrix*	Grass Snake	LC	G-L
Colubridae	*Platyceps najadum*	Dahl's Whip Snake	LC	L
Colubridae	*Elaphe sauromates*	Eastern Four-Lined Ratsnake	LC	L
Testudinidae	*Testudo graeca*	Common Tortoise	VU	G-L

*L:Literature, O: Observation, H: Habitat, A:Field G: Interview with locals

** based on syn. *Mediodactylus kotschyi*

6.3.3.4.2 Aves

Türkiye is crossed by the “Karadeniz/Akdeniz” flyway, which is a significant worldwide route for migratory terrestrial and aquatic birds. Türkiye is separated into three major migratory pathways for this significant flyway. The Project Area is situated to the north of the primary migration route and to the south of the secondary migration route (see Figure 6-55). The main migration route is used by cranes, pelicans, storks, and raptors. Certain aquatic avian species persist in their migratory by tracking the lakes region.

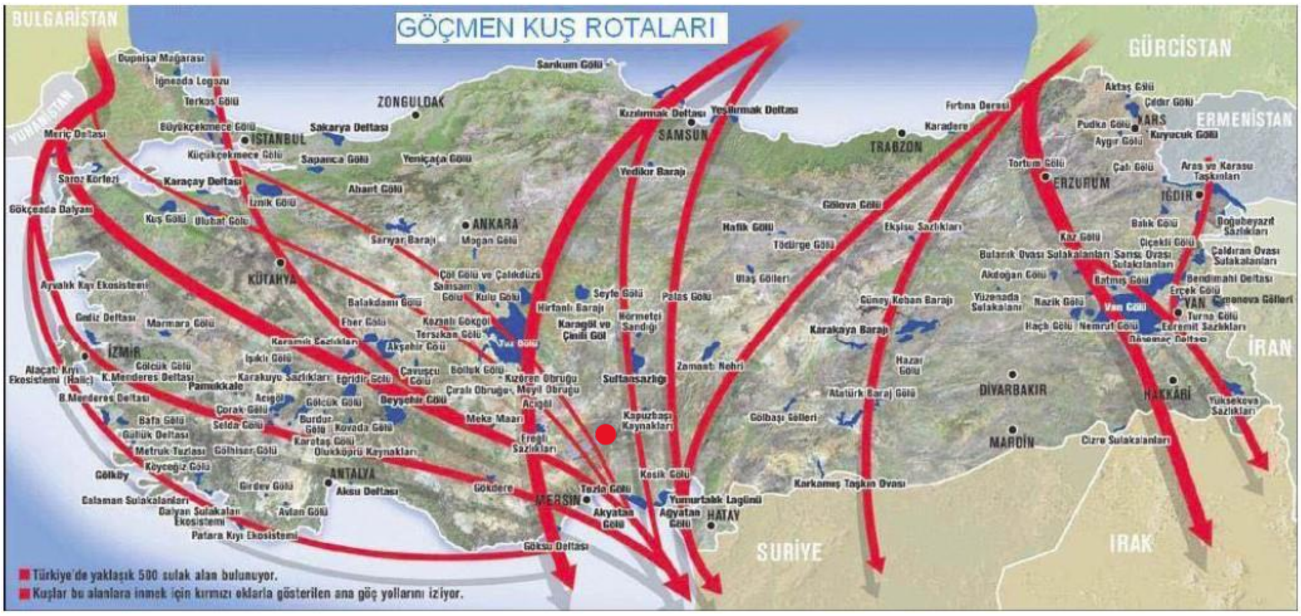


Figure 6-55: Bird Migratory Route in Türkiye and location of the project site[29]

During the field surveys carried out on October 18th, no migratory birds were observed in the LSA, despite the migration period.

A total of 47 bird species were identified as potentially present within the LSA and its vicinity, while a total of 32 species were observed during the field survey.

Based on the Global IUCN Red List, there are 2 species (*Aquila nipalensis* and *Falco cherrug*) categorised as Endangered (EN), 2 species (*Aquila 183anthodo* and *Otis tarda*) categorised as Vulnerable (VU), and 3 species (*Aegypius monachus, Circus macrourus* and *Vanellus vanellus*) categorised as Near Threatened (NT). All the remaining potentially present species are classified as Least Concern (LC).

No endemic species have been identified.

Additionally, according to expert judgement, *Aquila nipalensis* breeds in a region near to the field.

Bird identified species of conservation interest are reported in the Table 6-47 below, while the complete list of the species is reported in Appendix C.

Table 6-47: Bird species present or potentially present within the LSA

Family	Species	English Name	IUCN Global	Phenology	Obs./ Lit.*
Accipitridae	*Aegypius monachus*	Black Vulture	NT	Extant (non-breeding)	O
Accipitridae	*Circus macrourus*	Pallid Harrier	NT	Extant (non-breeding)	H
Accipitridae	*Aquila nipalensis*	Steppe Eagle	EN	Extant (non-breeding)	H

[29] Anonim. 2020. http:www.floradergisi.org/getFileContent.aspx?op=html&ref

Family	Species	English Name	IUCN Global	Phenology	Obs./ Lit.*
Accipitridae	*Aquila heliaca*	Imperial Eagle	VU	Extant (non-breeding)	H
Falconidae	*Falco cherrug*	Saker Falcon	EN	Extant (non-breeding)	H
Otididae	*Otis tarda*	Great Bustard	VU	Native resident	A
Charadriidae	*Vanellus vanellus*	Lapwing	NT	Extant (non-breeding)	H

*L:Literature A:Field, G: Interview with locals, O: Observation, H: Habitat

6.3.3.4.3 Mammals

Based on a comprehensive analysis of existing literature and on-site investigations, a total of 19 species have been identified as either now existing or potentially existing in the terrestrial LSA. However, the existence of only 8 species was verified through indications of their presence (such as tracks, burrows, scats, droppings) or observations.

According to the Global IUCN Red List, one species (*Vormela peregusna*) is categorized as Vulnerable (VU), while five species (*Barbastella barbastellus, Lutra lutra, Mesocricetus brandti, Miniopterus pallidus, and Spermophilus xanthoprymnus*) fall under the classification of Near Threatened (NT). Two species (*Microtus anatolicus and Nannospalax xanthodon*) are designated as Data Deficient (DD). All remaining mammal species are classified as Least Concern (LC). Furthermore, *Microtus anatolicus* has been identified as a species restricted to Türkiye, with its distribution limited to central and southwest Anatolia.

Spermophilus xanthophyrmnus burrows were observed in abundance within the LSA during field studies (see Figure 6-56). The Project Area spans across all regions within a 200-hectare radius. Based on the literature and observation data, it is likely that there are approximately 10 individuals per acre.

The mammal species categorised as Near Threatened or Vulnerable can be found in Table 6-48, whereas the comprehensive list of mammal species considered potentially present is provided in Appendix C.

Table 6-48: Mammal species of conservation concern present or potentially present within the LSA.

Order	Species	English Name	IUCN Global Status	End./ RR.	Obs./ Lit.*
Chiroptera	*Barbastella barbastellus*	Western Barbastelle	NT	-	L
Carnivora	*Lutra lutra*	Eurasian Otter	NT	-	L
Rodentia	*Mesocricetus brandti*	Brandt's Hamster	NT	-	O 2023
Rodentia	*Microtus anatolicus*	Anatolian Vole	DD	RR	O 2023
Chiroptera	*Nannospalax xanthodon*	Nehring's Blind Mole Rat	DD		O 2023
Chiroptera	*Miniopterus pallidus*	Pale Bent-wing Bat	NT	-	L

Order	Species	English Name	IUCN Global Status	End./ RR.	Obs./ Lit.*
Rodentia	*Spermophilus xanthophyrmnus*	Anatolian Ground Squirrel	NT	-	O 2023
Carnivora	*Vormela peregusna*	European Marbled Polecat	VU	-	O 2023

*L:Literature A:Field, G: Interview with locals, O: Observation, H: Habitat

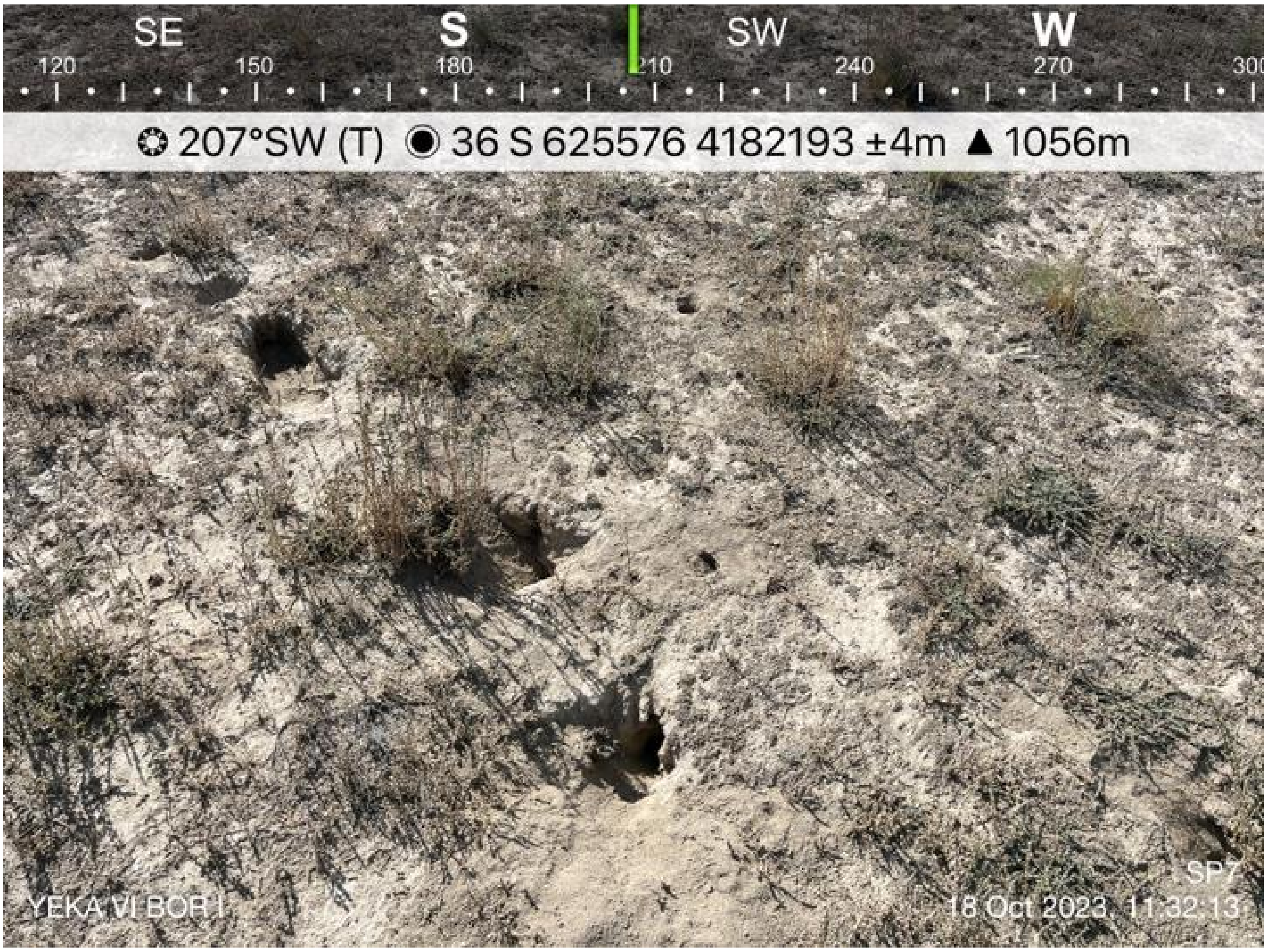


Figure 6-56: *Spermophilus xanthoprymnus* burrows observed within the LSA

6.3.4 Critical Habitat Assessment (CHA)

A screening was performed to determine if there are any Critical Habitats (CHs) inside the LSA, based on the information that is currently available. This screening was completed in accordance with IFC Performance Standard 6 (PS6).

6.3.4.1 Criterion 1: Habitat of significant importance to Critically Endangered and/or Endangered species

Species classified as Endangered (EN) or Critically Endangered (CR) by the global IUCN criteria were taken into account. In the absence of a global assessment by the International Union for Conservation of Nature (IUCN), such as "Not Evaluated" (NE) or "Data Deficient" (DD), the status of the species was determined by considering the threat categories outlined in the local assessments, such as the Red Data Book for Turkish Plants. These assessments were re-evaluated by the local expert, Prof. Hayri Duman, using the most up-to-date information on the species' distribution and the IUCN 2001 criteria.

As a result, 3 species were identified as potentially triggering CH based on this criterion. These species include:

- 1 flora species:
  - Limonium tamaricoides (EN, Regional Endemic);
- 2 bird species:
  - Steppe Eagle (*Aquila nipalensis*, EN);
  - Saker Falcon *(Falco cherrug,* EN*)*;

During the October 2023 field survey, only one flora species was observed within the LSA, out of the ones mentioned above. Based on a survey of the literature, it is considered that there is a possibility of the presence of three species of birds.

In order to assess the importance of the LSA 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.

The Vulnerable species identified as potentially present show a significantly wide geographical distribution, thus 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 significant concentrations of endangered or critically endangered species designated by the IUCN were found in or near the study area. As a result, criterion 1c was not applied.

In order to apply the thresholds identified in Criterion 1a an “Ecologically Appropriate Area of Analysis” (EAAA) and the Extend of Occurrence (EOO) been identified for each species according to the following principles:

- for flora species: in the absence of clear geographical boundaries, the EAAA is identified to determine the presence of a critical habitat for flora species. The EAAA was defined considering the Ereğli Plain KBA and

IBA where the Project is located (see Figure 6-57). The EOO is identified as the floristic ecoregion "(4a) Yukarı Sakarya Section, (4b) Orta Kızılırmak Section, and (4ç) Konya Section" 131.744 km^2.

- for bird species the EAAA was identified as corresponding to Ereğli Plain KBA and IBA, in which the LSA completely falls within (see Figure 6-57). The extent of the thus defined EAAA is 1,294 km^2. The EOO was obtained from literature (BirdLife) for the two species.

The results of the CHA for Criterion 1 are detailed in (see Table 6-49) However, **no species triggering, or potentially triggering CH were identified based on this criterion.**

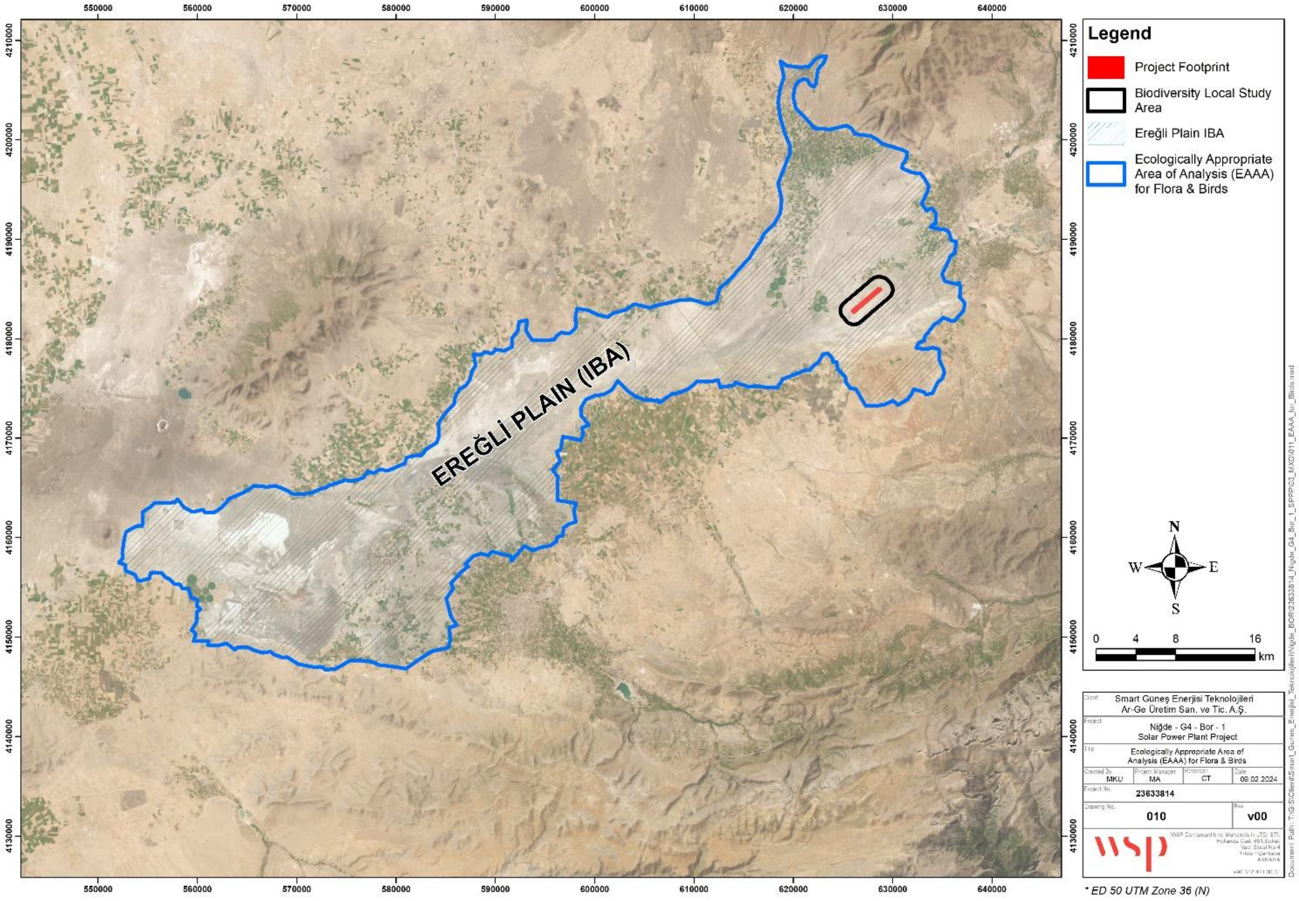


Figure 6-57: EAAA for flora and aves species

Table 6-49: Screening of flora and 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
Flora	*Limonium tamaricoides*	-	NE	EN	End	O	131,744,000	658,720	1,294	No	-
Bird	*Aquila nipalensis*	Steppe Eagle	EN	-	-	L	47,500,000	237,500	1,294	No	-
	Falco cherrug	Saker Falcon	EN	-	-	L	43,200,000	216,000	1,294	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) was considered.

According to Criterion 2, only one mammalian species was identified as potentially triggering CH.

- Anatolian Vole (*Microtus anatolicus*, DD, Restricted Range)

To evaluate the cruciality of the LSA for this species, the following threshold was applied (Guidance Note 6, GN75, IFC 2019):

a) areas that regularly hold ≥ 10% of the global population size AND ≥ 10 reproductive units of a species.

A quantitative assessment of the species' worldwide population is not feasible; therefore, to ascertain the existence of critical habitat, EAAA has been designated. The EAAA has been determined to correspond to the Ereğli Plain KBA and IBA, where the LSA is entirely encompassed. The specified EAAA has an area of 1,294 square kilometres, which is also the same size as the area for birds and plants (see Figure 6-57).

According to literature[30], the EOO of *Microtus anatolicus* appeared to be entirely outside the LSA. Nevertheless, the species was sighted within the LSA during field investigations conducted on October 18, 2023, by local experts. As the LSA is completely contained inside the Ereğli Plain KBA, which is regarded as an ecologically uniform area, the species is therefore thought to have the potential to be found throughout the entire KBA. Hence, the species' EOO was determined by adding the known EOO from literature to the extent of the Ereğli Plain KBA and IBA. Therefore, the species results to have a fragmented distribution range, with a total area of 43,903 km^2 (see Figure 6-58).

The EAAA was subsequently juxtaposed with the computed EOO to assess its potential to meet the specified threshold: "a) areas that consistently hold ≥10% of the global population size AND ≥ 10 reproductive units of a species" as per Criterion 2a. The outcomes of the critical habitat screening are elaborated upon below.

Given that the EAAA falls below 10% of the calculated EOO, the species does not meet the criteria to initiate Critical Habitat (CH) designation according to Criterion 2. Consequently, **no species potentially triggering CH based on this criterion were identified.**

[30] The IUCN Red List of Threatened Species – Source: https://www.iucnredlist.org/species/136237/137237409.

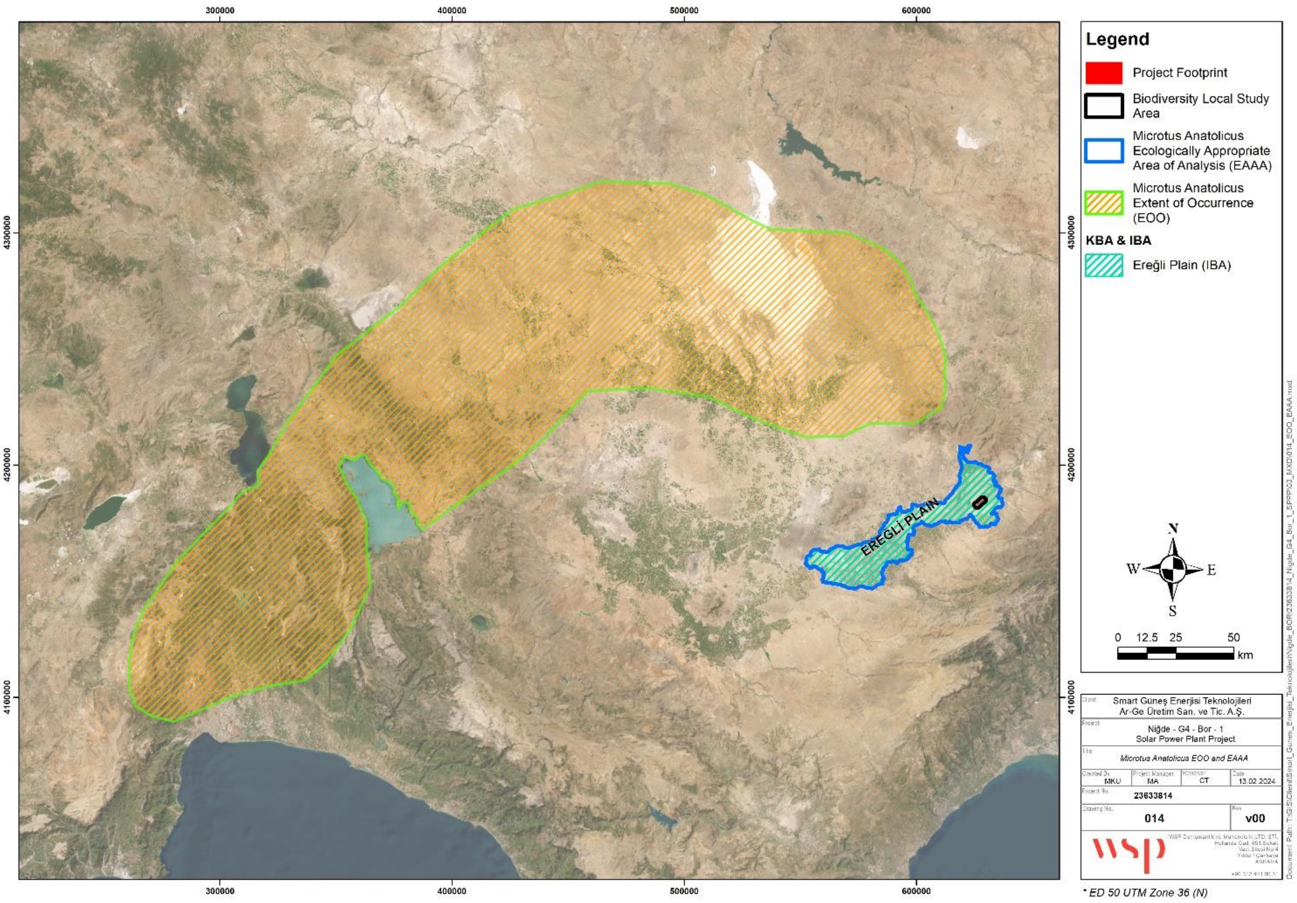


Figure 6-58: Microtus anatolicus EOO and EAAA

6.3.4.3 Criterion 3: Habitats supporting globally significant migratory or congregatory species

The evaluation took into account the existence of KBAs and IBAs that have been identified for congregatory species, as well as Wetlands of International Importance that have been designated under criterion 5 or 6 of the Ramsar Convention. Furthermore, the presence of migratory and congregatory species was also considered.

Criteria 3a threshold assessments were conducted on all migratory and congregatory bird species that triggered the Ereli Plain IBA: “areas known to sustain, on a cyclical or otherwise regular basis, ≥ 1 percent of the global population of a migratory or congregator species at any point of the species’ lifecycle”.

The literature data from BirdLife for the evaluated bird species’ global population estimates were obtained. Given that the worldwide population estimate is often supplied as a range with both a lower and upper limit, a cautious approach was taken by using only the lower limit for the calculation. For example, for *Charadrius leschenaultii* the global population is estimated at 150,000-340,000 individuals[31], therefore for the purpose of the CHA the lower limit of 150,000 was considered.

Population estimates of the bird inside the Ereğli Plain IBA (also EAAA) were collected from literature. In this case, although employing a cautious methodology, the highest value within the provided range of estimated

[31] BirdLife International (2024a). Species factsheet: *Charadrius leschenaultii*. Downloaded from http://datazone.birdlife.org/species/factsheet/greater-sandplover-charadrius-leschenaultii on 13/02/2024.

local population was taken into account. For example, for *Charadrius 191eschenaultia* the population at site is estimated to include 120-150 breeding pairs, therefore for the purpose of the CHA the upper limit of 150 breeding pairs was considered[32].

It is crucial to emphasise that the estimations provided on BirdLife are significantly outdated (1986-1998). Given the significant level of danger and extremely unfavourable conservation status of the IBA resulting from water scarcity and diversion since the late 1990s, which led to the shrinking of wetland habitats, it is probable that the current population figures have significantly declined. Hence, the evaluation is exceedingly conservative.

Subsequently, the population estimates at the site were compared to the global population estimates to determine if the IBA could potentially satisfy the Criterion 3 threshold. If the population estimate at the site is equal to or greater than 1% of the global population estimate, then the area is considered to potentially qualify as Critical Habitat (GN78, IFC 2019). The findings of the CH screening are analysed and presented in Table 6-50.

Following the screening process, three bird species were determined to have the potential to trigger CH based on Criterion 3a in the EAAA. The species mentioned are the Pigmy Cormorant (*Microcarbo pygmaeus*), the White-headed Duck (*Oxyura leucocephala*), and the Ruddy Shelduck (*Tadorna ferruginea*).

It is crucial to emphasize that all of these species are aquatic in nature, and their occurrence as breeding, wintering, and/or passage species is intricately linked to the existence of open water habitats. However, these habitats are absent within the LSA and its surroundings. In the Ereğli Plain IBA, including the EAAA, they are exclusively situated in its southwestern sector, approximately 60 km away from the Project LSA, aligning with the Akgöl Lake.(see Figure 6-57).

It is crucial to emphasise that all of these species are aquatic species, and their occurrence as breeding, wintering, and/or passing species is closely linked to the existence of open water habitats. These habitats are absent in the LSA or its surrounding areas. However, they are only found in the south-western part of the Ereğli Plain IBA, approximately 60 km away from the Project LSA. These habitats are specifically located around the Akgöl Lake (see Figure 6-48).

Therefore, it can be concluded that **no Critical Habitat is expected to be present in the LSA according to this criterion**.

[32] BirdLife International (2024b) Important Bird Area factsheet: Ereğli Plain. Downloaded from **http://datazone.birdlife.org/site/factsheet/749** on 13/02/2024.

Table 6-50: Screening of migratory and congregatory species potentially triggering Critical Habitat according to Criterion 3a (IFC, 2019)

Species	Common name	Global IUCN Status	Lit./ Obs.*	Global population (individuals)	1% of the global pop. (individuals)	Estimated Ereğli Plain IBA pop. (individuals)	Status in the IBA	Congregatory/ Migratory	IBA pop. is ≥ 1%of global pop.	Critical Habitat
Ardeola ralloides	Squacco Heron	LC	L	370,000-780,000	3,700	100	Breeding	Congregatory/ Migrant	No	-
Charadrius leschenaultii	Greater Sandplover	LC	O	150,000-340,000	1,500	300	Breeding	Congregatory/ Migrant	No	-
Falco naumanni	Lesser Kestrel	LC	O	80,000-134,000	800	70	Breeding	Congregatory/ Migrant	No	-
Glareola pratincola	Collared Pratincole	LC	L	160,000-600,000	1,600	100	Breeding	Congregatory/ Migrant	No	-
Grus grus	Common Crane	LC	L	491,000-503,000	4,910	6	Breeding	Congregatory/ Migrant	No	-
						253	Wintering		No	-
Himantopus himantopus	Black-winged Stilt	LC	L	450,000-780,000	4,500	600	Breeding	Congregatory/ Migrant	No	-
Mareca strepera	Gadwall Mareca	LC	L	4,300,000-4,900,000	43,000	40	Breeding	Congregatory/ Migrant	No	-
Marmaronetta angustirostris	Marbled Teal	NT	L	10,000-42,000	100	10	Breeding	Congregatory/ Migrant	No	-
Microcarbo pygmaeus	Pygmy Cormorant	LC	L	48,000-137,000	480	1,200	Breeding	Congregatory/ Migrant	Yes	CH
Netta rufina	Red-crested Pochard	LC	L	420,000-600,000	4,200	1,000	Breeding	Congregatory/ Migrant	No	-
Oxyura leucocephala	White-headed Duck	EN	L	5300-8700	53	494	Passage	Congregatory/ Migrant	Yes	CH
						100	Breeding		Yes	

Species	Common name	Global IUCN Status	Lit./ Obs.*	Global population (individuals)	1% of the global pop. (individuals)	Estimated Ereğli Plain IBA pop. (individuals)	Status in the IBA	Congregatory/ Migratory	IBA pop. is ≥ 1%of global pop.	Critical Habitat
Pelecanus crispus	Dalmatian Pelican	NT	L	11,400-13,400	114	62	Non-Breeding	Congregatory/ Migrant	No	-
Pelecanus onocrotalus	Great White Pelican	LC	L	265,000-295,000	2,650	40	Breeding	Congregatory/ Migrant	No	-
						1,000	Passage		No	-
Phoenicopterus roseus	Greater Flamingo	LC	L	550,000-680,000	5,500	600	Breeding	Congregatory/ Migrant	No	-
Platalea leucorodia	Eurasian Spoonbill	LC	L	63,000-65,000	630	40	Breeding	Congregatory/ Migrant	No	-
						250	Non-Breeding		No	-
Plegadis falcinellus	Glossy Ibis	LC	L	230,000-2,220,000	2,300	100	Breeding	Congregatory/ Migrant	No	-
Sternula albifrons	Little Tern	LC	L	190,000-410,000	1,900	120	Breeding	Congregatory/ Migrant	No	-
Tadorna ferruginea	Ruddy Shelduck	LC	L	170,000-220,000	1,700	3,016	Wintering	Congregatory/ Migrant	Yes	CH
Vanellus spinosus	Spur-winged Lapwing	LC	L	130,000-800,000	1,300	40	Breeding	Congregatory/ Migrant	No	-

*L:Literature A:Field, G: Interview with locals, O: Observation, H: Habitat

6.3.4.4 Criterion 4: Highly threatened and/or unique ecosystems

This criterion focused on ecosystems facing the imminent risk of substantial reduction in size or decline in quality, characterized by limited spatial coverage, and/or hosting significant concentrations of species restricted to a specific biome. The implementation of Criterion 4, as outlined in GN79 and IFC 2019, involves utilizing the "Red List of Ecosystems (RLE)," especially in cases where official IUCN assessments have been carried out. It is important to note, however, that there has been no evaluation conducted in Türkiye, as evidenced by the absence of assessments in the IUCN RLE Database.[33]. Hence, the current unavailability of assessments in Türkiye renders the use of the "Red List of Ecosystems (RLE)" impractical. In lieu of this, the "European Red List of Habitats" was employed to pinpoint threatened ecosystems.

The "European Red List of Habitats" (European Union, 2016) is the outcome of a comprehensive and meticulous evaluation conducted by Alterra and IUCN, with the collaboration of numerous experts throughout Europe. The criteria and categories applied to the EUNIS habitat types in the European Red List of Habitats are derived from a protocol outlined in a feasibility study. [34], This protocol combines elements of the IUCN Red List of Ecosystems[35] approach for assessing the risk of ecosystems (2016). The categories assigned to the EUNIS habitat types closely mirror those utilized in the IUCN Red List of Threatened Species. Specifically, the CR (Critically Endangered) or EN (Endangered) designations encompass habitats facing the imminent threat of substantial reduction in quantity, be it in terms of area, distribution, or biotic/abiotic quality. These categories also encompass habitats with limited spatial coverage and those harboring concentrations of species restricted to a particular biome, indicating a very high risk of collapse.Within the LSA, only one natural habitat type was recognized, namely the EUNIS habitat "E6.2 – Continental inland salt steppe." According to the European Red List of Habitats, this habitat has been categorized as Vulnerable (VU).[15].

No habitats classified as Endangered (EN) or Critically Endangered (CR) were identified. Therefore, **no Critical Habitat is expected to be present in the LSA according to this criterion.**

6.3.4.5 Criterion 5: Areas associated with key evolutionary processes

This criterion encompasses the examination of areas with landscape features potentially linked to evolutionary processes or notably distinct species populations, raising concerns for their special conservation. However, the LSA does not exhibit landscape features that are known to influence evolutionary processes, leading to distinctive regional configurations of species and ecological characteristics. Notably, there are no species or subpopulations within the area distinguished by a specific level of isolation, spatial heterogeneity, or an abundance of environmental gradients or edaphic interfaces. Additionally, the LSA is not acknowledged for its significance in climate change adaptation or as a biological corridor. Consequently, these considerations indicate that the study area does not support any pivotal evolutionary processes.

Therefore, **no Critical Habitat is expected to be present in the LSA according to this criterion**.

---

[33] http://assessments.iucnrle.org/

[34] 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.

[35] 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

7.0 ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

7.1 Physical Components

7.1.1 Air Quality

According to the baseline conditions acquitted from the site to define baseline air quality (see Section 6.1), the physical component *Air Quality* was detected as a **Medium** value of sensitivity. The AoI is taken into account to be sensitive for the following reasons:

- PM10, PM2.5, and settled dust in the AoI;
- Proximity to residential areas, vulnerable entities, and ecologically sensitive receptors may pose a potential exposure to air emissions.

As part of the ESIA, PM2.5, PM10, and settled dust measurements were carried out between December 2023 and February 2024 at four representative locations. Measurement results show that the dust levels are below the regulatory limits around the Project Area.

7.1.1.1 Impact Factors

7.1.1.1.1 Construction phase

The impact factors originated from the Project activities potentially affecting air quality during construction phase are listed in Table 7-1. Construction activities are a source of dust emissions that may have temporary impact on local air quality. Emissions during the construction activities are related with land clearing, ground excavation, cut and fill operations etc. Dust emissions changes in different phases of the construction activities.

Table 7-1: Project actions and impact factors potentially affecting air quality during construction phase

Project Actions	Impact Factors
▪ Vegetation clearing/soil removal (earthworks) ▪ General engineering/construction works ▪ Transportation of construction materials	▪ Emission of dust and particulate matter ▪ Emission of gaseous pollutants

For the construction phase, impacts potentially affecting this component are evaluated below.

<u>**Emission of dust and particulate matter**</u>

Dust and particulate matter emissions from construction activities such as land clearing, ground excavation, cut and fill operations are calculated by using the emissions factors given in the Annex 12 of the Regulation on Control of Industrial Air Pollution (see Table 7-2). The controlled factors stand for the cases where activities are carried out with measures in place such as sprinkling, keeping materials moist, loading and unloading without skidding, etc. Uncontrolled emission factors, on the other hand, represent the situations where activities are carried out without taking any mitigation measures.

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

Source of emission	Emission factors		Emission Factor Unit
	Uncontrolled Conditions	Controlled Conditions	
Storage	5.8	2.9	kg/ha.day
Transportation (total distance)	0.7	0.35	kg/km-vehicle

The calculation of dust emissions is presented in Table 7-3. Considering that the land preparation activities and corresponding dust emissions 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. 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:

$$\text{Dust Emission }\left(\frac{\text{kg}}{\text{h}}\right) = \text{Emission Factor }\left(\frac{\text{kg}}{\text{km} - \text{vehicle}}\right) \text{ x Distance }\left(\frac{\text{km}}{\text{vehicle}}\right) \text{ x Number of vehicles }\left(\frac{\text{vehicle}}{\text{h}}\right)$$

According to the information acquired from the Client, excavation work will be carried out only at the point where the administrative building will be located in the Project area. Panel carrier legs will be mounted on the ground with a pile driving machine.

Table 7-3: Dust Emission Estimation – Administration Building Construction

Dust Emission due to Administration Building Construction:	
Excavation amount	40,000 m^3
Bulk density of soil	2.00 ton/m^3
Mass of excavated soil	40,000 m^3 x 2.00 ton/m^3 = 80,000 ton
Duration of earth works	180 days
Daily working time (2 shifts)	16 h/day
Hourly excavation amount	80,000 ton / (180 days x 16 h/day) = 27.8 ton/h

Dust emission due to excavation (under controlled conditions)	27.8 ton/h x 0.0125 kg/ton = **0.35 kg/h**
Dust Emission due to unloading of backfill material:	
Backfilling amount	40,000 m^3
Bulk density of soil	2.00 ton/m^3
Mass of backfilling material	40,000 m^3 x 2.00 ton/m^3 = 80,000 ton
Duration of earth works	180 days
Daily working time (2 shifts)	16 h/day
Hourly backfilling amount	80,000 ton / (180 days x 16 h/day) = 27.8 ton/h
Dust emission due to unloading of backfill (under controlled conditions)	27.8 ton/h x 0.005 kg/ton = **0.14 kg/h**

The total amount of dust to be emerged from the construction activities under controlled conditions are calculated as 0.50 kg/h. This amount is below the threshold value for the air emission dispersion modelling requirement defined as 1 kg/h threshold value for area source defined in Table 2.1 in Annex-2 of the Regulation on Control of Industrial Air Pollution (RCIAP). Potential impacts on air quality have been assessed without using software models.

<u>Emission of gaseous pollutants</u>

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 7-4).

Table 7-4: 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

[1] https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100OA05.pdf

Rated Power (kW)	NMHC (g/kW-hour)	NOx (g/kW-hour)	PM (g/kW-hour)	CO (g/kW-hour)
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

During calculation of the gaseous emissions from construction activities, all machines and equipment are assumed as working simultaneously to represent the emissions under worst-case scenario.

The amount of gaseous pollutants calculated by using emission factors (see Table 7-4) are presented in Table 7-5 and Table 7-6.

Table 7-5: Pollutant Emissions Originated from the Each Construction Equipment

Construction Equipment	Number of Equipment	Rated Power (kW)	Parameter	Emission (kg/hour)
Pile Driver	1	114	NMHC	0.022
			NOX	0.046
			PM	0.002
			CO	0.570
Loader	1	110	NMHC	0.021
			NOX	0.044
			PM	0.002
			CO	0.550
Truck	2	119	NMHC	0.045
			NOX	0.095
			PM	0.005
			CO	1.190
Concrete Pump	1	145	NMHC	0.028
			NOX	0.058
			PM	0.003
			CO	0.508
Trans mixer	1	85	NMHC	0.016
			NOX	0.034

Construction Equipment	Number of Equipment	Rated Power (kW)	Parameter	Emission (kg/hour)
			PM	0.002
			CO	0.425
Wire Pulling and Stopper Machine	1	114	NMHC	0.022
			NOX	0.046
			PM	0.002
			CO	0.570

Table 7-6: 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	0.153	3
NOX	0.322	4
PM	0.016	1
CO	3.813	50

Since the amount of each pollutant emission originated from the construction activities is below the threshold value for the air emission dispersion modelling requirement defined in Table 2.1 of Annex-2 of the RCIAP, air quality modelling study was not conducted for these pollutants.

The total amount of pollutants originated from the construction activities are calculated as below the threshold value for the air emission dispersion modelling requirement defined in RCIAP. Impacts on air quality have been assessed without using software models.

7.1.1.1.2 Operation Phase

Table 7-13 lists the impact factor of the Project activities potentially affecting air quality during operation and decommissioning phases.

Table 7-7: Project Actions and Related Impact Factors During Operation Phase

Project actions	Impact factors
Plant/infrastructure operation	Emission of gaseous pollutants

The impact factor identified above is described below and assessed in the matrix that follows.

Emission of gaseous pollutants

During the operational phase of the Project, the emissions anticipated from Project-related activities are the exhaust emissions produced by the vehicles utilized by operational staff. Throughout this phase, a total of 20 personnel will be employed, and vehicle traffic will primarily consist of maintenance operations and staff transportation to and from the Project Area.

7.1.1.1.3 Decommissioning Phase

Activities during the decommissioning phase are projected to resemble those of the construction phase, thereby resulting in similar impacts. Consequently, no new impacts are foreseen during the decommissioning phase of the Project, aside from those already identified in the construction phase.

7.1.1.2 Mitigation Measures

In terms of mitigation measures, the mitigation hierarchy (avoidance, minimization, rehabilitation/restoration) will be followed and implemented. For minimizing the air emissions, the following mitigation measures will be implemented during the construction, operation and decommissioning phases:

- Construction sites and transportation routes will be sprayed with water, especially during hot-dry seasons and windy conditions, while dust-generating work will be slowed or halted during strong winds, supplemented by additional water spraying as needed.
- Material handling will be minimized, and where dust levels remain problematic, additional control measures such as spraying with water during material handling will be implemented.
- Trucks carrying dust-generating materials will be covered with tarp and have their loads sprayed with water to minimize dust.
- Loading and unloading will be carried out without skidding to prevent dust generation.
- Construction traffic will avoid passing through settlements whenever possible; if unavoidable, measures such as speed limits will be implemented to minimize emissions, and affected communities will be informed of activities and schedules.
- Speed limits will be enforced, and vehicle movements and idling will be minimized.
- Vehicle engines and machinery will be operated only when essential to reduce emissions.
- Lighting fires and burning materials will be strictly prohibited.
- Minimum necessary number of equipment/vehicles will be used simultaneously.
- Transportation distances will be minimized where feasible.
- Regular checks and maintenance of machinery and equipment will be conducted for providing optimal working conditions and compliance with environmental standards and regulations.
- Vehicle exhaust emissions must comply with regulations, with routine maintenance and emission measurements conducted accordingly.
- Stockpiles will be kept for the shortest possible duration and sited considering prevailing wind directions to minimize impacts on sensitive receptors.
- Electric powered equipment mechanization will be used when feasible.
- Personal protective equipment, such as dust masks, will be provided to workers where excessive dust levels are expected.
- Grievance mechanism to record and respond to complaints will be developed.

7.1.1.3 Residual Impacts

7.1.1.3.1 Construction Phase

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 construction activities.

Table 7-8: 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
Emission of dust and particulate matter	Duration:	Short	Medium	Short-term	**Negligible**	Medium	**Negligible**
	Frequency:	Frequent					
	Geo. Extent:	Local					
	Intensity:	Low					
Emission of gaseous pollutants	Duration:	Short	Medium	Short-term	**Negligible**	Low	**Negligible**
	Frequency:	Frequent					
	Geo. Extent:	Local					
	Intensity:	Low					

7.1.1.3.2 Operation Phase

The project characteristics, actions and the proper implementation of the mitigation measures proposed above, a potential **negligible negative impact** is expected on the air quality due to operation phase.

Table 7-9: 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	Duration:	Very long	Medium	Short-term	**Low**	Medium	**Negligible**
	Frequency:	Frequent					
	Geo. Extent:	Local					
	Intensity:	Negligible					

7.1.1.4 Monitoring

The following monitoring actions 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 at the closest sensitive receptors in case of grievance;
- 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 exceptional incidents that cause extra dust or gas emissions, either on- or offsite, and the action taken to resolve the situation in the logbook.

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;
- Maintaining a logbook 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.

7.1.2 Noise and Vibration

In accordance with the data and information gathered for 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; and
- Close presence of communities, vulnerable targets and sensitive ecological receptors potentially exposed to noise and vibration emissions.

Within the scope of the baseline studies, 3 representative background noise measurement locations have been assigned to determine the baseline noise levels around the Project Area. Ambient noise levels were measured for a 48-hours period between in December 2023, at each location. Based on the results, baseline noise levels are below the limit values defined in both the IFC noise standards and the Turkish national legislation.

A noise modelling software "SoundPLAN Essential 5.0"[36] was used for the determination of predicted noise levels that would potentially take place during the construction phase of the Project. Information about the noise levels of machinery and equipment that are identified as noise sources to be used during the construction phase of the Project, was obtained from the Client. For the machinery and equipment whose noise levels could not be provided by the Client, noise modelling software program's library was used.

During the modelling studies for the construction phase of the Project, below steps were followed:

As a first step of modelling studies, 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.

Then, the humidity, temperature, and air pressure data of the Project Area were introduced to the model.

The noise sources identified for the study area were introduced to the model together with their noise levels (dBA).

The determined receptors have also been digitized in the model.

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.

Finally, 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 a close distance to the sensitive receptors. As a

[36] https://www.soundplan.eu/en/software/soundplanessential/

result of the model runs, noise levels in the defined receptors and grid noise maps for the study area are obtained.

The assumptions and approaches used in the noise model are listed below:

- Noise model was developed by using machinery and equipment type and amount, and noise levels which are defined in Section 7.1.2.1.1;
- The Project Area temperature is taken as 11.2°C, humidity as 58.5%, and air pressure as 879.6 hPa by assuming a general average for region which is provided in Section 6.1.2;
- The ground effect was taken as 0.5 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 a close distance to the sensitive receptors, at the same time and with maximum capacity.

For the worst-case scenario simulation, modelled noise levels were cumulatively assessed in consideration with the highest noise levels measured during the baseline studies, and the cumulative noise values were assessed in consideration with the Project Standards.

7.1.2.1 Impact Factors

7.1.2.1.1 Construction Phase

The impact factor which will be generated as a result of the Project Actions that will potentially affect the ambient noise levels during construction phase is listed in Table 7-10.

Table 7-10: Project Actions and Corresponding Impact Factor for the Construction Phase

Project Actions	Impact Factor
Vegetation clearing/soil removal (earthworks)	Emission of noise
General engineering/construction works	
Transportation of construction materials	

The related impact factor is described below and assessed in the matrix that follows.

Emission of noise

Increase in ambient noise levels are expected as a result of heavy machinery and equipment to be used in the infrastructure and superstructure construction, is evaluated cumulatively and conservatively in this section in order to display the worst-case scenario for the construction phase of the Project. On the other hand, it should be noted that construction activities will not take place at the night-time.

The list of machinery and equipment which will be used during the whole construction phase of the Project, are provided by the Client and presented in Table 7-11. While some of the noise levels of the machinery and equipment are provided by the Client, for the one whose noise levels could not be provided by the Client, noise modelling software program's library was used.

In the context of the worst-case scenario approach, the model is set considering the situation where all of the noise sources are operating at a close distance to the sensitive receptors, at the same time and with maximum capacity.

Table 7-11: Construction Machinery and Equipment List

Machinery / Equipment	Number	Sound Power (Lw)
Truck	2	105[1]
Loader	1	106[1]
Crawler Dozer	1	117[2]
Water Truck	1	105[1]
Concrete Pump	1	108[1]
Transmixer	1	103[1]
Pile Driving Machine	1	105[1]

[1] Obtained from the Client

[2] Obtained from the library of Sound Plan Essential 5.0.

The calculated noise levels at the selected receptors, where baseline noise measurements were carried out, the cumulative results and the comparison of results with the IFC noise standards and Turkish regulatory noise limit values are presented in Table 7-12. Based on that, all the cumulative noise levels are below the limit values defined in both the IFC noise standards and Turkish national legislation.

The daytime grid noise map generated for the construction phase of the Project, is presented in the Figure 7-1.

Table 7-12: Modelled Construction Noise Levels and Baseline Noise Levels at the Selected 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	Niğde	Bor	Emen	Residential	1,050	41.6	-	41.6	41.6	-	39.6	37.3	40.2	37.4	37.3	43.7	37.3	44.0	43.0	37.3	4.1	0.0	3.8	5.6	0.0
N-2	Niğde	Bor	Emen	Residential	1,500	37.7	-	37.7	37.7	-	51.1	40.5	52.1	46.5	40.1	51.3	40.5	52.3	47.0	40.1	0.2	0.0	0.2	0.5	0.0
N-3	Niğde	Bor	Seslikaya	Residential	1,400	37.8	-	37.8	37.8	-	47.5	44.8	47.4	47.8	44.6	47.9	44.8	47.9	48.2	44.6	0.4	0.0	0.5	0.4	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 in consideration with the highest noise levels measured during the baseline studies.
[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).

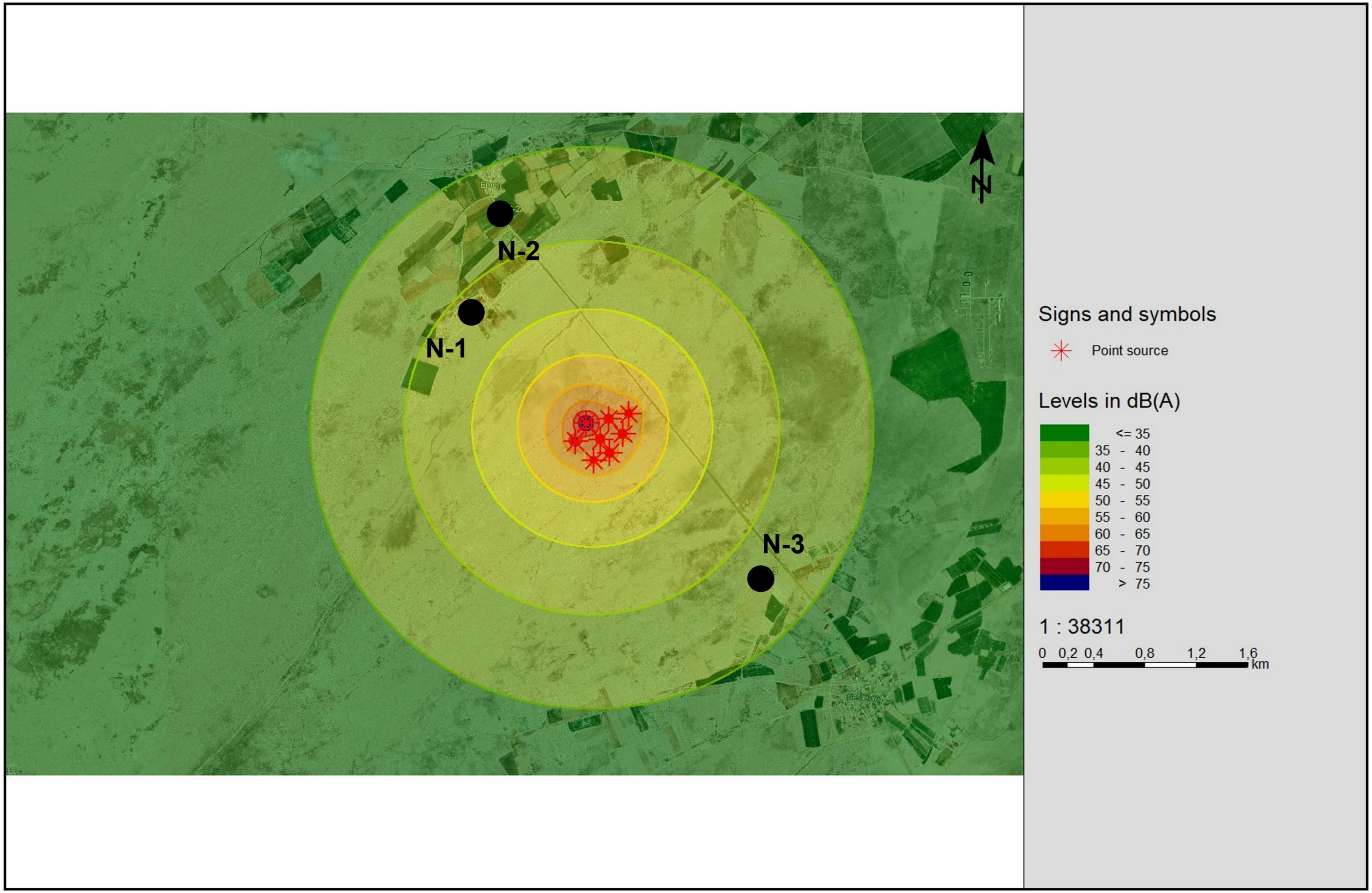


Figure 7-1: Daytime Grid Noise Map for the Construction Phase of the Project

7.1.2.1.2 Operation Phase

The impact factor which will be generated resulting from the Project Action that will potentially affect the ambient noise levels during operation phase is listed in Table 7-13.

Table 7-13: Project Action and Related Impact Factor During Operation Phases

Project Action	Impact factor
Plant operation	Emission of noise

The related impact factor is described below.

- **Emission of noise**

The primary components of the Project, such as photovoltaic panels and inverters, operate quietly without the need for combustion engines or mechanical moving parts. Unlike conventional power generation sources like fossil fuel-based plants, which involve combustion and rotating machinery, solar power plants rely on the direct conversion of sunlight into electricity through semiconductor materials. Therefore, environmental noise to be generated by the Project is not expected to cause any increase in the background noise levels at the closest sensitive receptors.

7.1.2.1.3 Decommissioning Phase

Activities during the decommissioning phase are projected to resemble those of the construction phase, thereby resulting in similar impacts. Consequently, no new impacts are foreseen during the decommissioning phase of the Project, aside from those already identified in the construction phase.

7.1.2.2 Mitigation Measures

In terms of mitigation measures, the mitigation hierarchy (avoidance, minimization, rehabilitation/restoration) will be followed and implemented. It should be noted that the noise modelling study and relevant assessments are based on the worst-case scenario which represents the situation where all of the noise sources are operating at a close distance to the sensitive receptors, at the same time and with maximum capacity. Therefore, the real increase in baseline noise levels would be much lower than the predicted values in most of the construction period due to the homogeneous distribution of machinery and equipment on the site.

During the construction, operation and decommissioning phase, provisions of the “Regulation on Protection of Workers from Noise-Related Risks” and “Regulation on Control of Environmental Noise” will be applied in order to protect both health of employees and environment regarding to noise related impacts. Based on that, appropriate personal protective equipment and materials such as ear plug or ear protector will be provided to workers in order to protect them from noise related impacts, if required.

The below given control measures will be applied where possible during construction phase:

- Machinery and equipment which have lower sound power levels, will be selected;
- Operation hours of specific operations, machinery or equipment, especially mobile sources that will operate through the community areas, will be limited;
- Noise sources will be re-located to less sensitive areas to take advantage of distance and shielding where possible;
- Speed limit applications will be applied for the Project machinery and vehicles that will transport construction materials and equipment;
- Project traffic will be reduced by routing out of community areas wherever possible;

- Suitable mufflers on compressor components and engine exhausts will be installed;
- Acoustic enclosures for equipment casting radiating noise will be installed;
- Engine covers will be kept closed to minimize noise when the equipment is in operation;
- Idling of construction machinery and vehicles will be avoided;
- New and/or properly refurbished and regularly maintained machinery, vehicles and equipment will be used to the extent possible;
- Any component of machinery or equipment, which generates excessive noise (e.g., broken or loosely placed engine hood, a defective muffler, etc.) will be discarded if the related components cannot be repaired/maintained and they will be replaced as appropriate;
- Workers will be trained regarding to best practices, including switching off equipment when it is not required and avoiding unnecessary operation of engines;
- Grievance mechanism to record and respond to complaints will be developed;
- Regular maintenance of the construction machinery and equipment will be carried out, in order to minimize the possible high noise levels that might be generated by the machinery and equipment.

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 noise measurement results indicate that ambient noise levels exceed the Project Standards, firstly construction schedule will be reviewed and revised in order to limit the number of machinery and equipment to be operated simultaneously and to limit the hours of operation, if possible. If construction schedule could not be revised, noise barriers could be installed without any gaps and with a continuous minimum surface density of 10 kg/m^2 in order to minimize the transmission of sound through the barrier. In that case, the barriers should be located close to the source or to the receptor location to be effective. The exact number, location and specifications of the noise barriers will be determined if deemed necessary.

Although no significant noise related impact is expected during the operation phase of the Project, following measures will be implemented:

- Maintenance of the equipment will be done on regular basis in order to ensure that possible noise emissions are minimized;
- In case of any noise related grievance, noise measurement campaign will be carried out immediately at the area where noise related grievance is received;
- In case of any exceedance in the defined noise limit values, noise levels will be monitored at the receptors where the noise levels are exceeded, at least for a year on monthly basis; and
- In cases when monitoring results indicate that noise levels are exceeded the defined noise limit values, then noise abatement measures such as soundproofing, noise barriers at the source, etc. will be implemented.

7.1.2.3 Residual Impacts

7.1.2.3.1 Construction Phase

The below table summarizes the impacts resulted by the identified impact factor on the assessed component.

In accordance with the baseline conditions of the assessed component, characteristics of the Project, and Project actions, as well as the proper implementation of the mitigation measures defined above, a potential **negligible** impact is expected on the ambient noise levels during the construction phase of the Project.

Table 7-14: Residual Impact Assessment Matrix for the Noise Component During Construction Phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Emission of Noise	Duration:	Short	Medium	Short-term	**Low**	Medium	**Negligible**
	Frequency:	Continuous					
	Geo. Extent:	Local					
	Intensity:	Very high					

7.1.2.3.2 Operation Phase

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 Monitoring

During the construction phase of the Project, 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.

During the operation phase of the Project, noise measurements will be carried out in case of any Project related noise grievance. In case of any exceedance in the defined noise limit values, noise levels will be monitored at the receptors where the noise levels are exceeded, at least for a year on a monthly basis.

7.1.3 Soil and Subsoil

Drawing from the data gathered to establish the baseline (as outlined in Chapter 6.1), the physical aspect of Soil and Subsoil was designated as having a **Medium-Low** value of sensitivity due to the following factors:

- Limited soil contamination.

7.1.3.1 Impact Factors

7.1.3.1.1 Construction Phase

The potential impact factors to the soil and subsoil during construction phase are listed in Table 7-15.

Table 7-15: Project actions and related impact factors potentially affecting soil and subsoil during construction phase

Project actions	Impact factors
▪ Vegetation clearing/soil removal (earthworks) ▪ General engineering/construction works ▪ Transportation of construction materials ▪ Temporary stockpiling of material (storage)	▪ Removal of soil ▪ Minor leakage of contaminants into soil ▪ Discharge of wastewater ▪ Occupation of land

Removal of Soil

Topsoil removal will be applied under the area of the permanent building foundations. Soil removal will occur during various activities, including earthworks (such as excavation and filling) to prepare the surface for construction, trenching for cable laying, and excavations for building foundations (e.g., control building). It is anticipated that no excavation waste will be generated, as the material excavated will be utilized for filling purposes. Materials required for construction activities, such as bedding, padding, backfilling, and aggregates, will be sourced from third-party companies holding permits/licenses compliant with national regulations.

The removal of soil will inevitably result in disturbances, rendering the soil surface more susceptible to erosion by wind and/or rain. However, since there are no natural water receptors within the Project AoI, no surface drainage impact from soil erosion is expected.

Minor Leakage of Contaminants into Soil

Minor leakage of contaminants into the soil may occur due to various factors, including:

- Leakage of oil and fuel from vehicles and generators.
- Unintentional spills of any hazardous materials employed in the construction process.
- Runoff from zones lacking proper containment for the temporary storage of chemicals, oil, and fuel (e.g., areas without paving and secondary containment).
- Environmental pollution resulting from the temporary storage of hazardous materials and/or wastes.
- Management of waste disposal and wastewater.
- Unintended release of wastewater.

Discharge of Wastewater

During the construction phase, there will be no camping site and the daily generation of domestic wastewater due to personnel activities in mobilization area is estimated at 22.9 m^3/day. Domestic wastewater produced at the mobilization area has been stored in septic tanks and periodically transported by Niğde Special Provincial Administration by vacuum trucks and sent to water treatment plant. No wastewater generation is anticipated as a result of dust suppression activities, as the water used for such purposes is expected to evaporate.

Occupation of Land

Occupation of land mainly related to presence of the new facilities (such as PV panels, administrative buildings, and switchyard) and the artificial surfaces will be increased.

7.1.3.1.2 Operation Phase

The impact factors from the Project activities potentially affecting soil and subsoil during operation phase are listed in Table 7-16.

Table 7-16: Project actions and related impact factors potentially affecting soil and subsoil during operation and decommissioning phases

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 the soil may occur due to various factors which are already summarized in above for construction phase (see Section 7.1.3.1.1).

Discharge of Wastewater

During the operation phase, the daily generation of domestic wastewater due to personnel activities in the administration building is estimated at 4.58 m^3/day. Domestic wastewater produced at the administration building are being stored in septic tanks and periodically transported by Niğde Special Provincial Administration by vacuum trucks and sent to wastewater treatment plant. This implementation will continue during operation phase.

Dry cleaning method will be used for panel cleaning activities. Therefore, no wastewater generation is expected from panel cleaning during operation phase.

Occupation of Land

New facilities (such as PV panels, administrative buildings, campsite, and switchyard) and the artificial surfaces will be remained during operation phase.

7.1.3.1.3 Decommissioning Phase

Activities during the decommissioning phase are projected to resemble those of the construction phase, thereby resulting in similar impacts. Consequently, no new impacts are foreseen during the decommissioning phase of the Project, aside from those already identified in the construction phase.

7.1.3.2 Mitigation Measures

The following mitigation measures shall be implemented to mitigate the effects of the impact factors during construction, operation and decommissioning phases of the project.

Minor Leakage of Contaminants into Soil

- Specific plans for pollution prevention and waste management will be enforced to ensure prompt control of releases and spills before they reach significant levels that could potentially impact soil quality.
- Hazardous material storage area, where chemicals and liquids are stored, has been constructed to prevent soil contamination. This involves paving these areas with adequate secondary containment, installing proper drainage systems, and adhering to Material Safety Data Sheet (MSDS) requirements. Additionally, the Project will adhere to relevant legal and safety regulations to prevent leaks from on-site hazardous material storage facilities.
- Temporary waste storage area has been constructed in accordance with regulations outlined in the Waste Management Regulation issued in the Official Gazette on April 2, 2015, and GIIP. These areas have been situated away from facilities and human traffic, with space provided for licensed waste vehicle access. Precautions against fires and spills, such as fire extinguishers and spill kits, will be in place. Hazardous and non-hazardous wastes will be stored separately, with different entrance doors. Suitable drainage systems will be installed to collect any leaks. The storage area floor will be covered with impermeable concrete, and hazardous waste compartments will have raised concrete walls/parapets to prevent leaks. Wastes will be

stored in tanks and containers, with labels indicating the waste type. Regular waste removal will be ensured to prevent storage area overcapacity.

- Industrial Waste Management Plans for temporary waste storage areas established by contractors will be submitted to the relevant Provincial Directorate of the Ministry of Environment, Urbanization, and Climate Change as per defined format.
- Temporary Waste Storage Permits will be obtained from the related Provincial Directorate of the Ministry of Environment, Urbanization, and Climate Change for temporary waste storage sites generating hazardous waste exceeding 1,000 kg per month.
- Hazardous Materials and Hazardous Waste Compulsory Liability Insurance will be acquired for hazardous waste temporary storage areas/containers, regardless of the stored hazardous waste amount, following regulations outlined in the Waste Management Regulation.
- Agreements for waste reuse, recycling, recovery, and disposal will be made with the municipality and licensed firms.
- Official waste declarations for all generated waste will be submitted to the online system of the Ministry of Environment, Urbanization, and Climate Change annually.
- Storage of waste outside designated areas will be prohibited and wastes from interim storage areas will be transferred to temporary storage areas.
- Regular maintenance of vehicles and machinery/equipment will be conducted to prevent oil/fuel leaks.
- Refuelling and maintenance of machinery/vehicles will be conducted on impervious surfaces or with drip trays to prevent soil contamination during refuelling operations.
- Generators and equipment containing chemicals will be placed in contained areas to minimize drainage, spillages, and leaks.
- Secondary containments, ponds, and drip trays will be regularly inspected, especially during extreme weather conditions.
- Portable spill containment materials will be provided and spill response training will be given to workers.
- In case of spills or leaks, accredited laboratories will conduct sampling and analysis to identify contamination levels and plan corrective actions accordingly.
- Emergency Preparedness and Response Plans will be implemented to manage spills and leaks.

Discharge of Wastewater

- Septic tanks will be made leakproof, and measures will be taken to prevent deformation in extreme weather.
- No untreated wastewater discharge to land will be allowed, and polluted water resulting from accidental leaks will be collected or managed to prevent soil pollution.

7.1.3.3 Residual impacts

7.1.3.3.1 Construction Phase

The project characteristics actions and the proper implementation of the mitigation measures proposed above, a potential **low-negligible** is expected on the soil and subsoil during the construction phase.

Table 7-17: 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					

7.1.3.3.2 Operation Phase

The project characteristics actions and the proper implementation of the mitigation measures proposed above, a potential **low- negligible** is expected on the soil and subsoil during the operation phase.

Table 7-18: 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					

7.1.3.4 Monitoring

The following monitoring measure shall be implemented on the soil and subsoil during the construction, operation and decommissioning phases.

- Regular site inspections will be conducted to confirm that drains remain clear of sediment buildup, ensuring unimpeded flow of runoff at sediment traps.
- Visual inspections of stormwater and wastewater drainage systems, as well as septic tanks, will be conducted periodically to assess their integrity and functionality.
- Site inspections will be regularly conducted and documented to detect any potential leaks.
- Periodic site inspections will be performed to identify any damage to hazardous materials storage areas and waste storage areas.
- Training sessions on spill response and the proper use of containment and cleanup materials will be documented for all workers, including subcontractor personnel.
- Site inspections will be conducted at regular intervals to verify the availability of an adequate supply of spill response materials, such as spill kits and metal trays, at the site and within each heavy machinery, with detailed records maintained.
- A routine maintenance program will be established for all vehicles and machinery/equipment, with maintenance records meticulously kept.

7.1.4 Geology and Geomorphology

According to the data gathered in the initial baseline assessment (see Section 6.1), the Geology and Geomorphology's physical aspect was determined to have a **low** sensitivity value. This is attributed to the insignificant impact on the topography and morphology.

7.1.4.1 Impact Factors

7.1.4.1.1 Construction Phase

In the construction phase, the primary impacts will be linked primarily to the following **impact factor**:

Table 7-19: Project actions and related impact factors potentially affecting geology and geomorphology during construction phase

Project actions	Impact factors
▪ Vegetation clearing/soil removal (earthworks) ▪ General engineering/construction works ▪ Temporary stockpiling of material (storage)	▪ Changes in the local morphology

Changes in the local morphology

The primary impact is associated with alterations to the existing area's morphology resulting from earthworks, excavations, site preparation (including excavation, filling with appropriate material, and flattening), and the construction of foundations for structures.

No blasting activities will take place for the Project.

Additional effects on geology and geomorphology are addressed in the respective sections of this ESIA.

7.1.4.1.2 Operation Phase

Following the impact screening, it is anticipated that there will be **no effects** on the geological and geomorphological aspects during the operational phase.

7.1.4.1.3 Decommissioning Phase

The decommissioning activities will involve dismantling the Project Components and related facilities. Additionally, the foundations of the structures will be taken out. The site is anticipated to be restored for future use. Following the impact screening, it is anticipated that there will be no effects on the geological and geomorphological aspects during the decommissioning phase. The decommissioning of infrastructures could yield positive impacts by restoring the natural state of the land.

7.1.4.2 Mitigation Measures

Below are the mitigation measures for the impacts of geology and geomorphology on the Project during the construction phase:

- Comprehensive studies of geological and geotechnical aspects, including seismicity, have been conducted for the Project prior to the construction phase as part of the local Environmental Impact Assessment (EIA). The suggestions outlined in these studies must be put into practice.
- The worksite will be reduced to the minimum necessary extent to fulfil the Project's tasks and activities.
- The construction site will be minimized as much as possible to fulfil the Project's tasks and activities.
- The foundations' dimensions, both in terms of footprints and depths, have been appropriately sized, thereby minimizing excavations and the resulting physical-mechanical disturbances.
- The flattening and excavation process will be minimized as much as possible to restrict morphological disturbances.
- If the removed material possesses appropriate geotechnical characteristics, a portion of it will be reused as fill material in the Project Area, aiming to minimize the consumption of raw materials.

7.1.4.3 Residual Impacts

7.1.4.3.1 Construction Phase

The table below (Table 7-20) illustrates the lasting effects on the geology and geomorphology components following the implementation of the mitigation measures mentioned above during the construction phase.

Table 7-20: 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 previously mentioned, the impact screening indicates that there are no anticipated effects on the geology and geomorphology components during the operation phase.

7.1.4.4 Monitoring

There is no need for specific monitoring activities for this component.

7.1.5 Seismicity

According to the data gathered in the initial baseline assessment (see Section 6.1), the sensitivity value of Seismicity was determined to be **low** along with Geology and Geomorphology's physical aspect.

7.1.5.1 Impact Factors

The primary natural hazard anticipated throughout all stages of the Project is earthquake.

Earthquakes, if they occur, pose a substantial risk to both the community and the well-being of workers, potentially resulting in accidents, fires, and other safety concerns across all project phases. Furthermore, earthquakes have the potential to induce adverse environmental effects, including spills, leakage, and erosion.

As per AFAD (Disaster and Emergency Management Authority), the peak ground acceleration (PGA) values for the Project Area, calculated for a return period of 475 years, are specified to be around 0.127 g.

Conversely, incidents such as landslides and rockfalls, as assessed under Law No. 7269, have not been observed in the Project Area or its surroundings. Additionally, no "Disaster Exposure Zone" designation has been issued previously for these specific disaster events.

7.1.5.2 Mitigation Measures

The followings are the measures aimed at mitigating the impacts resulting from the natural hazard and seismology aspect on the Project:

- Prior to and throughout construction activities within the study area, adherence to the "Türkiye Building Earthquake Regulation" (Official Gazette Number: 30364 Date: 18.03.2018) will be ensured.
- Thorough examinations will be carried out to evaluate the stability of structural elements under both regular operational loads and seismic loads. The Türkiye Building Earthquake Regulation mandates the determination of specific parameters before construction, and these parameters have been identified through geological and geotechnical investigations in the Project Area.
- Numerous structures will be constructed as integral components of the Project, and their design will adhere to both Turkish and international standards, incorporating specific structural features related to slope gradients in excavations and embankments, footing dimensions, and various other considerations.
- Prior to the construction phase, comprehensive studies (including geological, geotechnical, hydrological studies, flood risk assessments, etc.) will be finalized for the Project.

7.1.5.3 Monitoring

There is no need for specific monitoring activities for this component.

7.1.6 Hydrology and Surface Water

Using the data gathered in the baseline (see Chapter 6.1) the Hydrology and Surface Water Quality physical component was categorized as having a **low** level of sensitivity. This classification is attributed to the absence of surface water bodies in the AoI, as well as the lack of water/sediment pollution and the absence of hydrological changes in the sub-catchments of creeks within the AoI.

7.1.6.1 *Impact Factors*

7.1.6.1.1 Construction Phase

The impact factors on hydrology and surface water during the construction phase, resulting from the Project activities, are given as follows.

Table 7-21: Project actions and related impact factors potentially affecting hydrology and surface water during construction phase

Project actions	Impact factors
▪ General engineering and construction work, ▪ Management of the workforce	▪ Accidental introduction of hazardous chemicals (Surface water pollution) ▪ Discharge of Wastewater

Accidental introduction of hazardous chemicals (Surface water pollution)

If not appropriately handled, the temporary storage of waste and/or hazardous materials generated from construction activities may lead to the release of contaminants onto the surface or into the ground. The primary anticipation for contaminant leaks into water sources is linked to runoff from areas near freshwater bodies that have undergone:

- Leakage of oil and fuel from vehicles and generators.
- Unintentional spills of any hazardous materials employed in the construction process.
- Runoff from zones lacking proper containment for the temporary storage of chemicals, oil, and fuel (e.g., areas without paving and secondary containment).
- Environmental pollution resulting from the temporary storage of hazardous materials and/or wastes.
- Management of waste disposal and wastewater.
- Unintended release of wastewater.

The contamination of fresh surface water with chemicals can result in various detrimental effects on surface water quality, contingent on the type of contaminant and its concentration. Unintended spills of substances like cement, fuel, oils, and lubricants can significantly impact water quality in rivers, aquatic ecosystems, and downstream areas. Additionally, if surface water becomes contaminated, there is a swift potential for groundwater pollution.

Despite the possibility of severe consequences, it is anticipated that occurrences of such incidents will be rare and of low intensity. Therefore, spills, leaks, and accidental discharges are expected to originate mainly from the Project Footprint or associated facilities, which are typically situated at a certain distance from nearby water bodies.

Discharge of Wastewater/Water

During the construction phase, there will be no camping site and the daily generation of domestic wastewater due to personnel activities in mobilization area is estimated at 22.9 m^3/day. Domestic wastewater produced at the mobilization area are being stored in septic tanks and periodically transported by Niğde Special Provincial

Administration by vacuum trucks and sent to water treatment plant. No wastewater generation is anticipated as a result of dust suppression activities, as the water used for such purposes is expected to evaporate.

7.1.6.1.2 Operation Phase

The impacts anticipated during the operation phase are expected to mirror those observed in the construction phase. Consequently, the activities in the operation phase will resemble construction-related activities given as follows.

Table 7-22: Project actions and related impact factors potentially affecting hydrology and surface water during operation phase

Project actions	Impact factors
▪ Plant/infrastructure operation	▪ Accidental introduction of hazardous chemicals (Surface water pollution) ▪ Discharge of Wastewater

Accidental introduction of hazardous chemicals (Surface water pollution)

Detailed information regarding the impact of this Project on surface water pollution is outlined in the preceding section covering the construction phase.

Discharge of Wastewater

During the operation phase, the daily generation of domestic wastewater due to personnel activities in the administration building is estimated at 4.58 m^3/day. Domestic wastewater produced at the administration building has been stored in septic tanks and periodically transported by Niğde Special Provincial Administration by vacuum trucks and sent to wastewater treatment plant.

Dry cleaning method will be used for panel cleaning activities. Therefore, no wastewater generation is expected from panel cleaning during operation phase.

7.1.6.1.3 Decommissioning Phase

Activities during the decommissioning phase are projected to resemble those of the construction phase, thereby resulting in similar impacts. Consequently, no new impacts are foreseen during the decommissioning phase of the Project, aside from those already identified in the construction phase.

7.1.6.2 Mitigation Measures

The hydrology and surface water quality mitigation measures during the construction and operation phases include the following:

- The Project will adhere to safety protocols to prevent leaks of hazardous chemicals/materials and liquids (such as diesel fuel, oil) stored on-site.
- Design and construction of areas housing diesel/fuel storage tanks (referred to as hazardous material storage areas) will prevent potential soil contamination (using paved areas with ample secondary containment, effective drainage systems, and collection ponds).
- Temporary waste storage areas will be built in accordance with the stipulations outlined in the "Regulation on Regular Storage of Wastes," published in the Official Gazette No: 27533, dated 26/03/2010 (Amended: OG-24/06/2022-31876), and the "Regulation on Waste Management," published in the Official Gazette, dated 02/04/2015, No: 29314 (Amended: OG-23/03/2017-30016).

- Consultation with the General Directorate of State Hydraulic Works (DSI) and the General Directorate of Water Management (SYGM) will be consulted regarding hydrological studies and surface water quality. Additional studies will be conducted based on their recommendations before the construction phase.
- Safe Fuelling and Gasoline Handling Guidelines will be established in construction areas. Refuelling of vehicles or equipment will be prohibited within excavated areas. If it is impractical to move heavy equipment to designated fuelling points, an impermeable surface, like a drip-tray, will be employed to prevent accidental releases to groundwater aquifers.
- Excavated areas will not be used for storing hazardous materials, and the handling of such materials will adhere to the Control of Substances Hazardous to Health Procedure, aligning with the Environmental, Health, and Safety (EHS) Guidelines for Environmental Hazardous Material Management
- A procedure for managing the construction site during heavy rainfall periods will be developed. If necessary, exposed surfaces and stored materials will be covered to minimize sediment erosion into surface waters.
- The management plans will include specific measures related to surface water and protection, such as:
  - Design and management of spoil and soil storage areas and the opening of construction material stores, aiming to control sediment loss into runoff by minimizing slope length and angle.
  - Implementation of strategies to prevent rainfall erosion and avoid construction activities during heavy rainfall periods.
  - Diversion of external 'clean' runoff away from the construction area to prevent the mixing of 'clean' and 'dirty' runoff, thereby reducing the required size of sediment basins.
  - Routing of all 'dirty' runoff to designated sediment basins.
  - Installation of barrier fences and/or markings to define the limits of the structure/work area susceptible to damage.
  - Restriction of soil exposure and minimizing degradation during construction.
  - Covering and safeguarding degraded fertile ground using soil, vegetation, mulch, or erosion-resistant material.
  - Collection and proper management of polluted water (if generated by accidental leakages) to prevent its mixing with any water body.
  - Protection of existing drainage and irrigation channels, sediment barriers, green areas, and protection strips through appropriate measures, such as drains and erosion control pits.
  - Collection and settling of drainage from excavations to eliminate suspended materials before discharge, following required permits. Construction of local perimeter drains around working areas to gather suspended runoff and direct it to a system of settlement basins before discharge, where feasible, in compliance with permits.
  - Regular inspection and maintenance of all structures and facilities to ensure proper and efficient operation, particularly after heavy rainfall. Removal of sediment deposits, either by spreading on site (if uncontaminated) or at a properly licensed facility.

- Training workers, including subcontractor workers, on spill response and the use of containment and cleanup materials (spill kits).

The hydrology and surface water quality mitigation measures for the operation phase are outlined as follows:

- The Project will adhere to safety requirements to prevent leakages from hazardous chemicals/materials and liquids stored on-site.
- Temporary waste storage areas will be constructed in accordance with the stipulations outlined in the "Regulation on Regular Storage of Wastes," published in the Official Gazette No: 27533, dated 26/03/2010 (Amended: OG-24/06/2022-31876), and the "Regulation on Waste Management," published in the Official Gazette, dated 02/04/2015, No: 29314 (Amended: OG-23/03/2017-30016).
- Leak-proof septic tanks of high quality will be installed for the collection of generated domestic wastewater. The collected wastewater will be either transported by vacuum trucks and then will be disposed of via vacuum trucks to the nearest wastewater collection system.

7.1.6.3 Residual Impacts

7.1.6.3.1 Construction Phase

Throughout the construction stage, domestic wastewater produced will be gathered in a watertight septic tank. The Industrial Specialized Zone administration will regularly empty these wastewater tanks and transport the contents to the licensed treatment facility of the Industrial Specialized Zone.

The residual impact resulting from the outlined mitigation measures during the construction phase is detailed in Table 7-23. Considering the baseline conditions of assessed components, Project characteristics, and actions, along with the effective implementation of the proposed mitigation measures, a **negligible negative impact** on hydrology and surface water quality is anticipated during the construction phase.

Table 7-23: 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
Accidental introduction of hazardous chemicals (Surface water pollution)	Duration:	Short	Medium-low	Mid term	**Low**	Medium high	**Negligible**
	Frequency:	Infrequent					
	Geo. Extent:	Local					
	Intensity:	Low					
Discharge of Wastewater	Duration:	Short	Low	Mid term	**Negligible**	High	**Negligible**
	Frequency:	Frequent					
	Geo. Extent:	Local					
	Intensity:	Low					

7.1.6.3.2 Operation and Decommissioning Phases

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 7-24).

Table 7-24: 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
Accidental introduction of hazardous chemicals (Surface water pollution)	Duration:	Short	Low	Mid term	**Negligible**	Medium high	**Negligible**
	Frequency:	Infrequent					
	Geo. Extent:	Local					
	Intensity:	Low					
Discharge of Wastewater	Duration:	Long	Low	Mid term	**Low**	High	**Negligible**
	Frequency:	Continuous					
	Geo. Extent:	Local					
	Intensity:	Low					
	Frequency:	Infrequent					
	Geo. Extent:	Project Site					
	Intensity:	Negligible					

7.1.6.4 Monitoring

The surface water quality monitoring program will be tailored to site-specific risk assessments and adhere to established guidelines for surface water quality standards. The program framework is outlined as follows:

- Regular testing of drainage outfalls, especially during repair activities in ecologically sensitive areas and upstream of surface water resources. Test frequency will be determined based on flow discharge characteristics and the sensitivity of downstream receptors (e.g., ecological and/or water resources).
- Evaluation of surface water runoff and flooding conditions following heavy rainfall events to assess the efficiency of water conveyance systems.
- Design checks will be conducted to ensure the implementation of specified measures (e.g., concrete pavement in storage areas, collection pond underneath, gravel spread to unpaved areas).
- Scheduled site inspections will be conducted to monitor dust suppression activities and detect any potential leakages, with records maintained.
- Periodic site inspections will be undertaken to identify potential damage in hazardous materials storage areas and waste storage areas.
- Routine site inspections will ensure the presence of an adequate amount of spill-response materials, such as spill-kits and metal trays, at the site and in each heavy machinery, with records maintained.
- Training sessions on spill response, the use of containment and clean-up materials will be conducted for workers, including subcontractors' workers, and records of these training sessions will be kept.

7.1.7 Hydrogeology and Groundwater

According to the data gathered in the baseline (refer to Section 6.1) the Hydrogeology and Groundwater physical component was categorized with a **low** sensitivity value. This is attributed to the comparatively limited pressures, both in terms of quantity and quality, within the AoI since no groundwater use is planned during the lifetime of the Project.

7.1.7.1 Impact Factors

7.1.7.1.1 Construction Phase

Project activities during the construction phase have the potential to impact the quality of groundwater. This impact primarily arises from operations that can potentially contaminate groundwater.

Table 7-25: Project actions and related impact factors potentially affecting hydrogeology and groundwater during construction phase

Project actions	Impact factors
▪ General engineering and construction work ▪ Temporary stockpiling of material (storage) ▪ Management of the workforce	▪ Accidental introduction of hazardous chemicals (Groundwater pollution) ▪ Discharge of Wastewater

Accidental introduction of hazardous chemicals (Groundwater pollution)

The potential for groundwater contamination may rise during construction due to accidental releases of hazardous materials, especially in shallow overburdened areas. Various activities such as site clearance, earthworks, and spills or leaks from construction machinery, as well as refuelling and storage depots on-site, may affect groundwater quality.

Improper management of construction-derived waste may lead to groundwater pollution. Inadequate handling of temporarily stored waste or hazardous substances from construction operations might result in the release of pollutants onto the soil surface. Accidental leakages during hazardous substance handling, machine refuelling, or maintenance pose additional hazards. Groundwater pollution during construction can occur if mitigation measures are not effectively implemented, allowing pollutants to reach groundwater through the soil. Although no highly hazardous materials are anticipated for construction use, accidental spills from machinery or vehicles would reach groundwater only under specific conditions, such as large quantities and prolonged spill durations, which are not expected during construction or operation phases of the Project.

The temporary storage of waste or hazardous materials from construction activities could, if not properly managed, lead to contaminant release onto the surface or ground. Accidental spills during the use of hazardous substances, machinery refuelling, or maintenance also pose risks, and contaminants may infiltrate the soil and in very rare cases reach groundwater if mitigation measures' effectiveness is compromised. The use of particularly hazardous materials during construction is not expected, and accidental spills reaching groundwater would depend on spill size and duration, hence are not anticipated as risks during the construction and operation phases of the Project.

Discharge of Wastewater

During the construction phase, there will be no camping site and the daily generation of domestic wastewater due to personnel activities in mobilization area is estimated at 22.9 m^3/day. Domestic wastewater produced at the mobilization area has been stored in septic tanks and periodically transported by Niğde Special Provincial Administration by vacuum trucks and sent to water treatment plant. No wastewater generation is anticipated as a result of dust suppression activities, as the water used for such purposes is expected to evaporate.

7.1.7.1.2 Operation Phase

Impacts on this component during operation and commissioning phases will be the same as during the construction phase and are related to the following project actions and impact factors.

Table 7-26: Project actions and related impact factors potentially affecting hydrogeology and groundwater during operation phase

Project actions	Impact factors
▪ Plant/infrastructure operation	▪ Accidental introduction of hazardous chemicals (Groundwater pollution) ▪ Discharge of Wastewater

Accidental introduction of hazardous chemicals (Groundwater pollution)

The details related to this impact factor are also detailed in the previous section (construction phase).

Discharge of Wastewater

During the operation phase, the daily generation of domestic wastewater due to personnel activities in the administration building is estimated at 4.58 m^3/day. Domestic wastewater produced at the administration building has been stored in septic tanks and periodically transported by Niğde Special Provincial Administration by vacuum trucks and sent to wastewater treatment plant.

Dry cleaning method will be used for panel cleaning activities. Therefore, no wastewater generation is expected from panel cleaning during operation phase.

7.1.7.1.3 Decommissioning Phase

Activities during the decommissioning phase are projected to resemble those of the construction phase, thereby resulting in similar impacts. Consequently, no new impacts are foreseen during the decommissioning phase of the Project, aside from those already identified in the construction phase.

7.1.7.2 Mitigation Measures

The mitigation measures related to hydrogeology and groundwater quality for the construction, operation and decommissioning phases are as follows:

- Guidelines for the safe handling and fuelling of gasoline will be established within the construction zones. Fuelling of vehicles or equipment will be strictly prohibited within excavated areas. In cases where heavy equipment cannot be relocated to designated fuelling points, an impermeable surface, such as a drip-tray, will be utilized during the refuelling process to prevent inadvertent releases to groundwater aquifers.
- Hazardous materials will be prohibited from storage in excavated areas, and the handling of all such materials will adhere strictly to the Control of Substances Hazardous to Health Procedure. These procedures will align with the Environmental, Health, and Safety (EHS) Guidelines, specifically the Environmental Hazardous Material Management (IFC, 2007). For instance, secondary containment structures, including berms, dikes, or walls, will be implemented to contain at least 110 percent of the largest tank or 25 percent of the combined tank volumes in areas where hazardous materials are managed (e.g., fuel storage and loading areas, concrete mixing, hazardous material storage) to prevent the entry of hazardous materials into the site drainage.
- A comprehensive Emergency Response Plan (ERP) will be formulated following the Environmental, Health, and Safety (EHS) Guidelines: General EHS guidelines (IFC, 2007). This plan will be designed to effectively address spills of hazardous materials, including fuels, that may occur during construction activities.
- The specific items in the management plans will address the measures below related to groundwater and protection:

- Preventing the release of untreated wastewater, residues, or any waste materials into groundwater or surface water.
- Regulating and preventing wastewater discharges from various on-site activities, such as excavations and vehicle/equipment washing.
- Managing and containing any contaminated water resulting from accidental leakages to prevent its mixing with water bodies and to avoid topsoil/soil pollution.
- Ensuring the maintenance of vehicles and equipment, when necessary, in designated areas with impermeable surfaces (e.g., concrete floors) and implementing secondary containment systems as needed.
- Providing readily available portable spill containment and clean-up materials (spill kits) at the construction site, along with clear instructions on their usage.
- Training workers, including subcontractor workers, on spill response and the proper use of containment and clean-up materials (spill kits).

Supplying sufficient and well-maintained tanks, paved ground, spill containment materials, and appropriate secondary containment systems with adequate volume for the storage of fuel/oil and other fluids and hazardous substances to prevent soil contamination.

7.1.7.3 Residual Impacts

7.1.7.3.1 Construction Phase

The residual impact on the hydrogeology and groundwater component, following the implementation of the aforementioned mitigation measures during the construction phase, is detailed in the table below. (Table 7-27).

Table 7-27: 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
Discharge of Wastewater	Duration:	Short	Low	Short-mid-term	**Negligible**	High	**Negligible**
	Frequency:	Frequent					
	Geo. Extent:	Local					
	Intensity:	Medium					
Accidental introduction of hazardous chemicals (Groundwater pollution)	Duration:	Short	Low	Mid term	**Negligible**	Medium high	**Negligible**
	Frequency:	Infrequent					
	Geo. Extent:	Local					
	Intensity:	Low					

7.1.7.3.2 Operation Phase

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 7-28).

Table 7-28: 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
Discharge of Wastewater	Duration:	Long	Low	Short-mid-term	**Negligible**	High	**Negligible**
	Frequency:	Frequent					
	Geo. Extent:	Regional					
	Intensity:	Low					
Accidental introduction of hazardous chemicals (Groundwater pollution)	Duration:	Long	Low	Mid term	**Negligible**	Medium high	**Negligible**
	Frequency:	Infrequent					
	Geo. Extent:	Local					
	Intensity:	Low					

7.1.7.3.3 Monitoring

Construction period monitoring measures are as follows:

- Design checks will be conducted to confirm the implementation of the mentioned measures (e.g., concrete pavement in storage areas, collection pond underneath).
- Recorded documentation will be maintained for the training provided on spill response and the use of containment and clean-up materials for workers, including subcontractors' personnel.
- Regular site inspections will be carried out to guarantee the presence of an adequate supply of spill-response materials, such as spill kits and metal trays, at the site and within each heavy machinery, with records maintained.
- A scheduled maintenance program will be established, and maintenance records will be documented 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.

Operation period monitoring measures are as follows:

- The implementation of the mentioned measures, such as the presence of concrete pavement in storage areas and an underlying collection pond will be checked.
- Documentation will be maintained for the training provided to workers, including subcontractors' personnel, regarding spill response and the proper use of containment and clean-up materials.
- Regular site inspections will be conducted to verify the presence of a sufficient quantity of spill-response materials, including spill kits and metal trays, both at the site and within each heavy machinery. Detailed records will be maintained.
- A scheduled maintenance program will be established, and comprehensive records of maintenance activities will be maintained for all vehicles and machinery/equipment.

7.1.8 Traffic

The physical component *Traffic* was assigned a **Medium-High** value of sensitivity for the following reasons (see Section 6.1):

- Schools and residential areas in the vicinity
- The existing roads will be used for access to the site

7.1.8.1 Impact Factors

7.1.8.1.1 Construction Phase

The impact factors from the Project activities potentially affecting traffic during construction phase are listed in Table 6-42.

Table 7-29: Project actions and related impact factors potentially affecting traffic during construction phase

Project actions	Impact factors
▪ General engineering/construction works ▪ Transportation of construction materials ▪ Management of the workforce	▪ Increased and/or modified road traffic

Impacts potentially affecting this component are assessed below for the construction phase.

- Increased and/or modified road traffic
- Increased and/or modified road traffic in highways

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 D330 Road and increase in vehicles during construction phase are given in Table 7-30.

Table 7-30: Traffic Load Increase on D330 Road during Construction Phase

Vehicle Type	The Annual Average Daily Traffic Data of D330 Road	Total Number of Vehicle Increase with the Project's Construction	Traffic Load Increase (%) at State Road
Car	1343	1440	107
Medium- Duty Commercial Vehicle	216	-	-
Bus	3	-	-
Truck	196	400	205
Trailer +Tow Truck + Side Trailer	372	390	105
Total	2130	2230	105

Source: https://www.kgm.gov.tr/SiteCollectionDocuments/KGMdocuments/Istatistikler/TrafikveUlasimBilgileri/21TrafikUlasimBilgileri.pdf

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 105% increase in State Road traffic could be expected.

Accordingly, potential impacts of the traffic load during the construction phase may be summarised as below:

- The rise in traffic volume on highways will lead to an increase in environmental noise.

- Local communities are concerned about the high speeds of heavy vehicles and the increased traffic on highways.
- Increased road traffic could result in accidental wildlife casualties.
- The use of existing roads by heavy vehicles can cause damage to the roads.

Increased and/or modified road traffic in Village Roads

The site preparation and construction activities will necessitate the use of existing village roads, especially Emen Village Road, by heavy vehicles and cars to transport machinery, equipment, construction materials, and staff in and out of the Project Area. Due to the lack of data regarding the number of vehicles on village roads, it is challenging to assess the increase in traffic on these roads. Nonetheless, the anticipated impacts of increased traffic on access roads during the construction phase are as follows:

- Elevated traffic volume on access roads will result in heightened environmental noise along the routes leading to the Project Site.
- Increased traffic load may cause road interruptions and restrictions on traffic flow, particularly where village roads are utilized during construction activities and road closures.
- Speeding heavy vehicles and increased road traffic on access roads raise concerns among local communities.
- Enhanced road traffic on access roads may lead to unintentional wildlife casualties.
- Utilization of existing roads by heavy vehicles may result in damage to the village roads.
- The risk of safety incidents and accidents involving village road users/pedestrians is heightened when they share access roads with construction traffic.

7.1.8.1.2 Operation Phase

The impact factors from the Project activities potentially affecting traffic during operation and decommissioning phases are listed in Table 7-31.

Table 7-31: Project actions and related impact factors potentially affecting traffic during operation and decommissioning phases

Project actions	Impact factors
Plant/infrastructure operation	Increase and modification of traffic

Impacts potentially affecting this component are assessed here below for the during operation and decommissioning phases.

Increased and/or modified road traffic in Village Roads and Highways

Regarding the operation phase, 20 personnel will be working and the anticipated impacts of traffic load, particularly concerning shuttles/cars entering and leaving the Project Area, are outlined below:

- The high speed of vehicles is a source of concern and potential hazard for local communities.
- The transportation of personnel may affect traffic congestion at the local level.

- There are occupational safety risks associated with vehicle/worker accidents.

7.1.8.1.3 Decommissioning Phase

No new impacts are foreseen during the decommissioning and closure phase of the Project, apart from those already identified in the construction and operation phases.

7.1.8.2 Mitigation measures

Following mitigation measures will be implemented to avoid/minimise the impacts of the project on traffic during construction, operation and decommissioning phases.

- 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.
- 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.
- Traffic and road safety assessments for construction and operation phases will be undertaken. 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.
- 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 improved to make 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.
- If reversing of vehicles cannot be avoided at the work areas, necessary reversing procedures will be identified including installing reversing aids on vehicles, reversing sensors etc. Trained flagmen will be used when reversing cannot be avoided.
- Parking areas will be designated with signs and reverse parking will be implemented for emergency situations.
- 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 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 was already placed at the required areas (especially in the Emen Village Road) to prevent potential accidents/incidents. These signs will be maintained regularly. Barriers will be placed at the required areas to protect both human health and assets.

7.1.8.3 Residual impacts

7.1.8.3.1 Construction Phase

The project characteristics, actions and the proper implementation of the mitigation measures proposed above, a potential **negligible** is expected on the traffic during the construction phase (see Table 7-32).

Table 7-32: 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
Increased and/or modified road traffic in Highways	Duration:	Short	Medium-high	Short-term	**Low**	Medium-high	**Negligible**
	Frequency:	Frequent					
	Geo. Extent:	Local					
	Intensity:	Very High					
Increased and/or modified road traffic in Village Roads	Duration:	Short	Medium-high	Short-term	**Low**	Medium-high	**Negligible**
	Frequency:	Frequent					
	Geo. Extent:	Local					
	Intensity:	Very High					

7.1.8.3.2 Operation and Decommissioning Phases

The project characteristics, actions and the proper implementation of the mitigation measures proposed above, a potential **negligible** is expected on the traffic during the operation and decommissioning phases (see Table 7-33).

Table 7-33: Residual impact assessment matrix for the traffic during operation and decommissioning phases

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Increased and/or modified road traffic	Duration:	Very long	Medium-high	Short-term	**Low**	Medium high	**Negligible**
	Frequency:	Infrequent					
	Geo. Extent:	Local					
	Intensity:	Negligible					

7.1.8.4 Monitoring

The following monitoring measure shall be implemented to assess the true effects of the Project on the traffic during the construction, operation and decommissioning phases.

- Investigating incidents and accidents and utilizing lessons learned to enhance traffic mitigation measures.
- Ensuring compliance with licenses and conducting medical surveillance of operators to verify currency.
- Regularly monitoring road conditions to promote safe driving practices.

- Maintaining control over vehicle maintenance records to guarantee adherence to scheduled maintenance activities.
- Monitoring weather forecasts to safeguard the well-being of operators.
- Close monitoring of adherence to speed limits to safeguard the health and safety of both the public and employees.
- Reviewing comments and complaints received through the grievance mechanism to improve traffic mitigation efforts and mitigate any potential air quality and noise impacts.
- Implementing monitoring protocols specifically aimed at identifying any shortcomings or inefficiencies in road safety mitigation measures.

7.1.9 Greenhouse Gas (GHG) Emissions

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; 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, furnaces 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 the Project, the most significant emissions will be Scope 1, which are direct GHG emissions occurring from Stationary Sources (e.g., emissions from generators), Mobile Sources that are owned or controlled by the Owner (e.g., emissions from combustion in vehicles).

The combined annual emissions of the Project are about 1,718.4 t CO_2e per annum. This annual value is below the 25,000 t CO_2e threshold defined in IFC PS3 and Equator Principles IV. Therefore, no additional monitoring will be required. 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. 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. Project's GHG emissions will be managed in accordance with the Resource Efficiency Plan, and Pollution Prevention Plan to be prepared for the Project.

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 assessments of the greenhouse gas (GHG) emissions to be originated from the activities of the Project and Project's contribution to climate change is included in the CCRA presented in Appendix D.

7.2 Social Components

The Social Impact Assessment (SIA) outlined in this chapter of the report identifies both positive and negative impacts that may arise from Project activities. The SIA development primarily relies on:

- Examination of the Project's national Environmental Impact Assessment Report (EIA) and other relevant Project documents,
- Onsite social survey conducted from March 6th to March 8th, 2024.

Drawing from stakeholder engagement, document review, and expert input, the SIA was formulated to address construction, operation, and decommissioning impacts by proposing mitigation strategies for negative effects and enhancement measures for positive impacts. Please refer to Chapter 5 for the impact assessment methodology developed by WSP for both physical and social impacts.

7.2.1 Sample of the Social Surveys

During the social site visit, 37 households were participated in the household surveys. Female participants constitute 32% of the total participants. The number of participants, total and by gender are represented in Table 7-34.

Table 7-34: Number of participants

Village	Male	Female	Total
Seslikaya	11	5	16
Emen	4	7	11
Badak	10	0	10
Total	25	12	37

According to the results of the household surveys, it has been observed that majority of the participants are aged between 40-55. Age distribution of the participants by village is presented in Table 7-35.

Table 7-35: Age distribution of the participants

Age	Seslikaya	Emen	Badak	Total
19-25	0	1	1	2
26-39	3	1	0	4
40-55	4	4	6	14

Age	Seslikaya	Emen	Badak	Total
56-65	4	2	3	9
65+	5	3	0	8

When questioned about their familiarity with the Project, it was observed that the majority have general knowledge about the Project. In total, 70% of participants stated that they have some level of knowledge about the Project.

Table 7-36: Project Information

Project information	Seslikaya	Emen	Badak	Total
Yes	9	8	9	26
No	7	3	1	11
Total	16	11	10	37

The primary source of information for participants is through public channels, including informal conversations within the community. Additionally, many participants mentioned obtaining sufficient information from the Public Participation Meetings held during the site visit, prior to the household surveys.

Table 7-37: Information Source of the Participants

Village	Public	Internet	Public Officials	Mukhtar	Project officials	Meetings	Total
Seslikaya	3	0	1	2	1	2	9
Emen	6	0	0	0	2	0	8
Badak	4	0	0	0	0	5	9
Total	13	0	1	2	3	7	26

Table 7-38 provides data on how participants in the household interviews preferred to convey their complaints and suggestions, categorized by village. Overall, out of a total of 37 participants:

- 7 participants (19%) preferred to convey their complaints and suggestions through formal institutions, such as CIMER[37].
- 30 participants (81%) preferred to convey their complaints and suggestions through the village head (Mukhtar) or in person, directly to the Project personnel on site.

This indicates a significant preference among participants for conveying their complaints and suggestions through informal channels, such as the Mukhtar or verbal communication, compared to formal institutions.

Table 7-38: Requested Grievance Mechanism

Village	Through Institutions	Through Mukhtar / Vocally
Seslikaya	3	13

[37] Cumhurbaşkanlığı İletişim Merkezi (Presidential Communication Center), abbreviated as CİMER, is a system founded in 2015 allowing Turkish citizens to contact the Presidency of Turkey regarding complaints or to obtain information.

Village	Through Institutions	Through Mukhtar / Vocally
Emen	2	9
Badak	2	8
Total	7	30

7.2.1.1 Housing

During the household interviews, the participants were asked to compare their current housing conditions with other houses in the village. They were asked whether their housing conditions was better, worse or average compared to other houses. Table 7-39 presents responses from participants by village.

The responses indicate that the majority of participants across all villages perceive their housing conditions to be average compared to others in the village. However, one participant in Seslikaya village considers their housing conditions to be better than others.

Table 7-39: Housing Conditions

	Answers
Badak	
Average	10
Emen	
Average	11
Seslikaya	
Better	1
Average	15

During the interviews, participants were asked about their residency patterns throughout the year.

- All participants in Badak and Emen villages stated that they live in the villages all year round.
- In Seslikaya village, 2 participants reported residing in the village only during the summer period, while 14 participants reported permanent residency. In the winter period, these two participants reside in Bor District.

Table 7-40: Permanent / Temporary Residency

Village	Residency	Frequency
Badak	Permanent	10
Seslikaya	Summer Period	2
	Permanent	14
Emen	Permanent	11

Ecosystem Service Usage

In all villages, well water is utilized as a primary water source for households, with connections to households facilitated by electrical water pumps. There is no issue reported regarding the quantity of water; it has been indicated as sufficient. The problems faced by the local communities regarding water resources are highlighted as:

- It has been reported that residents are facing difficulties due to power outages because their well water is abstracted by using electrical pumps. Another issue related to electricity is that the older population is struggling to afford electricity bills.
- In one of the household surveys conducted in Seslikaya village, it was reported that they are having issues with the sewage system. The problem stems from a design flaw in the sewage pipe, preventing waste from flowing into the main sewage tank. As a result, the pipe gets clogged, leading to overflow and contamination of the surrounding soil with waste. Since the drinking water is sourced from the wells located in the gardens of the houses and the wells are situated within the contaminated soil, it becomes polluted, posing a risk to drinking water safety.

In addition to serving as a household water source, the wells are also connected to irrigation systems for agricultural purposes, with wells situated across the agricultural fields.

Moreover, as a critical component of local ecosystem service usage, the Project activities are expected to directly affect the pasturelands of Seslikaya village. The occupation of pasturelands disrupts sheep and goat grazing, negatively affecting the livelihoods of local communities reliant on animal husbandry in Seslikaya village. This issue is analysed in detail in Section 7.2.1.2 Land Use and Livelihoods.

7.2.1.2 Land Use and Livelihoods

Agricultural Production

During the household interviews, respondents were questioned about their involvement in agriculture. In Badak village, 6 out of 10 respondents confirmed their engagement in agriculture. In Emen village, 7 out of 11 participants reported involvement in agriculture. Similarly, in Seslikaya village, 13 out of 16 respondents indicated involvement in agriculture. Overall, the data reveals that 70% of the participants are engaged in agriculture.

Table 7-41: Agricultural Production

Villages		Land Cultivation
Badak	Yes	6
Emen	Yes	7
Seslikaya	Yes	13
Grand Total	-	26

Those who reported engaging in farming were further questioned about the crops they cultivated on their land. Wheat, sugar beet and barley are the main crops cultivated over the past year in all villages. Corn and clover are cultivated primarily for animal feed purposes.

Table 7-42: Agricultural Products

Villages	Agricultural Products
Badak	
Wheat	2
Sugar Beet	2

Villages	Agricultural Products
Barley	2
Corn	2
Clover	1
Emen	
Wheat	4
Sugar Beat	3
Clover	2
Corn	1
Barley	1
Seslikaya	
Sugar Beet	5
Wheat	5
Barley	3
Clover	2
Rye	1
Corn	1
Vegetables and fruits (Tomato, pepper, watermelon)	1

During the interviews, participants were questioned about any changes in agricultural production over the past five years. The majority across all villages reported a decrease, attributing it primarily to drought conditions and soaring market prices. The participants highlighted that high market prices have significantly impacted their agricultural production, as the income generated from selling their produce is insufficient to cover their expenses. This situation creates financial challenges for the farmers, making it difficult for them to sustain their livelihoods solely through agricultural activities.

Animal Husbandry

During the household interviews, respondents were asked whether they were involved in animal husbandry. Pie charts were used to provide a clearer visual representation of the data regarding the involvement of the participants in animal husbandry.

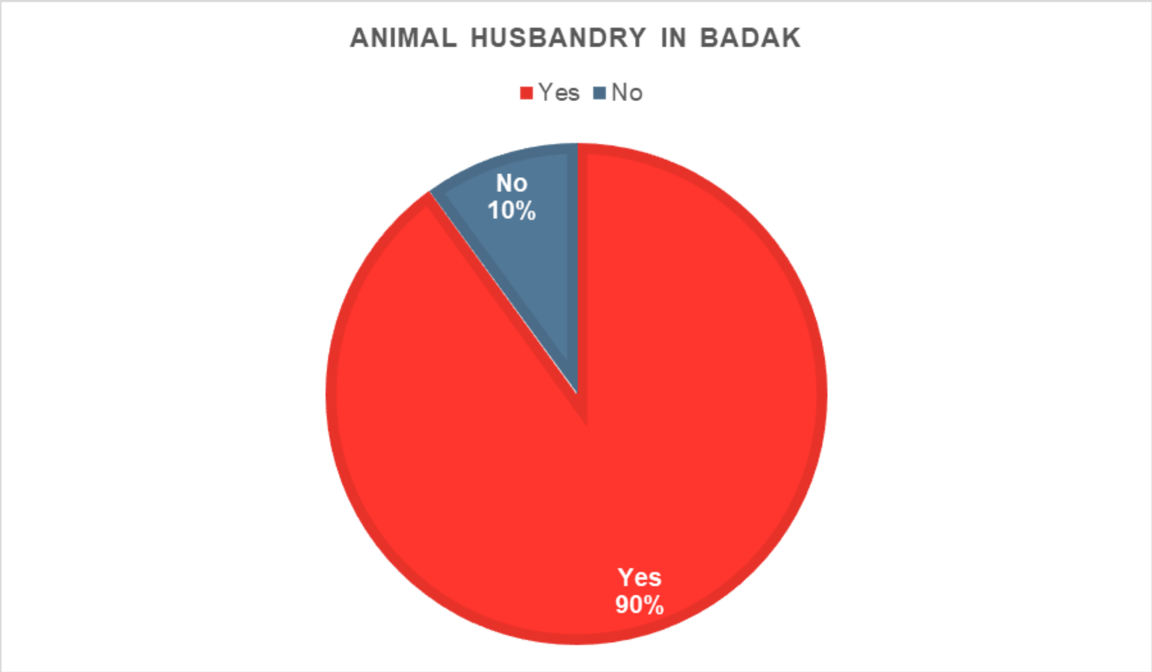


Figure 7-2: Animal Husbandry in Badak

In Badak village, the majority of participants, comprising 9 out of 10 respondents, indicated their involvement in animal husbandry. Specifically, 7 participants were actively engaged in cattle breeding, while 6 individuals were involved in sheep and goat breeding activities. Notably, some participants were engaged in both cattle and sheep breeding concurrently. This indicates that animal husbandry is a prevalent occupation in Badak village, with a significant portion of the population relying on livestock rearing for their livelihoods.

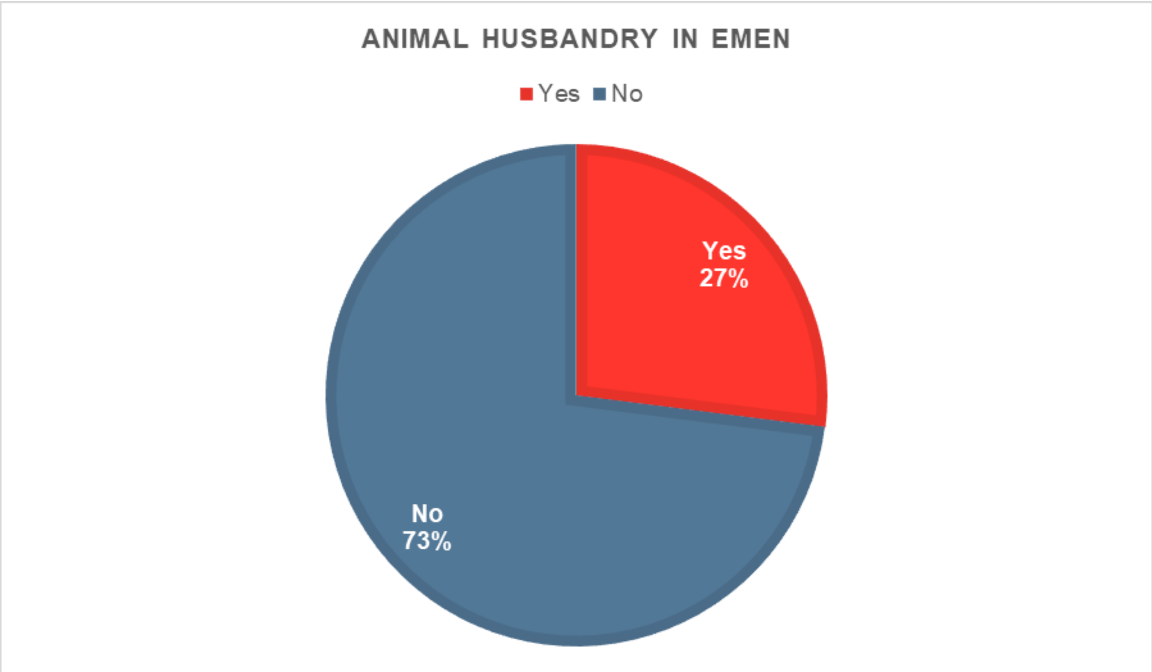


Figure 7-3 Animal Husbandry in Emen

Conversely, animal husbandry appears to be less common in Emen village compared to other villages in the area. Only 3 out of 11 participants in Emen reported engaging in animal husbandry activities. Of these, two participants were involved in breeding sheep and goats. It is important to note that one participant mentioned selling their animals due to the occupation of pastureland by the other projects in the YEKA zone in the past year, indicating that external factors such as land use changes may have influenced animal husbandry practices in the village.

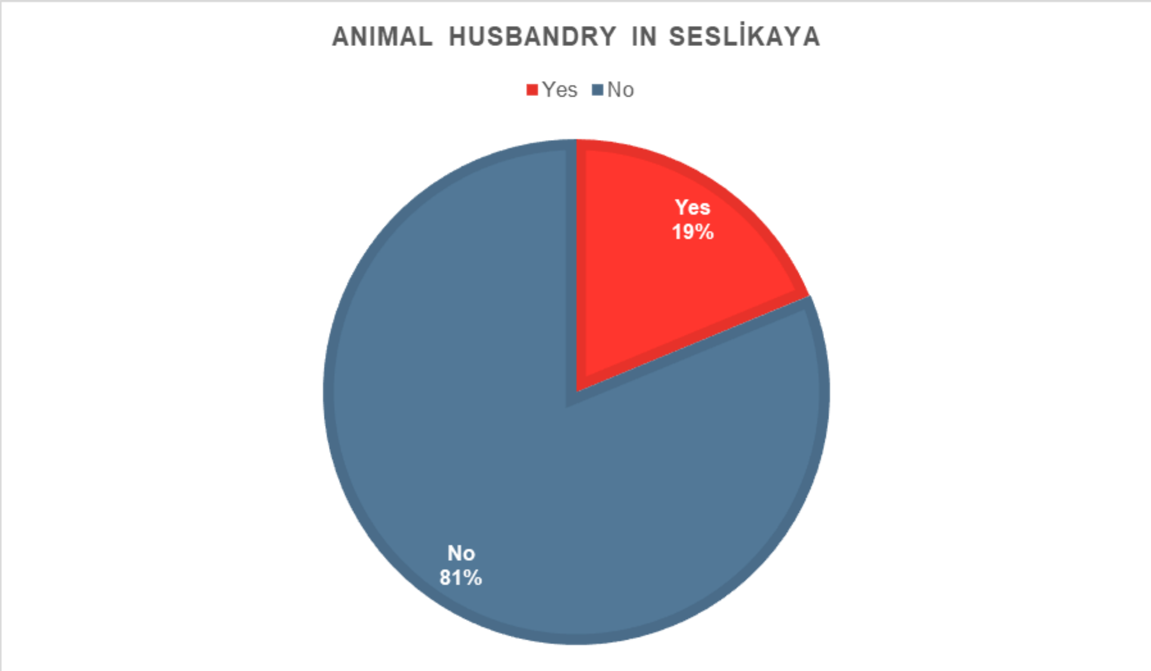


Figure 7-4 Animal Husbandry in Seslikaya

Similarly, in Seslikaya village, the number of participants engaged in animal husbandry was notably low. Only one household reported being engaged in cattle breeding, while two households were involved in sheep and goat breeding. This suggests that currently animal husbandry is not as prevalent in Seslikaya compared to other villages in the area.

Overall, the data suggests a decline in the number of individuals involved in animal husbandry activities, especially notable in Emen and Seslikaya villages. This reduction is primarily attributed to the occupation of pasturelands, which has adversely impacted the ability of local residents to sustain their land-based livelihoods.

7.2.1.3 Available Skills

During the household interviews, participants were asked about the skills available within their households, with both women and men of various ages expressing interest in working on the Project. The available skills in the villages within the households participated in the surveys are as follows:

- In Seslikaya: 5 cleaning personnel, 5 kitchen personnel, 4 unskilled workers, 2 drivers, 1 technician,
- In Emen: 2 technicians, 1 office worker, 1 cleaning personnel, 1 kitchen personnel, 1 unskilled worker,
- In Badak: 4 drivers, 4 office workers, 1 unskilled worker, 1 skilled construction worker, 1 security guard, 1 technician, 2 operators.

In the recruitment process, special attention will be given to utilizing the skills available locally within the villages. Local residents possessing skills such as cleaning personnel, kitchen personnel, and skilled construction workers will be prioritized for employment opportunities within the Project. This approach not only maximizes local participation but also ensures that the community benefits directly from the Project by providing employment opportunities to its residents who possess relevant skills.

7.2.1.4 Anticipated Project Impacts

Positive Impacts

As part of the assessment of anticipated Project impacts, discussions revealed that the creation of local employment opportunities emerged as a significant anticipated positive impact, especially for women and younger population. The provision of secure job prospects serves as a crucial aspect of the Project, offering stability and economic empowerment to community members.

Negative Impacts

During discussions with participants, concerns were raised regarding the negative impacts of the Project, with particular emphasis placed on the loss of pasture areas. Among the anticipated negative impacts, issues related to traffic were also highlighted highly.

- Negative impacts anticipated related to traffic include congestion, road damage, and safety hazards due to increased vehicle presence. Additionally, disruptions to local transportation routes may inconvenience residents and impede access to essential services and facilities.
- It is stated that the occupation of pasturelands could have negative economic impacts on land-based livelihoods, particularly affecting sheep and goat breeding. Despite households providing feed for their animals, the need for expansive grazing areas remains crucial for the well-being of sheep and goats.

It is evident that the occupation of pasturelands poses significant challenges to land-based livelihoods, especially affecting sheep and goat breeding activities. Addressing these concerns and mitigating negative impacts will be essential to ensure the sustainable development of the Project and the well-being of local communities.

Recommendations of the Participants

During the field study, participants provided several suggestions and requests regarding the Project:

- Informing the village about the Project to enhance community awareness.
- Ensuring employment opportunities for the local villagers to promote socioeconomic development.
- Providing support for animal husbandry and agriculture to support local livelihoods.
- Implementing irrigation measures to mitigate dust problems during construction activities.
- Repairing village roads and constructing speed bumps to enhance road safety and reduce vehicle speed.
- In addition to the previously mentioned suggestions, participants expressed concerns about using well water. The villagers in Badak Neighbourhood have a solar panel to provide energy for the pump they use to draw water from the well to the water tank for drinking water. However, the battery of this panel needs to be replaced due to the end of its economic life. Therefore, a financial and technical support is required for the repair of the solar panel. They highlighted that the use of electricity for water leads to significantly high electricity bills, which particularly burdens the older population due to their low-income levels.

7.2.2 Population and Demography

In the context of population and demography within the Project AoI, it is crucial to examine the impact factors, particularly concerning the anticipated population increase driven by the demand for workers required for Project-related activities.

7.2.2.1 Impact factors

7.2.2.1.1 Construction Phase

The primary impact factor associated with population increase will be the demand for workers required by the Project, which will result in increase in population. However, it is anticipated that this effect of this impact will decrease during the operation phase.

Table 7-43: Project actions and related impact factors potentially affecting population and demography during the construction phase

Project actions	Impact factors
General engineering/construction works	Increase of population (influx)

- **Increase of population**

During the construction phase, 100 personnel will be employed. The influx of workers and increased activity within the Project area may lead to various impacts on local communities. This could include increased traffic congestion on local roads, and potential pressure on local infrastructure such as utilities and public services. Moreover, the temporary increase in population could also lead to changes in social dynamics within the community. However, hiring local people for the construction phase will significantly reduce these potential impacts, as the influx of workers from outside the area will be minimized. Hiring individuals from the local community can ease the burden on local infrastructure and services, reducing traffic related impacts and minimizing changes in social dynamics within the community.

7.2.2.1.2 Operation Phase

During the operation phase of the Project, only a small number of workers (20) will be required, and they will utilize the administrative buildings located within the Project site boundaries. Consequently, the interaction of operation phase workers with local communities will be limited.

7.2.2.1.3 Decommissioning Phase

Decommissioning phase activities are mainly the moving out of the workers of the Project from the local area. Given that the phase primarily entails the departure of operation phase personnel, no significant impact on the local population is expected.

7.2.2.2 Mitigation Measures

To mitigate the negative impacts of population influx on local communities especially during the construction phase, the following measures will be implemented:

- Cultural sensitivity training will be provided for both incoming workers and local residents to foster mutual understanding, respect, and cooperation, thereby minimizing the potential for social tensions and conflicts.
- An Employee Code of Conduct will be developed and enforced to ensure proper behaviour and respect for local customs.
- Priority will be given to the recruitment of local residents for employment opportunities generated by the Project.
- When necessary, protocols for managing offsite accommodations will be implemented to safeguard workers' well-being and safety.

- Measures will be implemented to mitigate environmental impacts associated with increased population, such as waste management programs, and pollution control measures, to preserve the natural ecosystem and quality of life for residents.
- Transparent grievance mechanisms will be established to allow residents to voice their concerns and complaints regarding the Project impacts, ensuring timely resolution and accountability.

By implementing these mitigation measures in a comprehensive and coordinated manner, the negative impacts of population influx will be effectively addressed.

7.2.2.3 Residual impacts

7.2.2.3.1 Construction Phase

During the construction phase, careful consideration will be given to the potential increase in population and its associated impacts on the local communities. There will be an increase in population, which is expected to have a short duration and a medium-high sensitivity to the local environment. However, effective mitigation measures will be implemented to reduce the impact value to a low level. These measures include prioritizing local employment opportunities, providing cultural awareness training for workers, and establishing grievance mechanism.

Table 7-44: Residual Impact Assessment for Population and Demography During Construction Phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Increase in population (influx)	Duration:	Short	Medium-high	Short-mid-term	**Medium**	Medium high	**Low**
	Frequency:	Frequent					
	Geo. Extent:	Local					
	Intensity:	High					

7.2.2.3.2 Operation Phase

During the operation phase of the Project, the duration of population increase will be very long, with a medium-high sensitivity to the local environment. The increase in population is considered to have a medium-high sensitivity due to its potential to affect local demographics and community dynamics. However, measures will be implemented to ensure that any negative effects are mitigated effectively, resulting in a low overall impact value. Regular monitoring activities will be conducted to assess the implementation and effectiveness of these mitigation measures, ensuring that any residual impacts of population increase remain negligible throughout the Project phases.

Table 7-45: Residual Impact Assessment for Population and Demography During the Operation Phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Increase in population (influx)	Duration:	Very long	Medium-high	Short-term	**Low**	Medium high	**Negligible**
	Frequency:	Recurrent					
	Geo. Extent:	Local					
	Intensity:	Low					

7.2.2.4 Monitoring

Monitoring activities will be performed on the following issues during the construction and/or operation to ensure the implementation and effectiveness of the proposed mitigation measures.

- Periodic assessments will be conducted to evaluate the condition and adequacy of Project infrastructure, ensuring that they meet the needs of the growing population.
- Periodic assessments will be conducted to monitor the effectiveness of environmental protection measures and identify any emerging issues or concerns related to pollution, waste management, or ecosystem health.
- Employment statistics will be analysed regularly to track the proportion of local residents employed by the Project and assess the success of training and skills development initiatives in enhancing local employability.
- The effectiveness of cultural sensitivity training programs will be evaluated through feedback surveys.
- The operation of grievance mechanisms will be reviewed regularly to assess their accessibility, transparency, and responsiveness in addressing community concerns and complaints related to the Project impacts.

7.2.3 Infrastructure, Social Services and Ecosystem Usage

The Project may entail various implications for public infrastructure, social services, and ecosystem usage. It is imperative to precisely identify potential impacts to formulate accurate mitigation strategies. In this section, the assessment conducted throughout the phases of construction, operation, and decommissioning focused separately on infrastructure, services, and ecosystem usage. Subsequently, potential risks were identified, and corresponding mitigation measures were developed.

7.2.3.1 Impact Factors

7.2.3.1.1 Construction Phase

This section represents the assessment of the impacts associated with the Project on infrastructure, social services, and ecosystem usage such as water resources of the villages.

The impact factors of the Project causing potential implications during the construction phase are identified in Table 7-46.

Table 7-46: Project Actions and Related Impact Factors Potentially Affecting Infrastructure, Social Services and Ecosystem Usage during Construction Phase

Project actions	Impact factors
All Project activities during the construction phase	Transportation and traffic Access to education Access to health Water resources (Ecosystem services) Emergency response

Potential impacts due to the Project activities during the construction phase on infrastructure, social services and ecosystem usage are outlined below:

- Extensive activities during the construction phase such as excavation, transportation of materials, and installation of infrastructure can directly affect public infrastructure such as roads, utilities, and buildings, leading to disruptions or modifications to existing systems.

- The influx of population or workforce into the area for the Project, resulting in increased demand for public infrastructure and social services such as transportation, healthcare, education, and emergency response may strain existing systems and resources, affecting their availability and quality.
- Increasing vehicular traffic and commuting demands due to the Project may cause road congestion. This pressure on transportation infrastructure could lead to longer commute times, reduced transport accessibility, and challenges in maintaining road safety and traffic flow.
- The increased demand on the existing systems may create inability of vulnerable groups to equally access social and health services due to supply-demand imbalance.
- Changes in land use patterns may impact ecosystem usage. Occupation of pasturelands may impact the livelihoods of the local community, which is related to the impacts on ecosystem services and natural resources. Impacts on land use are assessed in detail in Section 7.2.4.
- The influx of population can strain existing emergency response services, leading to delays in response times as resources become limited.
- Construction activities can disrupt road networks, posing challenges for emergency vehicle access. Additionally, newly constructed infrastructure may lack established emergency access points or routes, leading to further delays in response times.
- The Project may bring new health and safety risks like hazardous materials or increased accidents, requiring more emergency responses and straining existing services.

Due to the construction activities from other projects in the region, Emen village road has experienced disruptions before. Given that the road of Emen Village will serve as a route for construction and employee vehicles going to and from the Project site, the community anticipates negative impacts on the road of Emen village. Mitigation measures will be implemented accordingly.

7.2.3.1.2 Operation Phase

The population influx during the construction phase will significantly decrease during the operation phase, which will result in most of the potential negative impacts to decline. Yet, some impacts may remain during the operation phase. The potential impacts expected during the operation phase of the Project are as follows:

- While the initial construction-related traffic may decrease, at times, operational activities could still contribute to traffic congestion and transportation challenges.
- The ongoing operation of the Project may continue to impact local ecosystems, including land use.

Therefore, while some negative impacts may decrease during the operation phase due to reduced construction activities and population influx, traffic and land use impacts may remain to a certain extent during the operation phase, requiring continued attention and mitigation measures.

7.2.3.1.3 Decommissioning Phase

During the decommissioning phase, the removal of the Project infrastructure from the site indicates a potential decrease in negative impacts. This phase marks the conclusion of the Project activities, which may introduce new environmental and social impacts. However, no new impacts on infrastructure, social services and ecosystem usage are expected during this phase.

7.2.3.2 Mitigation measures

Considering the potential negative impacts that may occur due to the Project activities especially during the construction phase, mitigation measures have been identified to prevent and regulate the adverse impacts on public infrastructure, social services and ecosystem. By implementing the following measures throughout all Project phases, it is possible to reduce the potential negative impacts resulting from the Project.

- An Emergency Preparedness and Response Plan will be developed and implemented to ensure timely and effective responses to emergencies, minimizing potential disruptions to infrastructure and services.
- A Traffic Management Plan will be prepared and implemented to mitigate congestion and ensure efficient traffic flow, reducing impacts on transportation infrastructure and services.
- As previously mentioned, the Emen village road has been disrupted due to other projects. The YEKA area has a Joint Venture ("KES Adi Ortaklığı") comprising three companies operating within the area, each with responsibilities that must be fulfilled. The KES Adi Ortaklığı will collectively address the issue concerning the Emen road and undertake measures to mitigate the damages caused.
- Collaboration with other projects will be ensured to develop comprehensive strategies for managing traffic and enforcing speed limits in the area. Physical speed reduction measures will be installed, such as putting speed bumps to naturally slow down vehicles entering the village.
- Before establishing construction and worker accommodations, engagement will be held with local authorities, including Municipalities, to share demands for energy, transportation, and water, fostering collaboration and proactive infrastructure planning.
- Health services will be provided at worker accommodations to alleviate pressure on local community health services, ensuring the well-being of Project workers without overburdening existing healthcare infrastructure.
- A first aid station and medical unit will be established onsite to promptly address any health-related incidents among workers, minimizing the strain on local healthcare facilities.
- Immediate maintenance will be applied in the event of damage to local infrastructure, such as telecommunications, electricity, roads, and water sources, to minimize disruptions and restore functionality.
- A Project-specific Grievance Mechanism will be implemented to record, address, and resolve incidents impacting local infrastructure and ecosystem services usage, promoting transparency, accountability, and community engagement in mitigating adverse impacts.
- Local authorities and communities will be involved in transportation planning to identify and address specific needs and concerns related to commuting and transportation services, ensuring inclusive decision-making and tailored solutions to mitigate transportation-related impacts.
- Drinking water for personnel will be provided in bottled form, with potable water for mobilization area sourced via water tankers.
- Continuous monitoring of water usage and quality will be conducted throughout the construction phase to ensure compliance with regulatory standards and environmental protection measures.
- Regular maintenance and inspection of water supply infrastructure will be carried out to prevent leaks, contamination, or other issues that could compromise water quality or availability.

7.2.3.3 Residual Impacts

7.2.3.3.1 Construction Phase

The residual impacts after the implementation of mitigation measures during the construction phase of the Project are assessed in Table 7-47.

During the household surveys, traffic congestion and road damage were identified as the most anticipated impacts in Emen Village. This is primarily attributed to existing road damage caused by other projects in the area, which has adversely affected transportation for residents. Given the high frequency of construction activities and increased vehicle traffic, coupled with the sensitivity of the village to these impacts, the overall impact value is assessed as high. However, it is expected that after the implementation of mitigation measures, the residual impact will decrease to a medium level.

Access to education was also anticipated to be impacted by construction activities. As children in the villages rely on the same roads affected by construction and increased traffic, their ability to access education may be disrupted. The disruption caused by construction activities could potentially lead to delays or difficulties in transportation, impacting the punctuality and attendance of students at school. However, after the implementation of mitigation measures, the residual impacts on access to education are expected to be at a low level.

In all villages, well water is utilized as a primary water source for households, with connections to households facilitated by electrical water pumps. There is no issue reported regarding the quantity of water; it has been indicated as sufficient. The problems faced by the local communities regarding water resources are highlighted as:

- It has been reported that residents are facing difficulties due to power outages because their well water is abstracted by using electrical pumps. Another issue related to electricity is that the older population is struggling to afford electricity bills.
- In one of the household surveys conducted in Seslikaya village, it was reported that they are having issues with the sewage system. The problem stems from a design flaw in the sewage pipe, preventing waste from flowing into the main sewage tank. As a result, the pipe gets clogged, leading to overflow and contamination of the surrounding soil with waste. Since the drinking water is sourced from the wells located in the gardens of the houses and the wells are situated within the contaminated soil, it becomes polluted, posing a risk to drinking water safety.

For these reasons, the component sensitivity is assessed as high; but the Project is not expected to impact local water resources.

No significant impacts are expected on access to health, water resources, or emergency response capabilities due to the Project. Adequate measures will be implemented to ensure continued access to healthcare, safeguard water resources, and maintain effective emergency response procedures. Consequently, the residual impact values for these aspects are assessed as negligible.

Table 7-47: Residual Impact Assessment for Infrastructure, Social Services and Ecosystem Usage during the Construction Phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Transportation and traffic	Duration:	Short	Very high	Mid-term	**High**	Medium high	**Medium**
	Frequency:	Frequent					
	Geo. Extent:	Regional					
	Intensity:	High					
Access to education	Duration:	Short	Medium	Short-mid-term	**Low**	Medium	**Low**
	Frequency:	Frequent					
	Geo. Extent:	Local					
	Intensity:	Medium					

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Access to health	Duration:	Short	High	Short-mid-term	**Low**	Medium high	**Negligible**
	Frequency:	Recurrent					
	Geo. Extent:	Local					
	Intensity:	Low					
Water Resources (Ecosystem services)	Duration:	Short	Medium-low	Short-mid-term	**Low**	Medium high	**Negligible**
	Frequency:	Continuous					
	Geo. Extent:	Local					
	Intensity:	Medium					
Emergency Response	Duration:	Short	Low	Short-term	**Negligible**	Medium high	**Negligible**
	Frequency:	Infrequent					
	Geo. Extent:	Local					
	Intensity:	Low					

7.2.3.3.2 Operation Phase

Similar to the construction phase, Project personnel will continue to utilize the roads, particularly those in Emen village, during the operation phase. During household surveys, residents of Emen village reported that employees from other projects often exceed speed limits in the village during operation phases, leading to increased traffic risks. This is why road and transportation assessments are crucial in addressing these concerns. Road and transportation infrastructure are expected to experience a very long duration of impact with very high sensitivity and a low intensity. Since the frequency is assessed as recurrent compared to frequent during the construction phase, the residual impact value is low. Yet, operation phase mitigation measures continue to be implemented to reduce the traffic related impacts. Similarly, access to education is anticipated to have a very long duration with medium sensitivity and a medium intensity, resulting in a low residual impact value after mitigation measures. Access to health services, water resources, and emergency response are expected to have negligible impacts during the operational phase due to their low intensity and frequency, with negligible residual impact values. Through continuous monitoring and implementation of mitigation measures, the overall impact of these factors will be effectively managed during the operational phase of the Project.

Table 7-48: Residual Impact Assessment for Infrastructure, Social Services and Ecosystem Usage during the Operation Phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Road and transportation	Duration:	Very long	Very high	Mid-term	**High**	Medium-high	**Low**
	Frequency:	Recurrent					
	Geo. Extent:	Local					
	Intensity:	Low					
Access to education	Duration:	Very long	Medium	Short-mid-term	**Medium**	Medium	**Low**
	Frequency:	Frequent					
	Geo. Extent:	Local					
	Intensity:	Medium					
Access to health	Duration:	Very long	Medium-low	Short-mid-term	**Low**	Medium high	**Negligible**
	Frequency:	Recurrent					
	Geo. Extent:	Local					
	Intensity:	Negligible					

Water Resources	Duration:	Very long	Low	Short-mid-term	**Negligible**	Medium high	**Negligible**
	Frequency:	Frequent					
	Geo. Extent:	Local					
	Intensity:	Low					
Emergency Response	Duration:	Very long	Low	Short-term	**Negligible**	Medium high	**Negligible**
	Frequency:	Infrequent					
	Geo. Extent:	Local					
	Intensity:	Negligible					

7.2.3.4 Monitoring

The effectiveness of the mitigation measures will be continuously monitored throughout both the construction and operation phases. This monitoring will be achieved through the following records:

- Implementation of relevant management plans,
- Tracking traffic-related incidents involving contractor workers, subcontractor workers, and external individuals,
- Documenting instances of full road closures attributed to Project activities,
- Maintaining records of grievances received from external stakeholders regarding access to education and health, along with the percentage of grievances resolved positively,
- Documenting emergency response actions taken,
- Monitoring the usage of water resources that impact local communities,
- Recording community feedback and satisfaction levels through surveys or engagement sessions.

The comprehensive monitoring approach outlined above will provide valuable insights into the effectiveness of mitigation measures and ensure timely adjustments or improvements as needed, fostering sustainable project management practices.

7.2.4 Land Use and Land-based Livelihoods

Ministry of Energy and Natural Resources has allocated 2,539 hectares of land in the Bor District of Niğde Province on September 29th, 2018, where the Project is located. The legal status of the allocated land was changed to an industrial zone suitable for the development of solar power projects (i.e. Renewable Energy Resource Area (abbreviated as “YEKA” in Turkish). In accordance with that, “Competition Announcement on the Allocation of Renewable Energy Resource Areas and Connection Capacities Based on Solar Energy” was launched on July 14th, 2021, and YEKA SPP-4 (Bor-1, Bor-2 and Bor-3) competitions were held by the Ministry of Energy and Natural Resources on April 8th, 2022, accordingly. As a result of the competition, Smart has awarded with the YEKA Right of Use Agreement for the G4-Bor-1 region on May 16th, 2022.

The Project will be located on 201.3 ha treasury land whose status was changed from pastureland by Niğde Governorship Revenue Office National Real Estate Directorate's letter dated June 1st, 2018, and numbered 7112. The Project Area has been classified as an "Industrial Zone" in the 1/100,000 scale Environmental Plan and located within the borders of the "Niğde-Bor Energy Specialized Industrial Zone".

The closest settlements to the Project area are Seslikaya Village (2.64 km away), Emen Village (1.92 km away), and Badak Village (5.08 km away).

As per the Project components, only associated facility of concern is determined as Energy Transmission Line (ETL). Approximately 29.5 km long 154 kV ETL was established by TEİAŞ to transmit the produced electrical energy to the Yaysun SPP Substation. An EIA report has been prepared for the ETL project in accordance with the requirements of Turkish EIA Regulation, and the “EIA Positive” decision has been obtained on August 22nd, 2023, with decision number of 7217. During the EIA process, the connection agreement between Smart and TEİAŞ was signed on January 24th, 2023. According to the EIA report, along the 154 kV ETL, 14 some poles and 2 final poles will be established. Based on information provided by Smart and studies conducted by WSP, it has been determined that the establishment of the ETL will impact two privately owned lands. Despite efforts made during site visits to contact the landowners of these properties, they could not be reached.

The Emen pasture area spans approximately 1057.79 hectares within the Emen settlement, while the Badak pasture area encompasses about 45.43 hectares within the Badak settlement.

Within the YEKA (Renewable Energy Resources Zones), there are three projects known as G4-Bor-1, Bor-2, and Bor-3. These projects collectively occupy a portion of the YEKA area, which has been designated for renewable energy development. The total land allocated for the YEKA zone is 2,539 hectares. When the land within the YEKA zone is excluded from the entire pastureland area of Seslikaya, the remaining pasture area available for grazing is 1,516 hectares.

According to the results of the social surveys, the Project site has been utilized for livestock activities by residents of Seslikaya village, while the villages of Emen and Badak do not rely on the Project site for grazing purposes. Primarily, residents of Badak and Emen villages transitioned to cattle breeding before the Project commenced. Although animal husbandry is also practiced in Badak village, their reliance on the pasture area has significantly diminished since they shifted from raising sheep and goats to cattle. They have stated that they no longer utilize the pasture for cattle breeding. Similarly, households engaged in cattle breeding in Seslikaya village do not utilize the pasture, as cattle are fed in barns. However, for households engaged in sheep and goat breeding in Seslikaya village, the occupation of pasturelands results in negative impacts on their livelihoods. Household surveys reveal that the establishment of other solar power projects in the YEKA has significantly impacted land-based livelihoods in Seslikaya village. Following the occupation of pastureland by other projects, a significant portion of residents in the area ceased sheep and goat breeding activities due to the reduction in available grazing areas. The remaining areas were also situated at a considerable distance from the village, prompting many residents to sell their animals over the past year. Also, surveys conducted with members of the local community revealed that, beyond grazing, it is crucial to recognize the need for sheep and goats to have expansive areas where they can engage in physical activities. Allocating sufficient space for these animals enables them to exhibit their natural behaviours, which ultimately contributes to their overall health and productivity. However, the occupation of pasturelands limits the available space for the animals to roam freely, potentially negatively impacting their well-being and overall productivity.

In conclusion, the occupation of pasturelands by various projects in the region has reduced the available grazing areas for sheep and goats. While locals who have already switched to cattle breeding are not affected, those in Seslikaya village who are still engaged in sheep and goat breeding state that they experience negative impacts on their livelihoods. The reduction in available grazing areas, previously due to other projects in the region, has forced many residents to sell their animals, while the limited space further threatens the livelihoods of residents currently engaged in sheep and goat breeding.

7.2.4.1 Impact factors

7.2.4.1.1 Construction and Operation Phase

This section presents the impact of Project’s construction and operation phase activities on land use and land-based activities, through occupation of pastureland and privately owned lands and economic displacement of communities reliant on land-based livelihoods.

Table 7-49: Project Actions and Related Impact Factors Potentially Affecting Land Use and Land-based Livelihoods during the Construction and Operation Phase

Project actions	Impact factors
General engineering/construction works Plant operation	Occupation of pastureland Occupation of privately owned lands

7.2.4.1.2 Decommissioning Phase

Once the Project reaches the end of its economic lifespan, estimated to be around 30 years, it will undergo decommissioning. Following rehabilitation operations, the ground surface will be covered with vegetation selected to suit the soil, climate, and flora of the region. Subsequently, the Project site will be transferred to the Ministry of Industry and Technology. The Ministry will then decide on potential alternative uses for the site by local communities.

7.2.4.2 Mitigation measures

The following measures will be implemented to mitigate potential adverse impacts on land use and land-based livelihoods:

The following mitigation measures shall be implemented to mitigate the effects of the impact factors.

- 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.
- Social responsibility projects will be developed and implemented to enhance local infrastructure, education, healthcare, and economic opportunities to mitigate Project impacts on land-based livelihoods.
- Alternative income-generating activities, vocational training, and entrepreneurship opportunities will be supported for affected communities to mitigate economic displacement due to the Project and promote sustainable livelihoods.
- YEKA area has a Joint Venture (“KES Adi Ortaklığı") comprising three companies operating within the area. Each company within this joint venture holds responsibilities that must be fulfilled. As part of this partnership, including Smart, measures will be implemented to restore the livelihoods of individuals affected by the projects in the region.
- Affected households in Seslikaya village will be given priority during the recruitment process.
- Feed assistance will be provided to individuals engaged in animal husbandry, particularly in Seslikaya village, to ensure that the nutritional requirements of livestock are met and to support the livelihoods of households.
- Since agriculture and animal husbandry are simultaneously practiced in Seslikaya, households engaged in agriculture will receive assistance in agricultural production to support income-generating activities.
- Efforts will be made to ensure that the support provided is tailored to the specific needs and circumstances of the households in Seslikaya village.
- Training programs/workshops for the local community will be provided on sustainable farming and animal husbandry practices.
- Vulnerable groups that will be affected by the Project will be determined and special assistance will be provided.

- During the social surveys, vulnerable groups identified within the villages. As per Smart's request for a list of individuals in need, the identified individuals have been shared with Smart to provide food aid to these groups during the Eid. This approach will be maintained throughout the Project lifecycle. Vulnerable groups in the villages will be periodically identified to update information and ensure that assistance reaches every person who requires support.
- Regular monitoring and evaluation mechanisms will be established to assess the impact of the assistance programs and make any necessary adjustments to ensure their continued effectiveness in supporting the livelihoods of the local community.
- Transparent and fair negotiations will be conducted with two of the privately owned lands on the ETL route, seeking their consent for land acquisition and ensuring fair compensation for any loss of land and livelihoods.
- Legal support and assistance will be provided to the landowners to protect their rights during the land acquisition process.
- Any loss of or damage to crops caused by Project activities (including associated facilities) will be compensated.
- Meaningful consultation and participation with affected communities and actively seeking their input and feedback on livelihood restoration initiatives will be ensured to incorporate their perspectives into decision-making processes.
- Grievance mechanisms will be established to address any grievances raised by affected landowners and communities promptly.
- A Community Liaison Officer will be employed to facilitate communication and engagement with the local communities throughout all Project phases, ensuring concerns are addressed and feedback is incorporated into decision-making processes.

7.2.4.3 Residual Impacts

7.2.4.3.1 Construction and Operation Phase

Outcomes from the household surveys and assessment of impact factors indicate that the Project will result in negative impacts on land use and land-based livelihoods. The occupation of pastureland is anticipated to result in economic displacement of communities reliant on land-based livelihoods in Seslikaya village.

The occupation of pastureland begins during the construction phase and continues throughout the planned 30-year operational phase. While confined to the Project site geographically, the impact on livelihoods extends locally, particularly affecting residents in Seslikaya. The Project, when eliminating the cumulative impacts from other projects in the area, exhibits a medium intensity, while the component sensitivity is notably high due to the lower socioeconomic status of the villages and the limited alternative livelihood opportunities available. Consequently, prior to the implementation of mitigation measures, the impact value is assessed as very high. However, after implementing relevant mitigation measures aimed at reducing economic impacts and supporting alternative livelihoods for Project-affected persons (PAPs), the residual impact value is anticipated to decrease to a medium level. If mitigation measures are implemented with High effectiveness and careful consideration, prioritizing the needs of the local communities, the impact can be reduced to a low level.

Table 7-50: Residual Impact Assessment for Land Use and Land-based Livelihoods during the Construction and Operation Phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Occupation of pastureland	Duration:	Very long	Very high	Long term	**Very High**	Medium high	**Medium**
	Frequency:	Continuous					
	Geo. Extent:	Project Site					
	Intensity:	Medium					
Occupation of privately owned lands	Duration:	Very long	Medium	Mid term	**Medium**	Medium	**Low**
	Frequency:	Continuous					
	Geo. Extent:	Project Site					
	Intensity:	Low					

7.2.4.4 Monitoring

The following monitoring measures will be implemented to evaluate the impacts of the Project on land use and land-based livelihoods and assess the effectiveness of mitigation measures:

- Monitoring local employment figures of community members, with a specific focus on women.
- Tracking support provided to livestock breeders, including feed, tools, and supplies, along with engagement and grievance records.
- Monitoring carrying capacity of remaining pastureland through stakeholder engagement and grievance mechanism.
- Recording support provided to farmers, such as seeds, tools, fertilizer, and collaboration with local cooperatives for agricultural production.
- Documenting damage and compensation on lands due to unexpected events.
- Tracking adoption of new/improved technologies and their impact on agricultural production.
- Documenting new agricultural production patterns and training programs for capacity building and skill development.
- Collaborating with local authorities for capacity enhancement strategies and engaging with vulnerable groups.
- Recording grievances related to vulnerable groups and resolution processes, as well as prioritizing them for employment opportunities.
- Documenting social responsibility projects targeting vulnerable groups and measures taken to mitigate negative impacts.

7.2.5 Economy and Employment

7.2.5.1 Impact Factors

7.2.5.1.1 Construction Phase

Positive Impacts

The construction phase of the Project is planned to last for 11 months, and 100 personnel will be employed. During the construction phase, priority will be given to employing 100 personnel from the nearest settlements. The villages host individuals who can work for the construction activities. Additionally, the Project appeals to the younger population residing at the villages, as they particularly prefer jobs with insurance coverage and regular employment opportunities. It is anticipated that skilled positions will primarily be sourced at both national and international levels. Conversely, local workers are expected to be suitable candidates for unskilled or semi-skilled roles in ancillary services and construction activities, including food and catering, laundry and cleaning services, transportation, and security. Only when the necessary skills cannot be met locally, the Project will then employ workers from the regional and national levels. Priority will be placed on recruiting local workers to maximize local socioeconomic benefits. Hence, the Project will strengthen local employment, prioritizing hiring individuals from the settlements within the AoI.

In addition to providing employment opportunities, the Project will contribute to the local economy by purchasing various goods and services. These include fuel for mobile equipment, transportation services, food supplies, passenger vehicles for Project use, electrical energy requirements, maintenance and repair materials, office supplies, vehicle maintenance, travel expenses, logistics support, accommodation, communication services, and security provisions. These economic activities will play a significant role in enhancing the regional economy. At the village level, where limited goods and services may be available, the Project can further contribute by hiring local resources, such as tractors, and sourcing goods from local markets.

During the site visit, it was observed that Emen village has a small grocery store/café where people can buy food and drinks. However, there are no markets in Seslikaya and Badak villages.

Table 7-51: Project Activities and Positive Impact Factors Associated with Economy and Employment During the Construction Phase

Project activities	Positive Impact factors
All project activities during the construction phase	Demand for workforce (Employment opportunities) Demand for goods, materials and services

7.2.5.1.2 Operation Phase

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 7.2 hours) and an average total radiation intensity of 1,311 kWh/m²-year (daily total 3.6 kWh/m²). Considering the possibility of providing uninterrupted energy with energy transmission, the Project is expected to have substantial contribution to national economy of Türkiye. [38]

Table 7-52: Project Activities and Positive Impact Factors Associated with Economy and Employment During the Operation Phase

Project activities	Positive Impact factors
Plant operation	Generation of electricity from renewable sources

7.2.5.1.3 Decommissioning Phase

No significant impact is anticipated on the economy and employment during the decommissioning phase.

[38] Eren Demiröz, Mehmet Kurban, Emrah Dokur Güneş Enerji Sistemlerinin Verimlilik Analizi, Bilecik-Kütahya Uygulaması, İleri Teknoloji Bilimleri Dergisi, 2015

7.2.5.2 Enhancement and Mitigation Measures

In this section, various enhancement and mitigation measures will be proposed to address the identified impacts and improve overall Project outcomes. These measures will aim to mitigate negative effects while enhancing positive impacts where possible.

Enhancement Measures for the Construction Phase

Employment opportunities offered by the Project will serve as a crucial income source, particularly benefiting unemployed individuals, households facing poverty, and the younger population within the AoI. To enhance these opportunities, the following actions will be undertaken:

- An assessment will be conducted to evaluate the availability of local workforce skills and identify actions necessary to enhance local employment opportunities.
- Preference criteria for hiring will focus on settlements directly impacted by the Project activities. If required skills cannot be met locally, the Project will then employ workers from the regional and national levels.
- Priority will be given to individuals previously engaged in grazing on the Project site, as well as those who are unemployed or living in poverty.
- A formal and transparent recruitment process will be established to ensure equal opportunities for all applicants.
- Both the village Mukhtars and local residents will be informed about the Project's recruitment opportunities through announcements and banners, ensuring equal access to information for all.
- Scholarship programs and vocational training initiatives will be implemented aimed at supporting local communities, providing educational opportunities, and enhancing skill sets to facilitate employment prospects generated by the Project, promoting socio-economic development and reducing dependency on Project-related services.
- Local suppliers will be identified prior to procurement, with priority given to sourcing goods and services from local businesses.
- Equal procurement opportunities will be provided to local small businesses through the Supplier Management Plan to be developed, ensuring an impartial and equal tender process.

Mitigation Measures for the Operation and Decommissioning Phase

Mitigation measures to address the anticipated negative impact on economy and employment during the operation and the decommissioning phase, and the subsequent retrenchment of workers from the construction phase, will include:

- Opportunities for skills development and career advancement through training programs and promotions will be offered for workers affected by retrenchment, enabling them to transition into other employment opportunities or sectors.
- Initiatives aimed at diversifying the local economy to create new job opportunities beyond the Project could be supported, such as promoting small business development, entrepreneurship, and tourism within the scope of corporate responsibility projects.
- Opportunities for infrastructure investment or development projects in the area could be explored to stimulate economic growth and create new employment opportunities for post-decommissioning.

- Assistance programs could be established to provide financial support and assistance with essential needs for retrenched workers during their transition period.
- Engagement with local communities, labour unions, and relevant stakeholders will be conducted to identify additional measures to mitigate the impact of retrenchment and support affected workers.
- Continuous monitoring and evaluation of the socio-economic impacts of the operation and decommissioning phase will be conducted to identify any emerging challenges or opportunities and adjust mitigation measures accordingly.
- The Worker Grievance mechanism to be developed during the construction phase will be implemented.

7.2.5.3 Residual Impacts

7.2.5.3.1 Construction Phase

The expected employment opportunities arising from the Project's construction phase represent a positive and short-term impact on the local economy. While employment opportunities may extend to the national level in case of absence of required labour force in the local area, the majority of personnel will be sourced locally. With the implementation of enhancement measures, the impact on job opportunities is assessed to be positive and high.

Given that there is only a local market in Emen village and limited alternatives available for procurement within the villages, the impact of demand for goods, materials and services evaluated as positive but low.

Table 7-53: Residual Positive Impact Assessment for Economy and Employment during the Construction Phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features		Impact Value	Mitigation effectiveness	Residual impact value
Demand for workforce (Employment opportunities)	Duration:	Short	Very high	Reversibility:	Short-mid-term	**Medium**	Medium high	**High**
	Frequency:	Frequent						
	Geo. Extent:	Local						
	Intensity:	High						
Demand for goods, materials and services	Duration:	Short	Medium	Reversibility:	Short-mid-term	**Low**	Medium	**Low**
	Frequency:	Recurrent						
	Geo. Extent:	Local						
	Intensity:	Medium						

7.2.5.3.2 Operation Phase

The increase in energy production, specifically from renewable sources, will significantly contribute to the national economy. The impact is characterized by very high sensitivity, indicating its importance. Additionally, the impact is long-term and extends nationally. Consequently, the overall assessment indicates a very high impact, underscoring the substantial contribution at the national level.

Table 7-54: Residual Impact Assessment for Economy during the Operation Phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features		Impact Value	Mitigation effectiveness	Residual impact value
Generation of electricity from renewable sources	Duration:	Very long	Very high	Reversibility:	Long term	Very High	Medium high	Very High
	Frequency:	Continuous						
	Geo. Extent:	National						
	Intensity:	High						

7.2.5.4 Monitoring

Monitoring measures will be implemented to assess the effectiveness of the specified measures, including:

- Regular monitoring of economic indicators and employment statistics to assess the Project's impacts on the local economy and employment rates.
- Assessment of training plans to determine their effectiveness in meeting Project objectives and improving worker skills.
- Documentation and tracking of grievances received, along with details of the issue, actions taken, and resolution status.
- Verification of annual energy production data to ensure accuracy and reliability.
- Timely and transparent publication of energy production information on the Project website.

7.2.6 Labour and Working Conditions

It is planned to employ 100 people during the construction phase of the Project and 20 people during the operation phase. There will be no worker accommodation facilities planned during construction phase of the Project. As per the information obtained from Smart, it is planned to employ local workforce where possible during the construction and operation phases. Hotel and home accommodation services are offered to personnel from neighbouring provinces and districts in the Niğde/Bor region. Shuttle transportation and fuel support are provided for personnel working in the local area.

Working hours will be planned in compliance with the Labor Law. Construction working hours are planned to be 8 hours/day as 1 shift and operation working hours are planned to be in 3 shifts of 8 hours each.

7.2.6.1 Impact Factors

7.2.6.1.1 Construction Phase

Table 7-55 outlines an overview of the impact factors associated with Labour and Working Conditions during the construction phase of the Project. These factors encompass aspects such as the overall working environment, terms of employment, non-discrimination and equal opportunity, and adherence to occupational health and safety standards.

Table 7-55: Project Activities and Related Impact Factors Associated with Labour and Working Conditions During the Construction Phase

Project activities	Impact factors
All project activities during the construction phase	Labour and working conditions related risks

The elements below are the components of the impact factor related to labour and working conditions risks. Each factor highlights specific aspects concerning workers' well-being and rights.

Working Conditions and Terms of Employment: This factor refers to the overall conditions in which workers perform their duties during construction. It includes working hours, shifts, rest periods, and employment terms, including contractual agreements, job descriptions, wages, and benefits packages.

- The Project can cause labour exploitation, including forced labour, child labour, and unfair wages or working hours.

Non-Discrimination and Equal Opportunity: This factor emphasizes the importance of providing equal opportunities to all individuals involved in the Project, regardless of their background, gender, race, religion, or other characteristics. Equal opportunity principles should guide recruitment, hiring, promotion, and treatment of workers throughout the construction phase.

- Workers may be at risk of discrimination, harassment, or unfair treatment based on factors such as gender, race, ethnicity, or nationality.

Occupational Health and Safety: This factor focuses on ensuring the health, safety, and well-being of workers throughout the construction phase. It involves implementing measures to prevent accidents, injuries, and illnesses in the workplace.

- The Project may pose risks of accidents, injuries, or fatalities occurring due to hazardous working environments, inadequate safety protocols, or insufficient safety equipment.
- There is a risk of inadequate training or skill development programs, resulting in unskilled or underqualified workers who are more prone to accidents.
- Workers face the risk of exposure to health hazards such as dust, chemicals, noise pollution, and poor air quality.

7.2.6.1.2 Operation Phase

During the operation phase, it is anticipated that the same impact factors experienced during the construction phase will be observed, with reduced intensity due to significant decrease in the number of employees. Additionally, the Project will result in retrenchment during the transition to the operation phase, requiring the collective dismissal of construction personnel upon the completion of the construction phase. However, contracts of limited duration will be utilized, and workers will be informed about the duration of their employment.

In terms of employment opportunities, it is crucial to acknowledge that the Project will experience a reduction in recruitment during the operation phase compared to the construction phase. As outlined in the Project national EIA Report, it is planned to employ 20 individuals, signalling a decrease in the workforce compared to the construction phase. Consequently, the downsizing of workers during the operation phase is unavoidable, potentially resulting in adverse effects on these workers.

Table 7-56: Project Activities and Related Impact Factors Associated with Labour and Working Conditions During the Operation Phase

Project activities	Impact factors
All project activities during the operation phase	Retrenchment

7.2.6.1.3 Decommissioning Phase

During the decommissioning phase, activities are anticipated to mirror those of the construction phase, thus resulting in similar impacts. Consequently, no new impacts are expected during the decommissioning phase of the Project, apart from those already identified during the construction phase.

7.2.6.2 Mitigation Measures

Mitigation measures for addressing the impacts associated with labour and working conditions during all Project phases will be crucial for ensuring the sustainable management of the Project. These measures should be tailored to address specific challenges and risks associated with each phase. Mitigation measures have been identified for the potential impacts during the construction phase, and these measures are deemed applicable throughout all phases of the Project, while also encompassing considerations for retrenchment during the operation phase.

- The following policies and plans will be developed and implemented to prevent and regulate risks associated with labour and working conditions:
  - Human Resources Policy
  - Human Resources Management Plan
  - Labour Management Plan
  - Occupational Health and Safety Plan
  - Offsite Accommodation Management Plan
  - Community Health and Safety Plan
  - Security Management Plan
- The Human Resources Policy and Management Plan will observe wage standards and working hour regulations and eliminate child and forced labour, discrimination, bullying, and harassment.
- Information on entitlements, benefits, and rights such as wages, hours of work, overtime arrangements and overtime compensation, and any benefits (sick, maternity/paternity, or holiday leave) will be provided to all workers.
- All workers will receive verbal explanations of their contracts as needed, ensuring they fully understand their rights before signing any employment agreements.
- Fair and timely payment of wages and benefits, including overtime compensation, will be ensured.
- Wages, benefits, and working conditions provided to workers will be aligned with industry standards in Niğde and the relevant sector, ensuring comparability with equivalent employers.
- Adequate rest periods and breaks during shifts will be provided to prevent fatigue and promote well-being.
- Open communication and dialogue between management and workers to address concerns and improve working conditions will be encouraged.
- Workers will be allowed to join trade unions and engage in collective bargaining.
- A grievance mechanism for workers will be established and implemented, providing a channel for addressing grievances related to Gender-Based Violence and Harassment (GBVH) as well as facilitating anonymous submission of grievances.

- Recruitment processes will be transparent and non-discriminatory.
- Child and forced labour will be prohibited, adhering to national legislation and international standards.
- Occupational health and safety standards will be strictly adhered to, promptly addressing hazards or concerns.
- Regular training sessions and workshops on occupational health and safety practices will be conducted.
- First aid and medical facilities, along with safety provisions against potential hazards, will be established.
- Accommodation for workers will be clean and safe, meeting basic needs of workers such as sanitary, laundry and cooking facilities and avoiding overcrowding.
- Heating, air-conditioning, and ventilation will be provided appropriately to ensure a comfortable and healthy environment for workers to rest and spend their spare time.
- Drinking water and water for food preparation, washing, and bathing will meet the requirements of the Turkish Regulation Concerning Water Intended for Human Consumption.
- Workers will be informed of accommodation rules and provided access to grievance mechanism.
- It will be ensured that third-party contractors adhere to labour laws and international standards, providing adequate protections and benefits for the workers.
- Third-party workers will be treated fairly and equitably, regardless of their employment arrangement. Discrimination or exploitation of third-party workers will not be tolerated.

Through the implementation of these mitigation measures throughout all phases, the Project will promote fair and ethical labour practices.

7.2.6.3 *Residual Impacts*

7.2.6.3.1 Construction Phase

The impact factor of labour and working conditions related risks is characterized by a short duration and recurrent frequency. The impacts have a medium-high sensitivity and mid-term reversibility due to their potential damaging effects on the well-being of workers. Although the impact values are expected to be high, effective mitigation measures will result in low residual impacts.

Table 7-57: Residual Impact Assessment for Labour and Working Conditions during the Construction Phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Labour and working conditions related risks	Duration:	Short	Medium-high	Mid term	**Medium**	Medium high	**Low**
	Frequency:	Recurrent					
	Geo. Extent:	Local					
	Intensity:	Medium					
	Frequency:	Recurrent					
	Geo. Extent:	Local					
	Intensity:	Medium					

7.2.6.3.2 Operation Phase

The impacts experienced during the construction phase will also apply to the operation phase. The transition to the operation phase following the completion of construction will entail the impact of retrenchment.

The impact of retrenchment is characterized by its very short duration and medium-high sensitivity, indicating a moderate-term impact. While the initial impact value is assessed as medium, mitigation measures, such as capacity-building initiatives, are expected to be effective in reducing the residual impact value to low.

Table 7-58 Residual Impact Assessment for Labour and Working Conditions during the Operation Phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Retrenchment	Duration:	Very short	Medium-high	Mid term	**Medium**	Medium	**Low**
	Frequency:	Single Event					
	Geo. Extent:	Local					
	Intensity:	High					

7.2.6.4 Monitoring

The following monitoring measures will be implemented to assess the impact of the Project on labour and working conditions during the construction and operation phases, as well as to verify the effectiveness of mitigation measures:

- Regular monitoring and assessment of working conditions will be conducted to identify and address potential hazards.
- Policies and procedures will be regularly reviewed and updated to adapt to changing labour laws and industry standards.
- Monitoring and oversight mechanisms will extend to third-party contractors to ensure compliance with labour regulations, safety standards, and project requirements.
- Compliance of contractors and supply chain companies will be monitored.
- Independent audits and inspections will be conducted as part of the monitoring process.
- Regular monitoring will be conducted for the following documentation:
  - Employment agreements with contractors and subcontractors,
  - Documentation of employment contracts and employee registration,
  - Records of employee training activities, including training materials, participant lists, training schedules, and photographs,
  - Incident records documenting any workplace incidents or accidents,
  - Records of grievances raised by workers will be documented and resolutions,
  - Collective agreements, if applicable,
  - Occupational health and safety records, including documentation of safety measures and compliance with regulations.

7.2.7 Community Health and Safety

The Project carries the potential of significant implications for community health and safety, necessitating a comprehensive assessment of its potential impacts and the implementation of appropriate mitigation measures.

7.2.7.1 *Impact Factors*

7.2.7.1.1 Construction Phase

Several key areas have been identified as potential impact factors of the Project's construction phase on community health and safety, including increased traffic, emission of dust, particulate matter and noise from construction activities, and the potential rise of communicable diseases and waste management issues.

Table 7-59: Project actions and related impact factors potentially affecting community health and safety during the construction phase

Project actions	Impact factors
General engineering/construction works	Increased and/or modified road traffic Risk of communicable diseases Disposal of waste deriving from construction activities Security risks and employment of security personnel Emission of dust and particulate matter Emission of noise

Results from the household surveys and impact assessment reveal the following anticipated impacts of the construction phase of the Project on community health and safety within the AoI:

- The construction activities are expected to involve frequent movement of trucks transporting machinery, equipment, and personnel. This heightened traffic density poses an increased risk of accidents within the Project AoI. While driver errors are a common cause of traffic-related risks, other factors like inadequate vehicle maintenance and road design flaws also contribute significantly. The social field study conducted in the villages within the AoI highlights that the main anticipated negative impact of the Project on community health and safety is the increased traffic due to construction vehicles, especially in Emen village. **Considering the cumulative effects of other projects in the area, traffic density is likely to increase, including road safety risks**.
- As a result of construction activities from other projects in the area, the road in Emen Village has experienced disruptions previously. During the household surveys, residents of Emen Village expressed their concerns regarding anticipated traffic-related impacts not only during the construction phase but also during the operation phase of the Project. Given that the road of Emen Village will serve as a route for both personnel and vehicles (employee vehicles) travelling to and from the Project site, the community anticipates increased traffic and its associated impacts on safety.
- Construction activities of the Project may impact community health and safety due to dust emission and degradation of air quality, potentially leading to respiratory discomfort and irritation for local people in the nearest settlements. Prolonged exposure to particulate matter from construction activities may harm health and overall well-being.
- The operation of equipment and vehicles during the construction phase will generate noise; however, it is not expected to exceed regulatory limits significantly.
- The construction phase is expected to employ approximately 100 personnel. The influx of workers during the construction phase may increase the risk of communicable diseases. Also, inadequate waste management due to population influx is a potential source of communicable diseases, posing risks for community health and safety. As previously indicated in the socioeconomic baseline study, the villages do not have health units, which makes these areas highly sensitive in case of a possible infectious disease.

- During the construction phase, the disposal of waste derived from construction activities is notably high compared to other Project phases. Improper disposal of construction waste can lead to environmental pollution, contaminating soil, water sources, and air quality, thus risking community health and the ecosystem. Moreover, construction waste creates physical hazards, increasing the likelihood of accidents and injuries for Project employees and local communities. To mitigate these impacts, proper waste management practices are crucial during the construction phase. The issues related to waste disposal are discussed in detail in Chapter 7.1.3.
- During the construction phase of the Project, security services will be needed on the Project site. Security personnel may negatively impact community health and safety if they engage in abusive behaviour, exacerbate tensions, or fail to effectively address security threats, leading to feelings of mistrust, fear, and a breakdown in community cohesion.

7.2.7.1.2 Operation Phase

The impact factors of the Project causing potential implications on community health and safety during the operation phase are presented in this section.

Table 7-60: Project actions and related impact factors potentially affecting community health and safety during the operation phase

Project actions	Impact factors
Plant operation	Increased and/or modified road traffic Disposal of waste deriving from operation activities Security risks and employment of security personnel

During operation, residents of Emen Village are concerned about increased traffic and safety issues on the road, which will serve as a route for personnel and vehicles traveling to and from the Project site.

There may be the possibility of waste disposal, though at a significantly reduced level compared to the construction phase. This possibility arises from the nature of operational activities, which typically involve fewer intensive processes and resource utilization. Hence, while waste disposal remains a consideration, the extent of waste generated during operation is expected to be considerably lower due to the absence of large-scale construction activities that typically generate significant waste.

During the operation, security-related issues and risks may still be considered; however, compared to the construction phase, these are expected to be significantly reduced. This reduction stems from transitioning to a more controlled and stable environment once operations start. Security measures implemented during the construction phase, such as fencing, surveillance systems, and restricted access areas, will likely remain effective, mitigating potential security threats. While caution and preparedness remain important, the operation phase typically experiences fewer security issues compared to the dynamic nature of the construction phase.

7.2.7.1.3 Decommissioning Phase

The impact factors of the Project causing potential implications on community health and safety during the decommissioning phase are presented in this section.

Table 7-61 Project actions and related impact factors potentially affecting community health and safety during the decommissioning phase

Project actions	Impact factors
Clearence works	Abandoned infrastructure

Abandoned infrastructure or equipment left behind after decommissioning may present physical hazards, such as sharp edges, unstable structures, or hazardous materials, increasing the risk of accidents and injuries to community members.

7.2.7.2 Mitigation Measures

A comprehensive Community Health and Safety Management Plan will be implemented for the Project, incorporating medical surveillance measures.

- A Community Grievance Mechanism will be implemented and accessible to all stakeholders to submit grievances regarding community health and safety issues.

Increased and/or modified road traffic

- Measures will be implemented to manage traffic effectively during peak hours, with equipment and material transportation scheduled during quieter times to prevent congestion on local roads. Road suitability for heavy vehicle use will be ensured through permits and maintenance and promptly addressing necessary repairs. Adequate lighting will be installed at the Project site to maintain visibility, and construction on existing roads will commence only after obtaining permits, with necessary precautions taken.
- Compliance with speed limits will be enforced to protect both community and employee safety. Collaboration with other projects will be ensured to develop comprehensive strategies for managing traffic and enforcing speed limits in the area. Physical speed reduction measures will be installed, such as putting speed bumps to naturally slow down vehicles entering the village.
- Vulnerable areas such as schools will be identified for construction traffic access planning and driving trainings will be given to the personnel. Vehicles **will** strictly follow designated routes, with off-road driving **allowed only in emergency situations**. If reversing cannot be avoided in the work areas, necessary reversing procedures will be identified, including using reversing aids and trained personnel when necessary.
- Designated parking areas will be marked, reverse parking will be implemented for emergencies, and pedestrian routes will be segregated from heavy vehicle paths where feasible. Traffic signs, signals, and barriers will be deployed to prevent accidents
- All vehicle operators will hold appropriate licenses and undergo medical checks, with repair and maintenance conducted by authorized bodies. Regular monitoring of road conditions and improvements will be undertaken as needed, with fatigue and distraction procedures established by local regulations.
- Community engagement will include informing residents about traffic management controls with collaboration sought to enhance signage and visibility, especially in areas with children. Additional driver training programs will enhance road safety, while increased speed control mechanisms and enforcement will be implemented. Collaborative scheduling adjustments for public transit will minimize school bus stop and pedestrian crossing times, with multi-stakeholder cooperation seeking to mitigate negative road safety impacts.
- A Traffic Management Plan that includes the above measures will be prepared and implemented to maintain traffic safety on the roads and to prevent the risks associated with the Project activities ensuring a “safe site, safe vehicle and safe driver” at all times. The Traffic Management Plan will be applicable and implemented during the construction and operation phases.

Risk of Communicable Diseases

The population influx due to the Project may contribute to a rise in communicable and infectious diseases. To prevent the spread of such illnesses, the following measures need to be implemented:

- Pre-employment health screening and regular medical checks of workers will be conducted in compliance with Turkish regulatory requirements.
- Adequate hygiene facilities, such as handwashing stations and sanitation equipment, will be provided throughout the Project site.
- Regular cleaning protocols will be applied across the Project site to maintain hygiene standards.
- Shared facilities and common areas will be regularly disinfected to minimize the spread of pathogens.
- Isolation protocols will be established for individuals displaying symptoms of illness to prevent transmission.
- Collaboration with local healthcare authorities will facilitate rapid response and containment in case of disease outbreaks.
- Workers will be encouraged to use social distancing measures and personal protective equipment (PPE) to reduce the risk of transmission.
- Employee training will be provided to raise awareness and promote healthy lifestyles among workers and the community.

Disposal of waste deriving from construction activities

- Appropriate waste disposal facilities, such as licensed landfills or recycling centres, will be utilized for the safe and environmentally responsible disposal of waste materials.
- Project personnel will receive training on proper waste management practices to minimize the generation of waste and maximize recycling and reuse opportunities.
- Measures will be implemented to prevent littering and illegal dumping of waste materials, including the installation of signage and barriers to deter unauthorized disposal.
- Regular monitoring and inspection of waste disposal practices will be conducted to ensure compliance with applicable laws and regulations.
- Regular audits and reviews of waste management practices will be conducted to identify areas for improvement and implement corrective actions, as necessary.
- A comprehensive waste management plan outlining procedures for proper handling, storage, and disposal of all waste materials generated during the Project activities will be implemented.

Emission of dust and particulate matter

- Dust control measures such as using dust suppression systems on construction machinery and covering stockpiles of materials will be implemented.
- Transportation routes will be regularly watered using water sprinklers to suppress dust.
- Construction activities will be enclosed whenever feasible to minimize the dispersion of dust into the surrounding air.
- Air quality levels in the Project AoI will be regularly monitored to promptly identify and address any exceedances of regulatory standards.

- Strict adherence to emission standards for construction equipment and vehicles will be ensured, including regular maintenance and inspection.
- Collaboration with local environmental authorities will be established to develop and implement best practices for dust control and air quality management.
- Dust control measures will be integrated into the relevant management plan to ensure comprehensive management of environmental impacts throughout the Project lifecycle.

Emission of Noise

- Noise-reducing equipment and machinery will be utilized where possible.
- Sound barriers or enclosures will be installed around noisy operations.
- Noisy activities will be scheduled during off-peak hours to minimize disturbance to nearest settlements.
- Mufflers or silencers will be installed on equipment to reduce noise emissions.
- Periodic inspections, regular maintenance and repair of machinery will be conducted by the authorized services to minimize noise from mechanical operations.
- Workers will be trained on noise management techniques and the importance of minimizing noise pollution.
- Regular noise monitoring surveys will be conducted to assess the effectiveness of mitigation measures and identify areas for improvement.
- Community engagement will be prioritized to address concerns and solicit feedback on noise mitigation efforts and grievance mechanism to record and respond to complaints will be developed.

Security Risks and Employment of Security Personnel

- Security personnel, who are members of the local community and familiar with local customs, will be employed, if possible, as a positive and visible point of contact between the Project and the local communities.
- Security services at the Project site will be provided by third-party company or in-house security personnel with clean criminal records and no history of abuse. Background checks will be conducted on all security personnel to ensure suitability for their roles.
- Security personnel will receive continuous training and professional development opportunities in their designated roles and responsibilities, including the use of force (and, where applicable, firearms) and appropriate conduct toward workers and affected communities in compliance with the requirements of applicable laws and international standards.
- Stakeholder consultations and transparent communication channels will be established to allow workers and the local community to express their concerns about security arrangements and the conduct of security personnel.
- Regular performance evaluations and monitoring of security personnel conduct will be carried out to maintain professionalism and adherence to established protocols.
- Unauthorized entry will be prevented using appropriate tools and gadgets, with warning signs about unauthorized entry displayed at various locations at the Project crossings.
- Hazardous areas within the Project site will be marked with appropriate signs.

- Entry and removal of equipment/material will be strictly controlled at designated control points, with movement allowed only after approval from the relevant department.
- Relevant Project officials will continuously accompany visitors during their stay on the Project site, and all visitors will be documented.
- Visitors will be provided with informational brochures detailing the Project area, site rules, and emergency procedures.
- Personal Protective Equipment will be provided to all visitors entering the Project site.
- Regular security patrols will be conducted at scheduled intervals.
- A Security Management Plan will be developed in accordance with both national (Private Security Services Law No: 5188, 2004) and international (e.g., IFC PS4) standards to address security-related impacts and safeguard the activities, assets, and premises at the Project site, while also mitigating potential impacts on workers and the local community.

Abandoned Infrastructure

- A decommissioning plan will be developed and implemented to outline procedures for the safe removal, disposal, or repurposing of infrastructure to minimize negative impacts on the community.
- Community outreach and communication efforts will be undertaken to inform residents about the decommissioning process, potential risks associated with decommissioning works, and safety precautions to be observed.
- Resources and support will be provided for community-led initiatives aimed at repurposing or revitalizing abandoned infrastructure to benefit the community while mitigating safety concerns.

7.2.7.3 Residual Impacts

7.2.7.3.1 Construction Phase

During the household surveys, traffic congestion and road damage were identified as the most anticipated impacts. Given the high frequency of construction activities and increased vehicle traffic, coupled with the sensitivity of the villages to these impacts, the overall impact value is assessed as high. However, even with mitigation measures in place, the residual impact is expected to decrease to a medium level, which still indicates significance.

All other identified impacts, including the risk of communicable diseases, inadequate waste management, security risks and employment of security personnel, dust and degradation of air quality, and noise, have negligible residual impact values. However, it is noted that dust problems are experienced by the residents as stated during the household surveys. Effective mitigation measures need to be implemented to address these concerns.

Table 7-62: Residual Impact Assessment for Community Health and Safety During the Construction Phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Increased and/or modified road traffic	Duration:	Short	Very high	Mid term	**High**	Medium high	**Medium**
	Frequency:	Frequent					
	Geo. Extent:	Local					
	Intensity:	Very high					

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Risk of communicable diseases	Duration:	Short	Medium-high	Short-mid-term	**Low**	Medium high	**Negligible**
	Frequency:	Infrequent					
	Geo. Extent:	Local					
	Intensity:	Medium					
Disposal of waste deriving from construction activities	Duration:	Short	Medium	Short-mid-term	**Low**	Medium high	**Negligible**
	Frequency:	Frequent					
	Geo. Extent:	Project Site					
	Intensity:	Medium					
Security risks and employment of security personnel	Duration:	Short	Medium	Short-mid-term	**Low**	Medium high	**Negligible**
	Frequency:	Frequent					
	Geo. Extent:	Local					
	Intensity:	Low					
Emission of dust and particulate matter	Duration:	Short	Medium-high	Short-mid-term	**Medium**	Medium high	**Negligible**
	Frequency:	Recurrent					
	Geo. Extent:	Local					
	Intensity:	Medium					
Emission of noise	Duration:	Short	Medium	Short-mid-term	**Low**	Medium high	**Negligible**
	Frequency:	Recurrent					
	Geo. Extent:	Local					
	Intensity:	Low					

7.2.7.3.2 Operation Phase

During the operation phase, traffic density is expected to significantly decrease. However, safety concerns remain particularly as drivers frequently disregard speed limits, leading to increased risk of accidents and injuries. Implementing stringent measures to monitor and enforce speed limits will be crucial in mitigating these safety hazards and ensuring the well-being of all individuals involved. Additionally, ongoing education and awareness campaigns aimed at promoting responsible driving behaviour will play a vital role in addressing this persistent challenge.

Inadequate waste management during the operation phase poses a long-term risk with a medium sensitivity and short-term reversibility. In the operational phase, the disposal of waste is anticipated to be considerably less than during the construction phase, thus the residual impact is negligible. Similarly, security risks and the employment of security personnel during the operation phase exhibit a long-term duration with medium sensitivity and short-term reversibility. The impact is localized and of low intensity, ultimately resulting in a negligible residual impact.

Table 7-63: Residual Impact Assessment 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
Increased and/or modified road traffic	Duration:	Very long	Very high	Mid term	**High**	Medium high	**Low**
	Frequency:	Frequent					
	Geo. Extent:	Local					
	Intensity:	Low					

Disposal of waste deriving from operation activities	Duration:	Very long	Medium	Short-term	**Negligible**	Medium high	**Negligible**
	Frequency:	Recurrent					
	Geo. Extent:	Project Site					
	Intensity:	Low					
Security risks and employment of security personnel	Duration:	Very long	Medium	Short-term	**Low**	Medium high	**Negligible**
	Frequency:	Frequent					
	Geo. Extent:	Local					
	Intensity:	Low					

7.2.7.3.3 Decommissioning Phase

During the decommissioning phase, the impact of abandoned infrastructure may pose critical concerns. This impact factor is characterized by its high sensitivity, as the abandonment of infrastructure can have significant repercussions on the local environment and community. However, the impact is short-term and highly reversible, with a low initial impact value. Effective mitigation measures can help alleviate this impact to some extent, although their effectiveness is rated as medium. Overall, with the implementation of mitigation measures, the residual impact value is anticipated to be negligible, ensuring minimal lasting effects on the community health and safety during the decommissioning phase.

Table 7-64: Residual Impact Assessment for Community Health and Safety During the Decommissioning Phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Abandoned Infrastructure	Duration:	Very short	Very high	Short-term	**Low**	Medium	**Negligible**
	Frequency:	Single Event					
	Geo. Extent:	Project Site					
	Intensity:	High					

7.2.7.4 Monitoring

Monitoring measures will be systematically implemented to assess various impact factors and ensure the effective management of risks throughout the Project.

- Traffic-related incidents involving workers and external persons will be recorded and tracked, with incident investigations used to improve mitigation strategies.
- Compliance with speed limits will be monitored to protect both community and employee safety.
- Road conditions and necessary road improvements will be monitored regularly.
- Records of driver training and community health and safety training will be maintained.
- Operator licenses and medical surveillance will be monitored to ensure compliance.
- The number of road closures caused by Project activities will be tracked.
- Vehicle maintenance records will be controlled to ensure regular maintenance.

- Grievances related to traffic will be recorded, and resolution rates will be tracked.
- Traffic density will be monitored through regular traffic counts and analysis of congestion levels during peak hours, with adjustments to transportation schedules as necessary to alleviate congestion.
- Inadequate waste management will be monitored through regular inspections of waste disposal practices, including audits of waste handling procedures and assessments of compliance with waste management regulations.
- The risk of communicable diseases will be monitored through regular health surveillance, including screening for symptoms, and tracking disease prevalence among workers and the local community.
- Dust and degradation of air quality will be monitored quarterly at the closest sensitive receptors for particulate matter levels, with adjustments made to dust control measures as needed to mitigate impacts.
- 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.
- Security risks and employment of security personnel will be monitored through regular assessments of security protocols and personnel conduct, including evaluations of security measures effectiveness and compliance with applicable laws and standards.

7.2.8 Human Rights

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)[39]:

> *Human rights are rights inherent to all human beings, whatever our nationality, place of residence, sex, national or ethnic origin, color, 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)*

The Human Rights Impact Assessment (HRIA) study for the Project was prepared by WSP Türkiye and conducted to support requirements and Good Industry Practices (GIP) in line with the specifications of Equator Principles IV (dated July 2020) and IFC Performance Standards. As part of the Environmental and Social Impact Assessment (ESIA) studies, a Human Rights Impact Assessment for the Project was carried out to identify measures for mitigating potential impacts on local communities and both direct and indirect workers. This assessment was undertaken in accordance with international standards, which mandate the inclusion of evaluations of potential adverse human rights impacts within the ESIA or other assessments.

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.

7.2.8.1 Legal Framework for Human Rights

National Requirements

National requirements and law concerning human rights in Türkiye include:

- Constitution of the Republic of Türkiye

[39] https://bangkok.ohchr.org/what-are-human-rights/
https://www.ohchr.org/en/human-rights/universal-declaration/

- The Law on the Human Rights and Equality Institution of Türkiye (TIHEK) (Law No. 6701, 2016)
- Labor Law (Law No. 4857, 2003) and related regulations
- Occupational Health and Safety Law (Law No. 6331, 2012) and related regulations
- Regulation on the Implementation of the Law Concerning Private Security Services

Various international human rights standards and treaties has been ratified by Türkiye. Some of the key human rights standards applicable in Türkiye include:

- Universal Declaration of Human Rights (UDHR): Türkiye is a member of the United Nations and is thus bound by the principles outlined in the UDHR, which covers a wide range of civil, political, economic, social, and cultural rights.
- European Convention on Human Rights (ECHR): Türkiye is a member of the Council of Europe and thus a party to the ECHR, which protects fundamental rights and freedoms, including the right to life, prohibition of torture, right to a fair trial, freedom of expression, and others.
- Turkish Constitution: The Turkish Constitution guarantees various fundamental rights and freedoms to its citizens, including but not limited to the right to life, equality before the law, freedom of expression, freedom of assembly and association, freedom of religion, and the right to privacy.
- Turkish Penal Code (TCK): The penal code of Türkiye also includes provisions related to the protection of human rights, such as prohibitions against torture, discrimination, and arbitrary detention.
- International Covenant on Civil and Political Rights (ICCPR): Türkiye is a signatory to the ICCPR, which covers rights such as the right to life, freedom of speech, freedom of assembly, and the right to a fair trial.
- International Covenant on Economic, Social and Cultural Rights (ICESCR): Türkiye is also a signatory to the ICESCR, which outlines rights related to education, healthcare, work, and an adequate standard of living.
- Convention on the Elimination of All Forms of Discrimination against Women (CEDAW): Türkiye has ratified CEDAW, which aims to eliminate discrimination against women and promote gender equality.
- Convention on the Rights of the Child (CRC): Türkiye is a party to the CRC, which sets out the civil, political, economic, social, and cultural rights of children.

It is important to note that while Türkiye has ratified these international treaties and has provisions in its constitution and legal framework to protect human rights, there have been concerns raised by human rights organizations and international bodies regarding the implementation and enforcement of these rights in Türkiye. Political, social, and legal challenges have sometimes impacted the full realization of human rights in the country.

International Requirements

The following international standards will be applicable to the Project:

- International Labor Organization (ILO) conventions ratified by Türkiye
- EP Guidance on Implementation of Human Rights Assessments under The Equator Principles (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)
- The International Bill of Human Rights
- International Labor Organization's Declaration on Fundamental Principles and Rights at Work
- 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

- Human Rights Policy
- Supply Chain Policy
- Supplier Code of Conduct
- Polysilicon Traceability Requirements

7.2.8.2 Methodology

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**
  - Freedom of thought and opinion
  - Right to information
- **Labor 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 of protection for the children
  - Right to social security, including social insurance
  - Labour standards in supply chains
  - Migrant workers
  - Women employment
  - Grievance Mechanism
- **Social rights**
  - Right to an adequate standard of living and housing
  - Right to health, food, water, and sanitation
  - Right to take part in cultural life
- **Vulnerability**
  - The rights of minorities
- **Community health and safety**
  - Environmental issues
  - Security issues

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 impact factors consist of **Duration (D)**, **Frequency (F), Geographic extent (G),** and **Intensity (I),** which are assessed in detail in Chapter 5 of ESIA Report. 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 7-65: Human Rights Impact Assessment 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

7.2.8.3 Human Rights Risks Concerning Forced Labour in Polysilicon Sourcing

The solar industry is associated with risks pertaining to human rights violations, particularly in the sourcing of polysilicon from regions with documented cases of forced labour. It has found that many polysilicon manufacturers operating in the Uyghur region has taken part in forced labour transfer programs or is linked to raw material suppliers who have engaged in such activities (Murphy & Elimä, 2021). As per the data from the 2023 Global Slavery Index (Walk Free, 2023):

- Modern slavery refers to the situations of exploitation that a person cannot refuse or leave because of threats, violence, coercion, deception, or abuses of power; taking many forms such as forced labour, forced marriage, debt bondage, sexual exploitation, human trafficking, slavery-like practices, forced or servile marriage, and the sale and exploitation of children.
- There are five high-value products that Türkiye imports which are at risk of being produced under conditions of modern slavery. Among these products, solar panels stand out with an import value of 0.4 billion US dollars, primarily originating from China. This information underscores the human rights risks associated with Türkiye's supply chain when importing solar panels from China. It highlights the importance of monitoring the production processes and supply chains to ensure that ethical and fair labour practices are upheld in the manufacturing of these critical components, given the concerns regarding modern slavery in certain industries and source countries.

In order to ensure whether the Project is associated with any human rights violations, an assessment has been conducted in this section regarding the labour standards in the Project's supply chain.

According to the information provided by Smart, the components of solar power plant will be produced at Smart's factory. As they are made in Türkiye, they do not pose any human rights risks regarding supply chain. Detailed information regarding component list will be shared by Smart at the future stages of the Project.

Smart has developed and is dedicated to implementing a comprehensive set of policies and strategies aimed at eliminating human rights risks and fostering sustainable labour practices throughout its operations. These policies and strategies include:

- **Sustainable Supply Chain Strategy including Polysilicon Traceability Requirements:** Smart investigates supplier compliance with its code of conduct based on fundamental labour principles outlined by the International Labour Organization (ILO) and the Ten Principles of the UN Global Compact. The code emphasizes providing safe working conditions, protecting children's rights, preventing human rights violations, and environmental protection. Awareness sessions will be conducted with suppliers to introduce Smart's strategy and requirements, and physical gap assessments will be performed to evaluate compliance. Additionally, Smart will support suppliers with training and projects to improve conditions in the supply chain. Regular audits conducted by Smart or assigned third-party auditors will verify compliance, with zero tolerance for violations in the polysilicon supply chain.

  To ensure transparency and traceability in its supply chain, Smart requires suppliers to disclose the entire supply chain, from solar panels to raw material extraction. Traceability requirements are implemented to prevent violations in the polysilicon supply chain, including forced and bonded labour. Smart aims to trace polysilicon content throughout the supply chain and map companies involved in the transport, trade, warehousing, and production of various materials. Traceability audits will be initiated in 2024, and a reporting system will be established for regular traceability reporting from suppliers, ensuring accountability and adherence to ethical standards.
- **Supplier Code of Conduct:** Smart's Supplier Code of Conduct outlines expectations for ethical and sustainable practices within its supply chain. It requires suppliers to provide a safe and healthy working environment, protect children's rights, prevent human rights violations, and safeguard the environment. Non-compliance may result in the termination of the business relationship, and suppliers are expected to maintain effective mechanisms for investigating and resolving violations.

- **Supply Chain Policy:** Smart expects its suppliers to uphold human rights, labour standards, and environmental protections, and sets strict standards for its supply chain to ensure compliance with these principles.
- **Human Rights Policy:** Smart prioritizes observing fundamental human rights in all business processes, fostering an egalitarian and fair working environment free from discrimination, ensuring compliance with national and international human rights standards, and rejecting all forms of child labour, forced labour, and discrimination. This Human Rights Policy highlights Smart's commitment to respecting human rights and continuously improving its practices.
- **Sustainability Policy:** Smart sets sustainability goals aligned with UN Sustainable Development Goals and continuously monitors its performance through a dedicated Sustainability Committee. Smart adheres to ethical principles, national and international standards, and legal regulations across all geographies and sectors of operation, engages in corporate social responsibility projects, fosters stakeholder cooperation, and invests in employee awareness and training initiatives to integrate sustainability into its corporate culture.

These policies and strategies demonstrate Smart's proactive approach to addressing human rights risks and promoting sustainable labour practices across its supply chain and operations. By adhering to these principles and continuously improving its performance, Smart will create positive social and environmental impacts while upholding its commitment to ethical business practices and corporate responsibility.

7.2.8.4 Project Human Rights Assessment

Human rights impacts are mainly influenced by the local human rights context and the specific activities of a project. To align with international standards, it is essential to consider the full scope of human rights impacts, including those directly caused or contributed to by the Project, cumulative impacts, and those linked to the Project through business relationships. Hence, Human Rights Impact Assessment is conducted to ensure that Smart understand and address the potential human rights impacts of its activities, promote ethical behaviour and responsible business practices, and contribute to sustainable development. It is worth noting that the potential issue areas typically assessed in the ESIA overlap with key human rights considerations, such as livelihoods and labour, community health and safety, resettlement, gender, and vulnerability.

Table 7-66 presents the assessment conducted is to determine the levels of human rights risks and potential mitigation measures pertinent to the Project.

Table 7-66: Human Rights Assessment

Topic	Project Context	Stakeholders	Impact Factor Features	Pre-mitigation	Mitigation Effectiveness	Mitigation Measures	Risk Categorization
Human Resources							
Working conditions and working hours	It is planned to employ 100 people during the construction phase of the Project and 20 people during the operation phase. Workforce will be sourced from local communities. National requirements, ILO Conventions ratified by Türkiye and IFC PS2 will be applied both direct and contractor workers. Working hours will be planned in compliance with the Labor Law. Construction working hours are planned to be 8 hours/day as 1 shift and operation working hours are planned to be in 3 shifts of 8 hours each.	Project workers	Duration: Very long Frequency: Frequent Geo. Extent: Local Intensity: Medium Sensitivity: Very high Reversibility: Short mid-term	**High**	Medium-high	The Project will implement Human Resources Policy of Smart. This policy will provide predictable employment opportunities for direct and indirect employees. The copies of HR 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	**Low**

Topic	Project Context	Stakeholders	Impact Factor Features	Pre-mitigation	Mitigation Effectiveness	Mitigation Measures	Risk Categorization
						clear and understandable to the employee. A copy of contract will be given to the employee. The Project will enhance local employment and give priority to local population during recruitment. Equal tender process will be applied. Capacity development will be supported. The safety and health protection of workers will be ensured by implementing necessary measures, including preventing occupational risks, and providing information and training,	
Wages	The Labor 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	Project workers	Duration: Very long Frequency: Frequent Geo. Extent: Local Intensity: Medium Sensitivity: Very high Reversibility: Short mid-term	**High**	Medium-high	The contracts of the workers will include the information regarding to salary and annual increase. All workers will be paid equal for equal jobs. Smart will ensure that all payroll practices adhere strictly to relevant labor laws and regulations, guaranteeing that workers	**Low**

Topic	Project Context	Stakeholders	Impact Factor Features	Pre-mitigation	Mitigation Effectiveness	Mitigation Measures	Risk Categorization
	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.					receive their entitled wages and benefits in accordance with legal standards. Regular audits and reviews of payroll records and compensation practices will be conducted to identify and rectify any discrepancies or errors, maintaining accuracy and integrity in payroll management.	
Non-discrimination	Labor Law: Article 5 of the Labor Law of Türkiye regulates the ban of discrimination in employment. According to that article ‘no discrimination based on language, race, sex, gender, political opinion, philosophical belief, and religion 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	Project workers	Duration: Very long Frequency: Infrequent Geo. Extent: Local Intensity: Medium Sensitivity: Very high Reversibility: Mid-term	**High**	Medium-high	Smart will actively promote equality of treatment and zero tolerance for harassment in the workplace. Human Rights Policy of Smart will be implemented. 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. Smart will ensure all forms of discrimination is prohibited by the	**Low**

Topic	Project Context	Stakeholders	Impact Factor Features	Pre-mitigation	Mitigation Effectiveness	Mitigation Measures	Risk Categorization
	remuneration for similar jobs or for work of equal value is not permissible."					Subcontractors and the Client itself. Regular evaluations and feedback mechanisms will be implemented to identify areas for improvement and implement necessary changes.	
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.	Project workers	Duration: Very long Frequency: Recurrent Geo. Extent: National Intensity: Medium Sensitivity: Very high Reversibility: Short mid-term	**High**	Medium High	In case of the absence of the unions, workers representatives should be elected, and periodical meetings will be held with the representatives. Worker representatives should be elected by the workers themselves. 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. These measures will be implemented by the Subcontractors as well and	**Low**

Topic	Project Context	Stakeholders	Impact Factor Features	Pre-mitigation	Mitigation Effectiveness	Mitigation Measures	Risk Categorization
						monitoring will be done by Smart.	
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	Duration: Very long Frequency: Infrequent Geo. Extent: Local Intensity: High Sensitivity: Very high Reversibility: Mid-term	**High**	High	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 Labor 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. Smart is committed to upholding human rights and will not tolerate any form of forced labour within its operations. Employees will have the freedom to terminate their employment	**Low**

Topic	Project Context	Stakeholders	Impact Factor Features	Pre-mitigation	Mitigation Effectiveness	Mitigation Measures	Risk Categorization
						in accordance with national law, ensuring that their rights are respected and protected. Smart will adhere strictly to all relevant labour laws and regulations regarding termination procedures, providing employees with the necessary support and guidance throughout the process.	
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	Duration: Very long Frequency: Infrequent Geo. Extent: Local Intensity: Medium Sensitivity: Very high Reversibility: Mid-term	**High**	High	Occupational Health and Safety Policy of Smart will be implemented. In the event of serious, imminent, and unavoidable danger; workers shall leave their workstation or dangerous area and proceed to a place safety. Workers will not be placed at any disadvantage because of their action.	**Low**
Right of protection for the children	Labor Law No. 4857, Article 71 states that employment of children who have not reached the age of 15 is prohibited. However, children who have reached the age of 14 and have	Project workers	Duration: Very long Frequency: Infrequent Geo. Extent: Local Intensity: Medium Sensitivity: Very high Reversibility: Mid-term	**High**	High	Human Rights Policy of Smart will be implemented. The minimum working age will be 18 for all direct and indirect workers. Subcontractor monitoring system will be established by Smart to ensure that all	**Low**

Topic	Project Context	Stakeholders	Impact Factor Features	Pre-mitigation	Mitigation Effectiveness	Mitigation Measures	Risk Categorization
	completed their primary education may be employed in light labor 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.					subcontractors comply with work age limits.	
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, short-term and long-term insurances. All direct and indirect workers will have right for social insurance and general health	Project workers	Duration: Very long Frequency: Frequent Geo. Extent: Local Intensity: Medium Sensitivity: Very high Reversibility: Short mid-term	**High**	Medium High	Social insurance payments of all direct and indirect workers will be strictly monitored by Smart. Awareness meetings will be held with the Project workers if required.	**Low**

Topic	Project Context	Stakeholders	Impact Factor Features	Pre-mitigation	Mitigation Effectiveness	Mitigation Measures	Risk Categorization
	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.						
Migrant workers	The Project will not employ any migrant workers.	Project workers	Duration: Very long Frequency: Infrequent Geo. Extent: Local Intensity: Low Sensitivity: Very high Reversibility: Short mid-term	**Medium**	Medium High	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.	**Low**
Women's employment	While the Project is anticipated to have a positive impact on women's employment in the local area, it is essential to acknowledge and mitigate potential human rights risks associated with women's employment.	▪ Women in local communities ▪ Project workers	Duration: Very long Frequency: Infrequent Geo. Extent: Local Intensity: Medium Sensitivity: Very high Reversibility: Short mid-term	**Medium**	Medium High	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. Equal pay for equal work will be implemented especially considerate of gender pay gap.	**Low**

Topic	Project Context	Stakeholders	Impact Factor Features	Pre-mitigation	Mitigation Effectiveness	Mitigation Measures	Risk Categorization
						Smart will not discriminate against women on the basis of their marital or reproductive status. Positive discrimination will be applied to female candidates during the recruitment process. Priority will be given to women if there are local procurement opportunities. The safety and needs of female staff at the Project site will be met at a high level.	
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 Presidency's Communication Centre (CIMER) has been providing a	▪ Local communities ▪ Project workers	Duration: Very long Frequency: Continuous Geo. Extent: Local Intensity: High Sensitivity: Very high Reversibility: Short mid-term	**High**	Medium High	Worker Grievance Mechanism will be established and implemented. Community Grievance Mechanism will be established and implemented. Grievance & Request Box and forms will be placed in accessible places within the villages such as Mukhtars' offices for the use of local communities and all stakeholders.	**Low**

Topic	Project Context	Stakeholders	Impact Factor Features	Pre-mitigation	Mitigation Effectiveness	Mitigation Measures	Risk Categorization
	centralized 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. In addition, Project specific grievance mechanism both for the Project workers and the stakeholders will be implemented.					Grievance & Request Box and forms will be placed in accessible places at the Project site for the use of Project workers. 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.	
Labour standards in supply chains	Importing polysilicon, a critical component in the solar panel industry, has raised concerns about forced labour risks within the supply chain. According to the information provided by Smart, the components of solar power plant will be produced at Smart's	▪ Workers in production in the supply chain	Duration: Very long Frequency: Recurrent Geo. Extent: International Intensity: Medium Sensitivity: Medium high Reversibility: Long term	**High**	High	Smart 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. Smart will not meet Project's material needs from suppliers where forced	**Low**

Topic	Project Context	Stakeholders	Impact Factor Features	Pre-mitigation	Mitigation Effectiveness	Mitigation Measures	Risk Categorization
	factory. As they are made in Türkiye, they do not pose any human rights risks regarding supply chain. Detailed information regarding component list will be shared by Smart at the future stages of the Project.					and child labour is being used. The following policies and strategies will be implemented by Smart: ▪ Sustainable Supply Chain Strategy including Polysilicon Traceability Requirements ▪ Supplier Code of Conduct ▪ Supply Chain Policy ▪ Human Rights Policy ▪ Sustainability Policy	
Socioeconomic and Cultural Context							
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	▪ Local communities ▪ Project workers	Duration: Very long Frequency: Continuous Geo. Extent: Local Intensity: Medium Sensitivity: Medium-high Reversibility: Short mid-term	**Medium**	Medium high	A Stakeholder Engagement Plan and the Grievance mechanism will be established to provide stakeholders to express their thoughts and the opinions on the Project. Stakeholder Engagement Meetings will be inclusive (encouraging the participation of locals	**Low**

Topic	Project Context	Stakeholders	Impact Factor Features	Pre-mitigation	Mitigation Effectiveness	Mitigation Measures	Risk Categorization
	account of his thoughts and opinions.					including vulnerable groups such as women).	
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 organizations, which qualify as public institutions.	▪ Local communities ▪ Project workers	Duration: Very long Frequency: Frequent Geo. Extent: Regional Intensity: Medium Sensitivity: Medium-high Reversibility: Short mid-term	**Medium**	Medium high	A Stakeholder Engagement Plan will be prepared for the Project and 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.	**Low**
Right to an adequate standard of living and housing	The social field study findings indicate that residents of Seslikaya village utilize the pastureland for animal grazing. The livelihoods of these	▪ Local communities ▪ Project workers	Duration: Very long Frequency: Infrequent Geo. Extent: Local Intensity: Low Sensitivity: Very high	**High**	Medium	Community development initiatives and social responsibility projects will be implemented by Smart to reduce the economic impacts on land-based livelihoods.	**Medium**

Topic	Project Context	Stakeholders	Impact Factor Features	Pre-mitigation	Mitigation Effectiveness	Mitigation Measures	Risk Categorization
	residents are impacted by the Project, as it encompasses the pasturelands.		Reversibility: Long term			Stakeholder Engagement Plan will be prepared and implemented. Grievance mechanism will be prepared and implemented.	
Right to health, food, water, and sanitation	Potential risks to local residents identified in the ESIA include traffic intensity, risk of communicable diseases, strain on local infrastructure and ecosystem services such as health services and water resources. Traffic intensity and impact on local road and transportation is expected due to the Project, which will be mitigated strictly.	▪ Local communities ▪ Project workers	Duration: Very long Frequency: Frequent Geo. Extent: Local Intensity: Medium Sensitivity: Very high Reversibility: Short mid-term	**High**	Medium High	Traffic Management Plan will be prepared and implemented. Community Health and Safety Management Plan will be prepared and implemented. Waste Management Plan will be prepared and implemented. The SPP construction area and all operational areas are to be regularly monitored for potential risks. In case of a grievance, additional measurements will be held, and the results will be shared with the local communities.	**Low**
Right to take part in cultural life	The main impact identified in the ESIA is increase in population during the construction phase	▪ Local communities ▪ Project workers	Duration: Very long Frequency: Recurrent Geo. Extent: Local Intensity: Medium	**Medium**	Medium High	Cultural awareness training will be provided to the workers. In addition to the implementation of	**Low**

Topic	Project Context	Stakeholders	Impact Factor Features	Pre-mitigation	Mitigation Effectiveness	Mitigation Measures	Risk Categorization
	which may create social unrest and changes in the dynamics within the local communities.		Sensitivity: Medium-high Reversibility: Short mid-term			Stakeholder Grievance Mechanism, CLOs will have a continuous dialogue with the local communities so that if they have problems with the Project workers, it would be detected.	
Rights of minorities	Results from the social surveys indicated that there are vulnerable groups within the villages. There are women-headed households with low incomes, and households generally have low socioeconomic status in the villages.	■ Local communities ■ Project workers	Duration: Very long Frequency: Recurrent Geo. Extent: Local Intensity: Low Sensitivity: Very high Reversibility: Mid term	**High**	Medium High	Community Liaison Officers (CLOs) will have a continuous dialogue with the local communities to ensure that the rights of minorities are respected and protected. The Project will assist vulnerable groups, including women-headed households, in accessing essential services such as healthcare, and create social responsibility projects that offer financial assistance to support their socio-economic needs. Awareness sessions and workshops will be conducted to educate both Project personnel and community members about the importance of minority rights within the Project area.	**Low**

Topic	Project Context	Stakeholders	Impact Factor Features	Pre-mitigation	Mitigation Effectiveness	Mitigation Measures	Risk Categorization
						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 are informed at a sufficient level.	
Environmental issues	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,	■ Local communities ■ Project workers	Duration: Very long Frequency: Recurrent Geo. Extent: Local Intensity: Low Sensitivity: Medium-high Reversibility: Short term	**Medium**	Medium High	Suitable and sufficient environmental management plans for waste, wastewater, noise, and air quality will be established and implemented. A relationship with municipal environmental department will be established in advance and monitoring of air and noise will be done in accordance with local regulations. The SPP construction area and all operational areas 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 Effectiveness	Mitigation Measures	Risk Categorization
	balanced environment. It is the duty of the state and citizens to improve the natural environment and to prevent environmental pollution.					Monitoring will be given high importance to ensure both Smart and Subcontractors comply with the international environmental and social standards. All employees including of contractors and subcontractors will receive general workplace orientation, site-specific workplace orientation and comprehensive training that includes environmental and social awareness and compliance training to be aligned with Project ESIA and ESMS.	
Security issues	During the construction and operation phase of the Project, unarmed private security personnel will be needed on the site.	▪ Local communities ▪ Project workers	Duration: Very long Frequency: Continuous Geo. Extent: Local Intensity: Low Sensitivity: Medium-high Reversibility: Short mid-term	**Medium**	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 will be established and implemented by Smart.	**Low**

Topic	Project Context	Stakeholders	Impact Factor Features	Pre-mitigation	Mitigation Effectiveness	Mitigation Measures	Risk Categorization
						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. Security personnel will be trained adequately in their envisaged roles and responsibilities, the use of force, gender-based violence and harassment and appropriate conduct toward workers and affected communities and the applicable laws. Security Forces: Assessing and Managing Risks and Impacts and Voluntary Principles on Security and Human Rights will be implemented by the Project.	

7.2.8.5 Mitigation and Monitoring Measures

The stage of mitigating and monitoring 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. By implementing the following mitigation and monitoring measures, Smart aims to continuously improve its approach to human rights management and maintain transparency and accountability in its operations:

- In accordance with IFC PS-2, risks related to social and labour issues, including human rights violations, forced labour, child labour, unsafe working conditions, and discrimination, will be eliminated.
- Smart will source necessary products from companies/countries that comply with international labour standards and eliminate human rights violations at the highest level.
- Smart will conduct thorough due diligence on suppliers to ensure compliance with international labour standards and human rights principles.
- Suppliers/service providers will be evaluated on their Health, Safety, Environment (HSE), Quality, System, Legal, and Compliance performance.
- Regular audits and assessments will be conducted to identify and address any potential human rights violations within the supply chain.
- Training programs will be initiated to related parties to raise awareness of human rights issues and promote adherence to ethical labour practices.
- A Project-specific grievance mechanism will be implemented for both Project workers and local communities to address concerns.
- Tools for stakeholders to raise grievances and requests will be provided in accessible locations.
- Stakeholders will be encouraged to report any concerns or suspicions of human rights abuses, and appropriate actions will be taken to address them in a timely manner.
- Any grievances related to human rights violations will be promptly investigated and addressed through the Project-specific grievance mechanism.
- A target/term target for grievance closing percentage will be determined and monitored.

7.2.9 Cultural Heritage

Based on the information from Section 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 because of the absence of archaeological heritage in the AoI.

7.2.9.1 Impact factors

7.2.9.1.1 Construction phase

The impact factors from the Project activities potentially affecting cultural heritage during construction phase are presented in Table 7-67**.**

Table 7-67: Project actions and related impact factors potentially affecting cultural heritage during construction phase

Project actions	Impact factors
General engineering/construction works	Removal of soil

Potential impacts affecting *cultural heritage* are assessed below for the construction phase.

- **<u>Removal of Soil</u>**

The construction of the Project, particularly soil removal, can potentially affect cultural heritage. Soil removal will occur during construction activities such as earthworks (excavation and filling) to prepare the construction surface, trenching for cable installation, and excavation for building foundations (e.g., administration building). Due to the absence of visible cultural heritage assets on the surface, only chance finding may occur during excavation and trenching.

7.2.9.1.2 Operation Phase

Considering the nature of the Project no impacts are expected on the cultural heritage component during the operation phase.

7.2.9.1.3 Decommissioning Phase

No impacts are expected on the cultural heritage component during decommissioning phase rather than the impact factors defined for the construction phase.

7.2.9.2 Mitigation Measures

The following mitigation measures shall be implemented to mitigate the effects of the impact factors.

- A Chance Find Procedure will be prepared in compliance with the project organization, and it will be implemented that is necessary for the management of the “chance finds”. All construction workers should receive a training on project requirements, protection of cultural and archaeological heritage, laws and legislations related with the archaeological and cultural heritage and chance find procedure.
- When any chance find occurs during the construction activities, the further steps should be taken in accordance with the Chance Find Procedure and the relevant bodies, and the Directorate of the Museum will be notified immediately. Relevant instructions about the sensitivity of the site will be shared with all construction team a few days before the construction activities, in case of any find or information associated with archaeological potential of the site is already discovered. Chance finding should not be moved, removed or further disturbed. The proper equipment will be identified and used with the consideration of the directorate of the museum and the construction teams.
- All construction personnel working during land preparation phase of the construction phase should receive training on project requirements, protection of cultural and archaeological heritage, laws and regulations regarding archaeological and cultural heritage and Chance Find Procedure.

7.2.9.3 Residual Impacts

Based on the characteristics and actions, as well as the proper implementation of the mitigation measures proposed above, a potential **<u>negligible</u>** is expected on the cultural heritage during the construction phase.

Table 7-68: 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					

No residual impacts are expected during operation and decommissioning phases.

7.2.9.4 Monitoring

During construction phase of the Project, especially during land preparation phase, excavated areas should be visually monitored in case of chance finds.

7.2.10 Visual Aesthetics

Based on the information from Section 6.2.11, the physical component Visual Aesthetics was assigned a **Medium-Low** value of sensitivity. The AoI is sensitive for the following reasons:

- Presence of two settlements within 2 km of Project Area,
- Absence of areas of touristic interest within the visual zone of visual influence, and
- Presence of roads and volume of traffic within the visual zone of visual influence.

7.2.10.1 Impact factors

7.2.10.1.1 Construction Phase

The impact factors from the Project activities potentially affecting visual impacts during construction phase are listed in Table 7-69.

Table 7-69: 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 Operation Phase

The impact factors from the Project activities potentially affecting visual impacts during operation phase are listed in Table 7-70.

Table 7-70: 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.

Solar power plants generate electricity by absorbing the sun coming to the solar panels. However, there is no solar panel that absorb the incoming light in 100%. Thus, all solar panel cause reflection of sun light which results in glare and glint impacts.

Glare is defined as a continuous source of bright light, while glint is defined as a momentary flash of bright light. As a result, speedy moving receptors are exposed to the glint impact while other receptors are encountered with glare impact. Both glint and glare are called as solar reflection while their duration is different. Shiny surface of the solar panels reflects the sunlight and cause solar glint and glare which result in amenity in surrounding area. In general, the main impacts of glint and glare is on aviation infrastructure (pilot and air traffic controllers), railway infrastructure (train operators), roads users and dwellings around the Project area.

PV modules of solar panels experience solar reflection losses of ~4% at the front glass surface. These reflection losses can be addressed by the use of anti-reflection (AR) coatings, and currently around 90% of commercial PV modules are supplied with an AR coating applied to the cover glass. The market for PV technologies is currently dominated by crystalline silicon, which has a record cell efficiency of 26.7%.

A typical silicon module has a configuration illustrated schematically in Figure 7-5. It consists of a back sheet (usually comprising polymeric materials such as polyvinyl fluoride (PVF), polyethylene terephthalate (PET), polyamides, an encapsulant layer, which is traditionally ethylene vinyl acetate (EVA), although recently other materials such as thermoplastic polyolefins (TPO) and polyvinyl butyral (PVB) have been used. The solar cells are positioned on the EVA and are then cushioned by another layer of EVA encapsulant. Finally, a sheet of toughened 3 mm-thick, low iron glass forms the protective outer surface as a cover glass.[40]

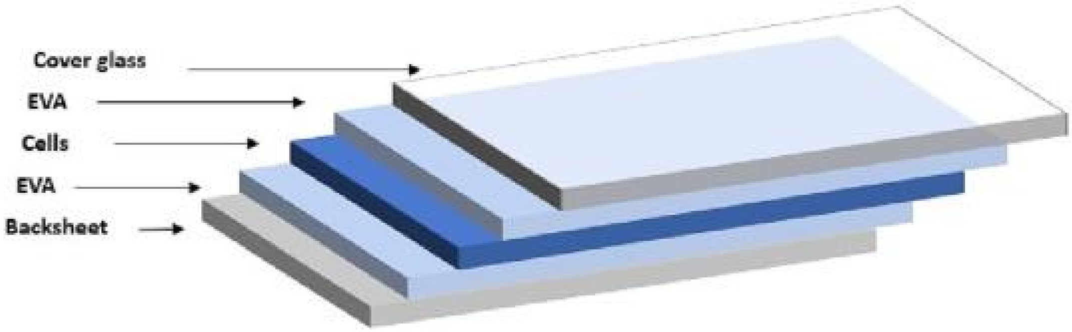


Figure 7-5: A Typical Silicon Module Scheme

Therefore, with the use of anti-reflection (AR) coatings, no glint-glare impact is foreseen during operation phase of the Project.

7.2.10.1.3 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.

However, as a part of decommissioning activities the structural and infrastructural components of the Project would be removed. Therefore, decommissioning of these structural and infrastructural components could have a positive impact if the natural state of the land is recovered.

7.2.10.2 Mitigation Measures

There are no regulatory or best practice guidance on landscape mitigation and management within the scope of the national legislation. The mitigation measures for the Project are as presented below:

- The areas used as construction area will be returned to their original use.

[40] Adam M. Law, Luke O. Jones, John M. Walls, The performance and durability of Anti-reflection coatings for solar module cover glass – a review, September 2023

- Restricted working hours will be proposed especially for built up areas and the use of machinery during those hours will be avoided in residential properties.
- Dust suppression will be implemented during construction phase.
- The housekeeping of the entire Project Area will be given importance throughout the life of the Project.
- The number of lights will be minimized to decrease light spillage from the site in line with health and safety standards. Also, all lights should be shielded and pointed to the ground to avoid direct light effects on the resettlements around the Project Area.
- Affected people's grievances on visual impacts should be regularly monitored. For this purpose, the external grievance mechanism should be implemented, and all stakeholders should have access to this mechanism.

7.2.10.3 Residual Impacts

Based on the baseline conditions of the assessed components, The residual impact following the above-mentioned mitigation measures during the construction phase is presented in the following table (see Table 7-71). The proper implementation of the mitigation measures proposed above, negligible negative impact is expected on visual impact during the construction phase.

Table 7-71: Residual Impact Assessment Matrix for the Visual Impacts during Construction Phase

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					

The residual impact after the application of the above-mentioned mitigation measures during the operation phase is presented in the following table (Table 7-72).

Table 7-72: Residual Impact Assessment Matrix for the Visual Impacts during Operation Phase

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					

7.2.10.4 Monitoring

Monitoring visual impacts involves observing how the community and stakeholders are affected. Any concerns raised will be documented and addressed through the Grievance Mechanism outlined in the Project's Stakeholder Engagement Plan, consistently throughout construction and operation phases. The Client will oversee regular checks on the visual and aesthetic state of Project facilities. These checks will occur during construction and operation phases with qualified personnel for evaluating aesthetic standards and taking necessary actions in coordination with contractors or upper management, as necessary.

Biological Components

The LSA is situated in an area characterized Natural Habitats (72%) and Modified Habitats (28%). The Natural Habitats consist solely of the EUNIS habitat "E6.2 - Continental Inland Salt Steppes", whereas the Modified Habitats are comprised of both rural industrial and commercial sites, as well as areas with mixed crops. There are no Critical Habitats (CHs) within the LSA, as assessed in Section 6.3.

- The LSA did not identify any flora or fauna species that trigger or potentially trigger Critical Habitat, but a list of "species of conservation concern" was compiled by considering the flora and fauna species classified as Near Threatened (NT), Vulnerable (VU), Endangered (EN), or Critically Endangered (CR) at a global or regional level based on the IUCN Red List of Threatened Species[41]. Local or regional endemic species present or potentially present within the LSA should also be considered. A summary of the identified "species of conservation concern" is given below:
- 5 flora species, including 4 species regionally classified as Vulnerable (*Gypsophila oblanceolate, Verbascum helianthemoides, Salsola stenoptera* and *Petrosimonia nigdeensis*) and 1 species regionally classified as Near Threatened (*Onopordum davisii*). In addition, *Gypsophila oblanceolate*, *Petrosimonia nigdeensis, Salsola stenoptera* and *Onopordum davisii* are regionally endemic species;
- 1 reptile species, classified as Vulnerable (*Testudo graeca*);
- 7 bird species, including 3 species classified as Near Threatened (*Aegypius monachus*, *Circus macrourus* and *Vanellus vanellus*), 2 species classified as Vulnerable (*Aquila heliaca* and *Otis tarda*), and 2 species classified as Endangered (*Aquila nipalensis*, and *Falco cherrug*);
- There are a total of 6 mammal species, with 5 of them classified as Near Threatened (*Barbastella barbastellus, Mesocricetus brandti, Miniopterus pallidus, Lutra lutra*, and *Spermophilus xanthoprymnus*), and 1 species classified as Vulnerable (*Vormela peregusna*). The Anatolian Vole (*Microtus anatolicus*) was identified as a species restricted to Türkiye, with a distributional range restricted to central and southwest Anatolia.
- Project LSA is within the borders of the IBA and KBA of the Ereğli Plain. Nevertheless, water abstraction and human activity have severely damaged this area to the point where the Project LSA's location no longer supports appropriate habitats for the bird species designated as an IBA trigger.

Based on the summarised features, the biodiversity component has been determined to have a **medium-high** sensitivity.

[41] The International Union for the Conservation of Nature Red List of Threatened Species – Source: https://www.iucnredlist.org/

This chapter examines the potential direct and indirect impacts on biodiversity aspects, taking into account their specific characteristics.

In the ESIA Methodology, Chapter 5.0 describes the semi-quantitative method for assessing biodiversity impacts. This method is briefly summarised once more. As a result of multiplying the sensitivity of the biodiversity feature by a sum of scores for an impact factor affecting a biodiversity feature, one can calculate the impact value of the factor. IA Methodology Chapter includes a sensitivity scale, and rankings are provided above.

Impacts on general biodiversity, including flora, fauna, and habitats are evaluated in section 7.3.1 for the construction, operation and decommissioning phase.

This section proposes avoidance, mitigation, and rehabilitation procedures based on the mitigation hierarchy principle. It also suggests Monitoring measures.

7.3.1 Impact Factors

7.3.1.1 Construction Phase

The potential impact of Project activities on biodiversity components during the construction period is given in Table 7-10.

Table 7-73: Construction Phase Actions and Related Impact Factors

Project actions	Impact factors
• Vegetation clearing/soil removal (earthworks) • General engineering/construction works • Transportation of construction materials • Temporary stockpiling of material (storage) • Management of the workforce	▪ Vegetation disturbance ▪ Emission of noise and vibrations ▪ Emission of dust and particulate matter ▪ Increased and/or modified road traffic ▪ Accidental introduction of alien species (potential risk)

- In order to determine the Project footprint, the area covered by photovoltaic (PV) panels, permanent facilities (such as inverter stations, substations, administrative buildings, internal roads, etc.), and temporary facilities (such as campsites and administrative buildings) were considered. The following assessment describes and discusses all the impact factors identified above.

Vegetation disturbance

Construction activities will result in the disruption of vegetation, leading to the direct loss of habitat, particularly in the areas where permanent and temporary facilities are being built. Conversely, locations designated for the arrangement of PV panels will encounter less disruption to vegetation and soil. Also, all of the Project Area will experience the effects of heavy machinery passing through for the transportation of construction materials, equipment, workers, waste, and other materials. As the Project Area is situated next to an existing road, no supplementary access roads will be constructed.

Vegetation disruption during construction activities will directly affect the flora species present in the facility construction areas. Furthermore, the disturbance of vegetation will result in the destruction of habitats suitable for fauna species that use the vegetation for food or shelter.

The local fauna – and in particular, the identified reptile species of conservation concern (*Testudo graeca*) and the identified mammal species of conservation concern (*Lutra lutra, Barbastella barbastellus*, *Mesocricetus brandti*, *Microtus anatolicus*, *Miniopterus pallidus*, *Spermophilus xanthoprymnus*, and *Vormela peregusna*) – could be directly impacted by the disturbance of vegetation and soil resulting from site preparation activities.

Species with limited mobility, such as reptiles, might not be able to relocate before construction begins. Similarly, species that rely on hiding to evade predators could also be unintentionally harmed or killed during construction operations.

- **Emission of noise and vibrations**

During the construction phase, medium to high intensity noise and vibration emissions are anticipated. Activities like surface levelling, transportation, and temporary stockpiling of materials, PV panels, are projected to contribute to noise generation.

Noise and vibration emission could indirectly lead to habitat degradation as sensitive fauna species may temporarily avoid the surrounding areas. Noise has a significant impact on wildlife species that heavily rely on auditory signals for survival, particularly birds and mammals.

Anthropogenic noise disturbance, for instance, has been observed to correlate with decreased densities of breeding birds[42,43]. Anthropogenic noise has been shown to cause significant decreases in species richness and abundances, affecting not only birds but also insect and amphibian species[44,45].

The effects of vibration emissions on wildlife are poorly studied in literature; however, an avoidance behaviour around the source of vibration is likely to exist for birds, reptiles and amphibians. Birds and reptiles are highly sensitive to vibration (e.g., Shen, 1983) because low-frequency noises can be a source of information about approaching predators and prey. Also, amphibians have exquisite sensitivity to vibration[46]: there are species that use low-frequency acoustic cues detected via ground vibrations to communicate, to time their emergence from burrows[47]. An impact is particularly anticipated during the breeding period of birds and mammals, as they may be startled by noise and vibration and could potentially abandon their nests or mating grounds.

Emission of dust and particulate matter

Construction activities such as surface levelling, temporary stockpiling of excess excavation materials, transportation of soil and construction materials, construction of facilities, pavement realization, and heavy truck crossings are anticipated to generate pollutants, dust, and particulate matter emissions.

Dust generated from construction activities could have adverse effects on surrounding vegetation and habitats due to continuous and substantial dust deposition. Specifically, dust emissions may impact vegetation by covering leaf surfaces and altering soil composition and structure[48]. Dust can obstruct stomata on leaf surfaces, thereby affecting processes such as photosynthesis, respiration, and transpiration, and may lead to symptoms of leaf injury. Consequently, plant productivity may decline, resulting in reduced vegetation growth, abundance, and loss of species.

---

[42] 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.

[43] 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.

[44] 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.

[45] 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.

[46] Lewis, E. R., & Narins, P. M. (1985). Do frogs communicate with seismic signals? *Science*, *227*(4683), 187-189.

[47] Dimmitt, M. A., & Ruibal, R. (1980). Environmental correlates of emergence in spadefoot toad (Scaphiopus). Journal of Herpetology, 21-29.

[48] 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)

There is no definitive standard for protecting vegetation against dust. Airborne soil dust is generally characterised by its large particle size, which limits its ability to stay suspended in the air for extended periods of time. Research conducted by the United States Environmental Protection Agency (US EPA) indicates that 90% of all airborne dust particles settle back onto the earth's surface within a distance of 100 metres from the point of emission, and over 98% settle within a distance of 250 metres. Nevertheless, in the presence of powerful wind conditions, these impacts may have extended further.

Fauna species relying on these habitats for food and shelter may also be indirectly impacted by habitat degradation caused by dust emissions into the atmosphere and subsequent deposition, leading to reduced habitat suitability for terrestrial wildlife. Additionally, direct effects on fauna species could occur through the inhalation or ingestion of vegetation or soil particles.

The dispersion of dust and particle matter, which occurs frequently but with low intensity, primarily affects the area surrounding the Project footprint. This impact is limited to a narrow geographic extent within a 100-metre buffer. The reversibility of this impact factor is seen as being of short- to mid-term duration.

Increased and/or modified road traffic

During the construction phase, there will be a rise in the number of vehicles travelling within the designated construction area and on the access roads. This is because construction materials, equipment, personnel, waste, and other materials need to be transported. Augmented vehicular traffic can lead to the direct death of wildlife species and the indirect deterioration of their habitats. Inadvertent collisions with animals and resulting deaths on roads can greatly affect certain wildlife populations, especially species that have limited ability to move around, such as the reptile species of conservation concern (*Testudo graeca*) and the small mammal species of conservation concern (*Mesocricetus brandti, Microtus anatolicus, Spermophilus xanthoprymnus, Nannospalax xanthodon* and *Vormela peregusna*) that have been identified.

More in general, traffic can have an important influence on the behaviour of wildlife and on its distribution, thus the use of the space, of local populations[49]: amphibians might be attracted by stagnant water that forms at roadside or within the construction area; reptiles and other ectotherms go there to bask in the sun; some birds use roadside gravel to aid their digestion of seeds; songbirds come to dust bathe on dirt roads, where they are vulnerable to vehicles as well as predators; vultures, crows, foxes and other scavengers seek out roadkill and often become roadkill themselves; mammals might be attracted by organic waste or to de-icing salts, browsing herbivores are attracted to the vegetation of roadside edge, rodents proliferate in the artificial grasslands of road verges, and many small mammals find roads to be efficient travel ways.

Accidental introduction of alien species (potential risk)

The removal of natural vegetation cover and disturbance of soil could encourage the spread of alien (non-native) and/or invasive species, which are inadvertently introduced by vehicles such as cars, trucks, and other heavy machinery used in construction. In disturbed ecosystems, invasive alien species have a competitive edge [50]. Once they enter a habitat, they might possibly alter its functioning and the species there, particularly those that are considered a priority for biodiversity conservation[51].

For instance, the change in the community of plant species could pose a significant threat to the local indigenous plant species in the LSA. These species were identified by Prof. Hayri Duman, a local specialist, during a field

[49] Clair, C. S., & Forrest, A. (2009). Impacts of vehicle traffic on the distribution and behaviour of rutting elk, Cervus elaphus. *Behaviour*, *146*(3), 393-413.

[50] Rejmanek M. & Richardson D. (2013). Plant Invasions and Invasibility of Plant Communities. Vegetation Ecology: Second Edition. 10.1002/9781118452592.ch13.

[51] 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.

study conducted on October 18, 2023. The species mentioned are *Gypsophila oblanceolata*, *Onopordum davisii*, and *Petrosimonia nigdeensis*.

Local fauna reliant on ecosystems impacted by invasive species may also be indirectly affected. The natural habitats within and around the Project footprint could see a reduction in biodiversity, potentially leading to the trivialization of the ecosystem, where more dominant species may emerge.

To account for potential impacts, a 100-metre buffer zone around the Project facilities is being implemented as a preventative measure.

The primary consequence resulting from disturbance of plants and soil will be the loss and degradation of habitat. Possible vegetation disruption caused by construction operations, such as the movement of vehicles, materials, and personnel, is likely to have a negative impact on the entire Project footprint and, to a lesser extent, the entire LSA. The plant and flora species, specifically the three species of conservation concern (*Gypsophila oblanceolata, Onopordum davisii*, and *Petrosimonia nigdeensis*), will be simultaneously impacted by multiple factors mentioned above, primarily by disturbances to vegetation and soil.

The construction impacts will primarily affect fauna species of conservation concern that have limited mobility and/or have strong ecological dependencies on the soil. Among the species of conservation concern are Tortoise (*Testudo graeca*, VU), the Brandt's Hamster (*Mesocricetus brandti*, NT), the Anatolian Vole (*Microtus anatolicus*, DD and Restricted Range), and the Anatolian Ground Squirrel (*Spermophilus xanthoprymnus*, NT). Bird species are less impacted during the construction phase because they have greater mobility, and the LSA is merely seen as a potential feeding or hunting ground for these species and not as a place for breeding.

It was quantified and discuss the possible impacts of the potential impact factors on biodiversity, and in particular on natural habitats, in the following paragraphs. The assessment of the direct impacts on Natural and Modified habitats was conducted within the boundaries of the Project footprint. On the other hand, the assessment of the indirect impacts was conducted within a 100 m buffer zone from the borders of the Project footprint, as well as within a 300 m buffer zone from the borders of the Project footprint. The possibly affected locations are illustrated in Figure 7-6, and their quantitative estimation is provided in Table 7-74.

Vegetation disturbance will directly affect 20% of the total LSA. The direct impacts will be focused on continental inland salt steppes, namely the E6.2 EUNIS habitat category. Given that the LSA has only one natural habitat, all direct impacts on natural habitats will be solely focused on it. These impacts will affect 14.48% of the habitat within the LSA, equivalent to 201.33 hectares. The Project is located next to an existing road and there are no plans to build additional access roads. As a result, there will be no further destruction/degradation of the habitat.

The construction activities cloud indirectly lead to the introduction of invasive alien species, which might potentially affect 21% of the LSA inside the 100 m buffer zone. The construction in the 100 m buffer zone will mostly affect continental inland salt steppes (E6.2, 256.23 ha), rural industrial and commercial sites (J2.3, 34.55 ha), and road networks (J4.2, 1.19 ha).

The emission of noise and vibrations resulting from construction activities could indirectly impact approximately 35.4% of the LSA inside the 300 m buffer zone. The indirect effects within the 300 m buffer zone will primarily affect continental inland salt steppes (E6.2, 378.99 ha) and rural industrial and commercial sites (J2.3, 111.27 ha).

Table 7-74: Calculation of direct and indirect impacts on EUNIS habitats within the LSA for the Construction Phase

EUNIS Habitat Type	Total LSA	Footprint impact		Impact on 100 m buffer		Impact on 300 m buffer	
	ha	ha	%	ha	%	ha	%
Natural habitat							
E6.2 - Continental Inland Salt Steppes	1.002.451	201.33	20.083	256.235	25.56	378.99	37.81
Subtotal	1.002.451	201.33	20.083	256.235	25.56	378.99	37.81
Modified habitat							
I1.2 - Mixed Crops of Market Gardens and Horticulture	31.82	0	0	0	0	0	0
J4.2 - Road Networks	4.14	0	0	1.19	28.74	1.85	44.69
J2.3 - Rural Industrial and Commercial Sites Still in Active Use	351.892	0	0	34.55	9.82	111.27	31.62
Subtotal	387.852	0	0	35.74	38.56	113.12	76.31
Total	**1.390.303**	**201.33**	**14.481**	**291.975**	**21.00**	**492.11**	**35.40**

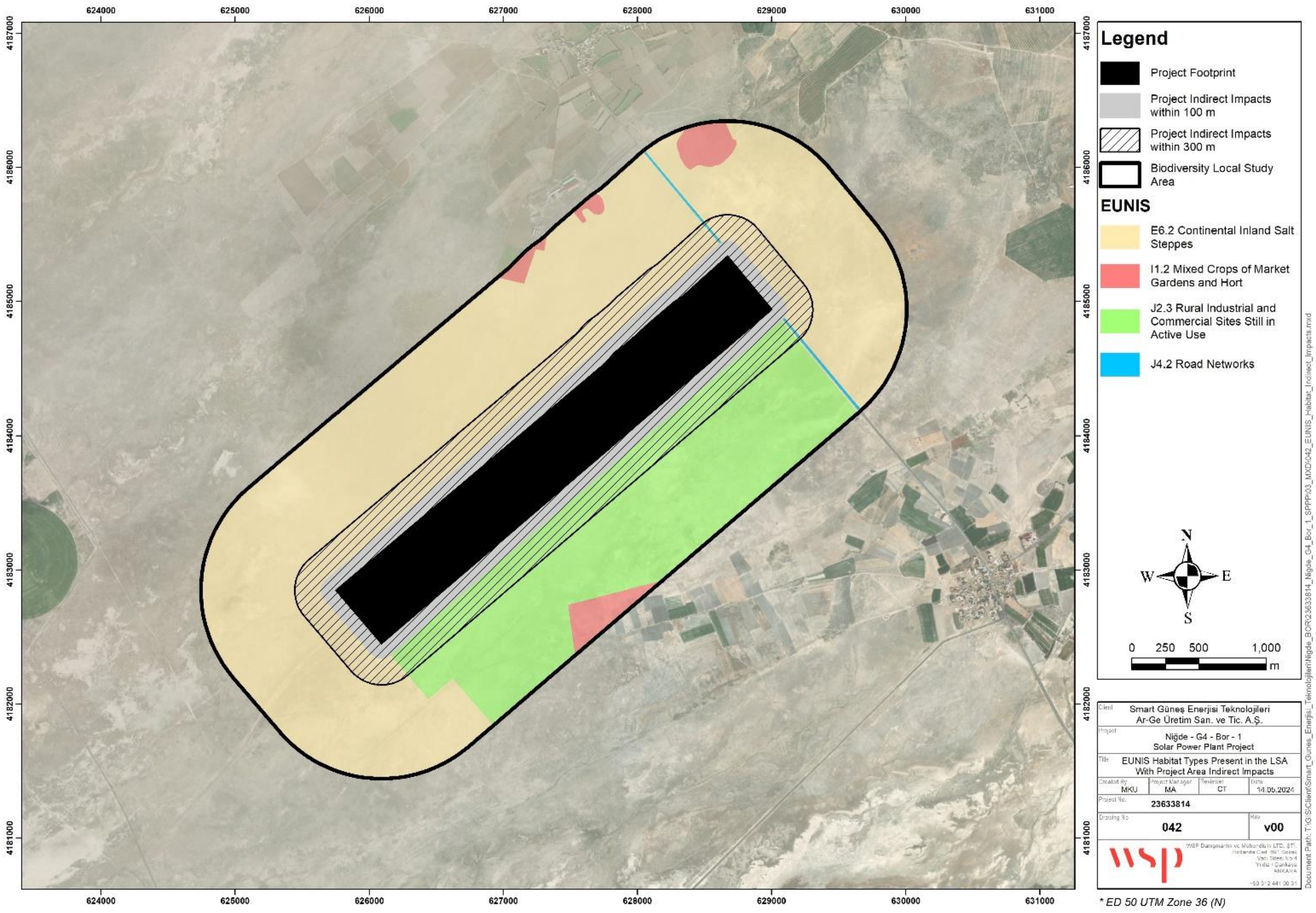


Figure 7-6: Map of the Construction Impacts on EUNIS Habitats within the LSA

7.3.1.2 Operation Phase

The possible impacts of the Project operations on biodiversity components throughout the operating phase are listed in Table 7-75.

Table 7-75: Project Actions and Related Impact Factors During Operation Phase

Project actions	Impact factors
Plant/infrastructure operation	Presence of permanent infrastructures (occupation of land) Emission of light (Presence of artificial lights) Emission of noise Accidental introduction of alien species (potential risk) Increase and modification of traffic

- For the operation phase, direct impacts deriving from the Project were assessed based on two types of Project footprints, the first of which corresponded to the areas covered by photovoltaic panels and the second of which corresponded to the areas occupied by permanent facilities (for example, inverter stations, substations, administrative buildings, internal roads). This assessment excluded temporary facilities since they will be rehabilitated following construction completion. Described and discussed in the following assessment are all the impact factors mentioned above.

Presence of permanent infrastructures (occupation of land)

The permanent infrastructure, including inverter stations, substations, administrative buildings, and internal roads, will lead to a reduction in natural habitat availability throughout the operational phase. This habitat loss will have direct and indirect effects on habitats, plant life, and animal species. It is worth noting that temporary facilities will not contribute to habitat loss, as they will be restored after the construction phase and during the operational phase. The construction of permanent infrastructures such as inverter stations, substations, administrative buildings, and internal roadways would result in the loss of natural habitat over the whole operational phase. This loss will have direct and indirect impacts on habitats, as well as flora and fauna species. The extent of habitat loss is quantified in Table 7-76. The temporary facilities, such as the campsite and administrative building, will not be impacted by habitat loss. This is because they will be restored and rehabilitated both during the construction phase and throughout the operation period.

There is an expectation that flora and vegetation will undergo at least partial recovery during the operational phase, attributed to the rehabilitation of temporary facilities and areas covered by PV panels. To ensure successful long-term management and restoration, it is crucial to implement an appropriate plan and conduct regular monitoring surveys to assess the effectiveness of restoration activities.

Another potential impact could arise from the reflection of sunlight by the photovoltaic panels, which might attract aquatic insects and possibly birds. These species could mistake the reflective surface of the panels for water bodies, as sources of reflected polarized light, becoming ecological traps associated with reproductive failure and mortality. This phenomenon could lead to rapid population declines or collapse, especially for insects that lay eggs in water[52].

[52] 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.

However, literature indicates that the construction of SPPs in desertic and steppe areas, frequently selected for their high insolation rates and significant potential for solar power generation, could yield positive effects for biodiversity. These benefits may manifest as increased plant diversity and biomass[53,54,55].

The favourable 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.

Certainly, although these regions might only obtain partial shade from the panels throughout the day, the biodiversity residing in them might still benefit[56]. For these reasons, it will be crucial to restore the areas cleared during construction and to establish long-term monitoring to evaluate the success of restoration activities. These efforts are anticipated to yield positive effects on local flora, fauna, and habitats.

- **Emission of noise**

Although solar panels themselves are often quiet, the permanent structures (i.e., tracking motors, inverters, high voltage transformers, energy storage devices) surrounding the solar power plant (SPP) could produce noise[57]. As it was evaluated in Section 7.1.2 of this ESIA report, since this noise to be generated by the Project is not expected to cause any increase at the background noise levels at the Project site and the closest sensitive receptors, no negative or adverse responses to animals are expected.

While the fauna species are foreseen to habituate to the disturbance originated from operation and maintenance activities, fauna disturbance due to the emission of noise connected to the operation phase is expected to be less than the emission of noise to be generated from the construction activities.

Emission of light (Presence of artificial lights)

This impact will result from the lighting integrated into the thermal cameras planned for installation within the project footprint. The LED lighting consists of 9 LEDs with 1000 lux power integrated into the camera systems. No additional environmental lighting is planned.

Lights can attract night-flying wildlife, leading them to be drawn towards permanent infrastructures, increasing the risk of collision and unexpected encounters with workers. Additionally, ecological light pollution can disrupt of fauna species' behaviour, including foraging and reproductive behaviour, biological clocks, predator-prey interactions, movement and dispersal patterns, community structure, and interactions among and within species[58].

The effects of light pollution are likely species-specific, influenced by the role ambient light plays in physiology and behaviour, and may also vary depending on the type of lighting employed. Taxa most susceptible to light pollution include bats, nocturnal birds, and insects. Depending on the species, bats may be either attracted to lights due to the presence of insects or they may avoid illuminated areas. Additionally, certain species of reptiles,

---

[53] 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.

[54] 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.

[55] 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.

[56] 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.

[57] 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.

[58] Longcore T. &Rich C. (2004). Ecological light pollution. Front. Ecol. Environ. 2004; 2[4]: 191– 198.

amphibians, birds, bats, and spiders have been observed to wait around artificial lights for prey. Artificial lighting can enhance the foraging efficiency of many bat species, but it may also increase their vulnerability to predation. Voigt *et al.* (2018[59]) noted that the response of migratory bats to light was influenced by light color. Nocturnal and migratory bird species might be also adversely impacted by artificial lights[60]. During the night, nocturnal migratory animals may become disoriented and drawn towards the illumination of the sky. Fixed white lights attract more individuals than flashing or coloured 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.

- **Accidental introduction and dispersal of alien species**

Continuing maintenance activities during construction could make it easier for highly competitive invasive alien plant species to arrive and spread. Additionally, alien species that have already established during the construction phase could further spread by taking advantage of the new environmental conditions created by the modified shade caused by panels.**Error! Bookmark not defined.**.

Invasive alien species have the potential to disrupt the functionality of ecosystems and alter the composition of the plant species community, including priority biodiversity species. The changes in the flora species community could pose a particular risk to regional endemic flora species, which were identified within the LSA by local expert Prof. Hayri Duman during a field survey conducted on October 18, 2023. These species include *Gypsophila oblanceolata, Onopordum davisii,* and *Petrosimonia nigdeensis.*

The existence of permanent infrastructures, such as PV panels, will have the most substantial impact on habitat loss and alteration. Nevertheless, it is anticipated that the flora and vegetation will experience some degree of restoration throughout the operational period, as a result of the rehabilitation of the temporary facilities, as well as in the vicinity of the photovoltaic (PV) panels. The altered temperature and soil conditions resulting from the presence of PV panels and the non-grazing have the potential to enhance local species richness, diversity, and biomass for the most prevalent and adaptable plant species, when compared to the surrounding overgrazed continental salt steppe habitat. (EUNIS habitat E6.2). The effect of grazing exclusion and PV panels on the three flora species classified as species of conservation concern (*Gypsophila oblanceolata, Onopordum davisii*, and *Petrosimonia nigdeensis*) is uncertain and will require monitoring throughout this period. For certain species of fauna, the presence of a fenced area with permanent facilities and PV panels may result in a loss of potential habitats. However, for other species, particularly those of conservation concern such as the Common Tortoise (*Testudo graeca*, VU), the Brandt's Hamster (*Mesocricetus brandti*, NT), the Anatolian Vole (*Microtus anatolicus*, DD and Restricted Range), and the Anatolian Ground Squirrel (*Spermophilus xanthoprymnus*, NT), the area could still be considered a suitable habitat. In fact, in some cases, the fence and PV panels could provide protection against grazing and predators. The emission of noise and the presence of artificial lights during the operation phase are not projected to significantly impact terrestrial fauna species, especially those of conservation importance. It is anticipated that land-dwelling animal species would adapt to these kinds of disruptions caused by operational and maintenance activities.

It was quantified and discuss the possible impacts of the potential impact factors on biodiversity, and in particular on natural habitats, in the following paragraphs. The assessment of the direct impacts on Natural and Modified habitats was conducted within the boundaries of the Project footprint. On the other hand, the assessment of the indirect impacts was conducted within a 100 m buffer zone from the borders of the Project footprint, as well as within a 300 m buffer zone from the borders of the Project footprint. The possibly affected locations are illustrated

[59] 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.

[60] Rich C. & Longcore T. (2006). Ecological Consequences of Artificial Night Lighting. Island Press Washington, DC.

in Figure 7-7, and their quantitative estimation is provided in Table 7-76. As information on the distribution of the panels within the project area was not certain at the time of writing of this report, the panels have been placed based on a worst-case scenario.

The existence of other permanent infrastructures such as inverter stations, substations, administrative buildings, and internal roads will directly affect 1% of the total LSA. These impacts will be limited to continental inland salt steppes, namely the E6.2 EUNIS habitat type, covering an area of 4.44 hectares.

The operation activities could indirectly lead to the introduction of invasive alien species, which might potentially affect 20.52% of the LSA inside the 100 m buffer zone. The construction in the 100 m buffer zone will mostly affect continental inland salt steppes (E6.2, 253.33 ha), rural industrial and commercial sites (J2.3, 30.83 ha), and road networks (J4.2, 1.19 ha).

Indirect impacts in the 300 m buffer deriving from operation, such as noise and emission of light, could impact a total of 20.52% of the AoI. Indirect impacts within the 300 m buffer will be mainly on continental inland salt steppes (E6.2, 253.33 ha). Indirect impacts will affect also rural industrial and commercial sites (J2.3, 30.83 ha), mixed crops of market gardens and horticulture (I1.2, 43.63 ha) and scattered residential buildings (J2.1, 1.12 ha).

The emission of noise and vibrations resulting from operation activities could indirectly impact approximately 35.4% of the LSA inside the 300 m buffer zone. The indirect effects within the 300 m buffer zone will primarily affect continental inland salt steppes (E6.2, 382.53 ha), rural industrial and commercial sites (J2.3, 107.53 ha), and road networks (J4.2, 1.85 ha).

The direct impacts deriving from the presence of PV panels will impact 5% of the total AoI and will be entirely on continental inland salt steppes (E6.2 EUNIS habitat type, 50.76 ha).

Table 7-76: Calculation of direct and indirect impacts on EUNIS habitats within the LSA for the Operation Phase

EUNIS Habitat Type	Total LSA	PV Panels Area		Direct Impact (Permanent facility)		Impact on 100 m buffer		Impact on 300 m buffer	
	ha	ha	%	ha	%	ha	%	ha	%
Natural habitat									
E6.2 - Continental Inland Salt Steppes	1.002.45	50.76	5.1	4.44	0.44	253.33	25.27	382.53	38.16
Subtotal	1.002.45	50.76	5.1	4.44	0.44	253.33	25.27	382.53	38.16
Modified habitat									
I1.2 - Mixed Crops of Market Gardens and Horticulture	31.82	0	0	0	0	0	0	0	0
J4.2 - Road Networks	4.14	0	0	0	0	1.19	28.74	1.85	44.69
J2.3 - Rural Industrial and Commercial Sites Still in Active Use	351.89	0	0	0	0	30.83	8.76	107.53	30.55
Subtotal	*387.85*	0	0	0	0	32.02	37.5	109.38	75.24
Total	**1.390.3**	**50.76**	**5.06**	**4.44**	**0.33**	**285.3**	**20.52**	**491.91**	**35.38**

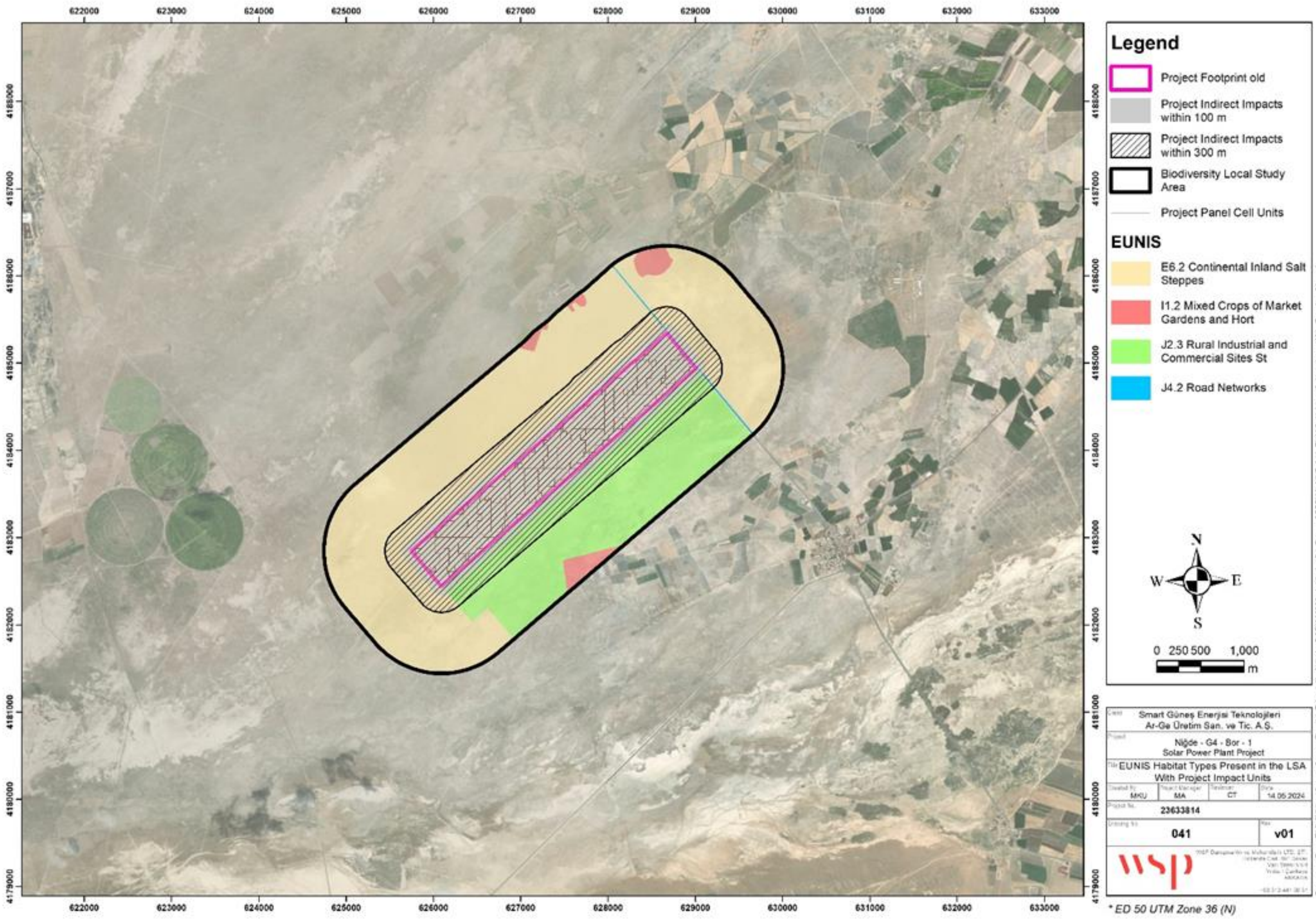


Figure 7-7: Map of the Operation Impacts on EUNIS Habitats within the LSA

7.3.1.3 Decommissioning/Closure Phase

The Project is anticipated to be operational for a minimum of 30 years without being decommissioned. The impacts experienced throughout the decommissioning process are anticipated to be transient in nature. The extent of these impacts will be contingent upon the extent to which the infrastructure is dismantled.

The primary objective of the decommissioning and closure phase is to restore the disturbed lands to establish stable, non-polluting, and self-sustaining ecosystems that can be seamlessly integrated into the future landscape, aligning with the activities in the surrounding area. Due to the uncertainty surrounding the future land use of the region and the lack of precise information at this stage, it is not possible to provide a comprehensive discussion on the impact of this phase on the biodiversity component. This is further compounded by the fact that Decommissioning and Closure is expected to occur several years from now.

Nevertheless, the restoration of natural vegetation and the re-establishment of disturbed regions will have favourable effects, providing to the reclamation of most areas and an overall improvement in biodiversity compared to the operational phase.

7.3.2 Mitigation Measures

Throughout the construction phase of the Project, the listed mitigation measures adhere to the mitigation hierarchy and are suggested across the entire area affected by the Project:

- **Avoidance**

Avoidance measures have been taken into account, especially during the design phase of the facilities, and include:

  - Reducing the footprint of individual facilities.
  - Prioritizing the utilization of existing modified habitat for the placement of temporary facilities whenever feasible.

- **Minimization**

1) vegetation disturbance:

  - Minimizing disturbance to natural vegetation to the extent necessary during construction activities. This involves clearly marking the boundaries of temporary and permanent facilities to mitigate the risk of footprint expansion.
  - To minimize wildlife mortality, pre-construction biological surveys will be conducted to identify and potentially relocate fauna species. These surveys, performed by an expert wildlife ecologist, will focus on species with limited mobility, such as mammals and reptiles, within the areas designated for temporary and permanent facilities. Surveys will be conducted no earlier than 7 days before construction. If any of these species are found, they will be collected by the ecologist and translocated to undisturbed but similar sites within the designated LSA.
  - Reptiles will be captured and relocated to a suitable receptor site, which is no smaller than the capture site and exhibits similar habitat characteristics and prey availability. The relocation will be conducted at a minimum distance of 50 meters from the Project footprint during the construction phase. In case essential works are necessary during winter when tortoises are hibernating, the works area will be thoroughly inspected for hibernation burrows. If a hibernating reptile is discovered during such works, it will be carefully moved to an alternative undisturbed part of the site. If relocation on-site is not feasible, the animal will be placed in care until it can be safely released the following spring.
  - Monitoring of small mammal species identified as species of conservation concern, including the Brandt's Hamster (*Mesocricetus brandti*, NT), Anatolian Vole (*Microtus anatolicus*, DD and Restricted Range), and Anatolian Ground Squirrel (*Spermophilus xanthoprymnus*, NT), will be conducted using endoscopic cameras placed within their burrows. If any living specimen is observed and essential ground-breaking works are required in areas where burrows are present, a gradual increase in disturbance levels over several days (at least first 4 days) will be implemented. This approach allows the animals to autonomously leave their burrows before they are fully excavated. For instance, machinery and equipment will be brought to the working area on day 1, followed by manual excavation on day 2, and mechanical excavation in the vicinity of the burrow on day 3.
  - Vehicle movement will be confined to the Project Site and existing roads connecting construction sites with surrounding areas. Off-road driving will be strictly prohibited to prevent any unnecessary disturbance of natural vegetation.

2) emission of noise and vibrations:

  - Works will be made to minimise night works between the hours of 8 pm and 6 am in order to minimise the negative effects on nocturnal wildlife species.
  - Restricting both the quantity and velocity of vehicular traffic on the current access routes.

3) emission of dust and particulate matter:

- Dust generated from construction material handling will be minimized by utilizing covers and/or control equipment such as water suppression, bag house, or cyclone systems. Additionally, moisture content will be increased through water spraying to mitigate dust dispersion. A speed limit will be enforced for all vehicles to prevent the generation of dust emissions, and all trucks will be regularly maintained to ensure proper functioning at all times. Internal roads will be appropriately compacted, maintained, and sprayed with water as necessary to minimize dust from vehicle movements. If water spraying is found to be insufficient, alternative surface treatment methods such as hygroscopic media like calcium chloride or natural-chemical binding agents for unpaved internal roads will be employed. This may involve using a sprinkler system or a "water-mist cannon.

4) "Increased and/or modified road traffic:

- Speed limits and animal crossing signs (If available) will be installed on the access roads. Efforts should be made to prevent the accumulation of stagnant water and organic waste within the construction site and on the roads to avoid attracting wildlife. If employees and contractors come across any fauna species, they will either wait for it to go away on its own or seek the help of the environmental technician to safely remove and relocate it to a suitable habitat. Training will be given to enhance the knowledge and understanding of employees and contractors regarding the presence of protected species and habitats in the area. This will enable continuous monitoring and facilitate appropriate responses in the event of animal encounters.

5) accidental introduction and spreading of alien species:

- During rehabilitation/restoration works, the use of non-native flora species, especially those classified as invasive alien species, must be avoided. If the proliferation of invasive species is detected, a suitable eradication plan will be devised and executed.

- **Rehabilitation/Restoration**

Temporary cleared areas resulting from construction will be expeditiously restored, with the objective of establishing a stable vegetative cover to mitigate erosion, dust accumulation, and the proliferation of invasive alien species. The ultimate goal is to restore the original habitat and positively impact biodiversity. Restoration and habitat rehabilitation will exclusively involve the use of native plant species from the region. Seeding and planting of grass and shrub species typical of the local flora will be carried out to achieve optimal groundcover. It will be crucial to prioritize the use of autochthonous adult plants and seeds collected from locations nearest to the restoration sites to maximize the success of translocation operations (Abeli & Dixon 2016)[61].

Throughout the operation phase of the Project, following mitigating measures, which adhere to the mitigation hierarchy, are recommended for implementation in the entirety of the affected area.

- **Avoidance**:
  - Avoidance measures have been taken into account, especially during the design of the facilities, and these measures include:
  - minimisation of the footprint of individual facilities.
  - using the already modified environment to accommodate temporary infrastructure.
- **Minimization**

[61] Abeli T. & Dixon K. (2016). Translocation ecology: the role of ecological sciences in plant translocation. Plant Ecology. 217. 10.1007/s11258-016-0575-z.

1) Presence of permanent infrastructures (occupation of land):

- The new permanent infrastructures will be enclosed by fences, however the fencing will be modified to reduce its barrier impact. Modifications to fencing can include creating regular gaps along the fence line, with a frequency of one gap per 100 metres. These spaces are maintained between the base of the fence and the ground. Furthermore, each individual gap could have a height of 10 cm and a width of 1 m.
- Non-reflective coating will be used on the panels to reduce reflection.
- Vehicle travel will be limited to the current roads that link the operation locations with the nearby regions. Off-road driving will be banned to prevent any unwarranted disruption of the natural vegetation.

2) Emission of noise:

No further steps of minimization are considered essential in addition to those already provided in Chapter 7.1.2.

3) Emission of light (Presence of artificial lights):

- It is advisable to limit the number of light sources to a minimum;
- preferred types of light in exterior lighting (e.g.: lights on site due to security reasons) applications are:
  - It is advisable to limit the number of light sources to a minimum. The recommended types of light for exterior lighting applications, such as lights for security purposes, are low pressure sodium lamps (SOX) and light emitting diodes (LEDs). LEDs are the preferred choice as they emit light in a more focused direction and have warmer colour temperatures, closer to 3000°K. Additionally, it is recommended to use lights triggered by presence detectors and lights that are directed towards the ground.
- Avoid using these sorts of lights:
  - Mercury lamps (MBF) are bluish-white lights that attract insects and are tolerated by bat species. High pressure sodium lamps (SON) are brighter pinkish-yellow lamps that are commonly used for road illumination.

4) Accidental introduction of alien species (potential risk):

- Avoid using non-native flora species, particularly those classed as invasive alien species, during rehabilitation and restoration projects.
- If the proliferation of invasive species is detected, a suitable eradication programme will be devised and executed.

- **Rehabilitation/Restoration:**

The areas devoid of vegetation beneath the PV panels will be as soon as possible recovered, with the aim of reestablishing the original natural ecosystem and potentially augmenting the richness and diversity of plant species. The restoration studies will be implemented according to a comprehensive and enduring strategy, with the objective of establishing a consistent plant cover to reduce erosion, dust accumulation, and the proliferation of non-native species.

Restoration and habitat rehabilitation will exclusively employ indigenous plant species. The implementation of seeding and planting of grass and shrub species indigenous to the area will be carried out to guarantee the most favourable ground coverage. In order to optimise the success of the translocation operations, it is crucial to utilise mature plants or seeds that are native to the area or obtained from the closest practical distance to the restoration sites[61].

Research indicates that building Solar Power Plants (SPPs) in desert and steppe regions, primarily selected for their high sun exposure and significant solar power generation potential, can have beneficial impacts on biodiversity. These include an increase in plant diversity and plant biomass.[62,63,64]. The favourable impacts mostly result from the shading provided by the PV panels, leading to a reduction in temperature and an increase in soil moisture in the regions covered by the panels[65]. The fence and PV panels could provide safety for small-sized mammals, reptiles, and birds, offering good impacts for terrestrial fauna species by shielding them from predators.

7.3.3 Residual Impacts

Taking into account the implementation of the aforementioned mitigation measures, the impact on biodiversity components is anticipated to be Medium during construction phase, as indicated in Table 7-77.

- The primary residual impact on natural habitats may stem from vegetation disturbance and the introduction and spread of alien species, potentially leading to modification and potential impoverishment of the original plant species community. To monitor these impacts, the following monitoring measures are suggested in the subsequent section.

Table 7-77: 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 disturbance	Duration:	Medium	Medium-high	Long term	**High**	Medium	**Medium**
	Frequency:	Frequent					
	Geo. Extent:	Project footprint					
	Intensity:	Medium					
Emission of noise and vibrations	Duration:	Medium	Medium-high	Short-term	**Low**	Medium	**Negligible**
	Frequency:	Highly frequent					
	Geo. Extent:	Local					
	Intensity:	High					
Emission of dust and particulate matter	Duration:	Medium	Medium-high	Short-term	**Low**	Medium	**Negligible**
	Frequency:	Highly frequent					
	Geo. Extent:	Local					
	Intensity:	High					
Increased and/or modified road traffic	Duration:	Medium	Medium-high	Short-term	**Low**	Medium	**Negligible**
	Frequency:	Moderately frequent					
	Geo. Extent:	Local					

[62] 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.

[63] 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.

[64] 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.

[65] 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 Features - Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
	Intensity:	Medium					
Accidental introduction of alien species (potential risk)	Duration:	Medium	Medium-high	Long term	**High**	Medium-high	**Low**
	Frequency:	Sporadic					
	Geo. Extent:	Local					
	Intensity:	Medium					

During operation phase, the predicted impact on biodiversity components is presented in **Table 7-78** resulting from the implementation of the indicated mitigation measures, which is anticipated to be **Low.**

- The primary residual effects may include the destruction of natural habitats as a result of the construction of permanent infrastructure, as well as the introduction and proliferation of invasive alien species, which could significantly alter and potentially deplete the original plant species population.

Table 7-78: 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 (occupation of land)	Duration	Long	Medium-high	Mid-term	**Medium**	Medium-high	**Low**
	Frequency	Continuous					
	Geo. Extent	Project site					
	Intensity	Low					
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 (Presence of artificial lights)	Duration	Long	Medium-high	Short-term	**Low**	Medium-low	**Low**
	Frequency	Highly frequent					
	Geo. Extent	Project site					
	Intensity	Negligible					
Accidental introduction of alien species (potential risk)	Duration	Long	Medium-high	Long-term	**High**	Medium-high	**Low**
	Frequency	Concentrated					
	Geo. Extent	Local					
	Intensity	Medium					

7.3.4 Monitoring

During construction phase, to ensure the implementation and effectiveness of the proposed mitigation measures in natural habitats, the following monitoring activities are planned:

- The existence and proliferation of invasive plant species within and in the vicinity of the building site will be checked biannually during the period of plant growth by a specialist botanist. If deemed required, an extirpation campaign will be implemented to prevent the proliferation of the invasive species.

- Observations of fauna species, specifically the reptile species of conservation concern (*Testudo graeca*) and the terrestrial mammal species of conservation concern (*Mesocricetus brandti, Microtus anatolicus, Spermophilus xanthoprymnus*, and *Vormela peregusna*), within and around the LSA, must be recorded along with photographic evidence and reported to the on-site Site Chief.
- Incidents involving wildlife or the sighting of live animals or carcasses on the access road or construction site shall be documented. If necessary, further precautions will be implemented to deter wildlife from entering the site and prevent incidents of roadkill.

During operation phase, on the other hand following monitoring activities are proposed to ensure the execution and effectiveness of the mitigation measures:

- A floristic and vegetational monitoring will be conducted in the areas beneath the photovoltaic panels where plant translocation and restoration activities have taken place. This monitoring aims to evaluate the effectiveness of these activities in improving species richness and diversity and restoring the original natural habitat. This monitoring will also assess the occurrence and population size of the flora species that have been classified as species of conservation concern, namely *Gypsophila oblanceolata, Onopordum davisii*, and *Petrosimonia nigdeensis*. An expert botanist will undertake this monitoring once per year during the vegetative season. The monitoring will continue for at least 3 years after the end of construction and during the operation phase.
- The existence and proliferation of invasive plant species in the regions covered by the photovoltaic panels will be evaluated biannually throughout the growing season by an expert botanist for a minimum of 3 years. If deemed required, an extirpation campaign will be implemented to prevent the proliferation of the invasive species.
- A monitoring programme will be conducted after construction to assess the impact of solar panels on the identified reptile species of conservation concern (*Testudo graeca*) and the identified terrestrial mammal species of conservation concern (*Mesocricetus brandti*, *Microtus anatolicus*, *Spermophilus xanthoprymnus*, and *Vormela peregusna*). This monitoring will focus on the areas located under the photovoltaic panels. The aim is to observe whether the panels provide protection and benefits to these animals from predators, hence a potential increase in local fauna species richness and abundance. This monitoring will be carried out annually for a minimum duration of 3 years by a specialist in terrestrial fauna.
- Incidents involving wildlife or the sighting of live animals or carcasses on the permanent access roads or in areas occupied by permanent infrastructure shall be recorded. If necessary, further precautions will be implemented to deter wildlife from entering the site and prevent incidents of roadkill.

7.3.5 Net loss assessment for Natural Habitats

The current analysis of net loss examines and explores the remaining and inevitable effects on natural habitats and species of conservation importance within the LSA. The assessment of residual impacts took into account the influence of interventions aimed at avoiding, mitigating, and monitoring the effects of construction and operation.

Critical Habitats were not identified within or around the LSA. For this reason, they are not discussed in the present assessment.

The primary effects on natural habitats are mostly linked to the loss of habitat within the permanent areas affected by the project.

Restoration activities will be carried out on all temporary facilities used during the construction phase (such as the campsite and administrative building). It is expected that the area will be restored by the temporary facilities during construction with the aim of returning the area to its former natural state of " E6.2- Continental inland salt steppes".

The measures presented for the construction and operation phases will mitigate the indirect impacts, such as the emission of noise, dust, and light, the increase in vehicular traffic, and the accidental introduction and dispersal of alien species. These measures are expected to have a negligible effect on the Natural Habitat and Species of Conservation Concern. Thus, the only residual effects will be those caused by the existence of permanent buildings and 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 calculated conservatively at the end of the operation phase corresponding to the areas permanently occupied by the presence of permanent buildings/infrastructures.

The total area occupied by permanent buildings and facilities is 4.44 hectares. This area is considered as an unavoidable residual impact and as a net loss of the natural habitat "E6.2 - Continental inland salt steppes".

Furthermore, PV panels cover an approximate area of 50.76 hectares, which is also part of the "E6.2 - Continental inland salt steppes" habitat. During the operation phase, it is anticipated that the flora and plants in this area would recover. In fact, SPPs have demonstrated the ability to contribute positively to biodiversity, as evidenced by several case studies and supported by the IUCN Guidelines[66]. This is particularly true when a Project is followed by the deployment of long-term management and restoration measures.

The literature provides numerous instances of beneficial effects on biodiversity resulting from the establishment of SPPs, particularly in arid grassland ecosystems. These effects include enhanced diversity of plant species and soil microorganisms[67] increased diversity of plant species, plant biomass, and plant functional traits related to reproductive fitness[68], elevated aboveground biomass, soil moisture, and vegetation cover[69,70], as well as greater abundance of floral species and pollinators[71].

The specific edaphic conditions beneath the PV panels and the absence of grazing could potentially lead to an increase in the number of different species, the variety of species, and the amount of plant material for the most common and adaptable plant species[72] compared to the nearby overgrazed salt steppe habitat. However, the

[66] 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

[67] 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

[68] 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

[69] 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.

[70] 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

[71] 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

[72] 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.

alteration may put specialist species, such as dry and salt tolerant endemic species, at a disadvantage because of the unique microenvironments created by the solar panels. Endemic species may face significant disadvantages due to their restricted geographical range, narrow tolerance to certain environmental conditions, or specialised patterns of life.

The previous chapters have outlined specific strategies to manage and restore the temporary facilities and PV panels in the long run. These measures aim to maximise the good benefits on biodiversity and ecosystem services while minimising the negative impacts. The impact of grazing exclusion and PV panels on the three flora species listed as species of conservation concern (*Gypsophila oblanceolata, Onopordum davisii*, and *Petrosimonia nigdeensis*) is uncertain and will require monitoring.

For certain fauna species, the presence of a fenced area with permanent facilities and PV panels may result in a loss of potential habitats. However, for other species, particularly those of conservation concern such as the Common Tortoise (*Testudo graeca*, VU), the Brandt's Hamster (*Mesocricetus brandti*, NT), the Anatolian Vole (*Microtus anatolicus*, DD and Restricted Range), and the Anatolian Ground Squirrel (*Spermophilus xanthoprymnus,* NT), the area could still be considered a suitable habitat. In some cases, the fence and PV panels could provide protection against grazing and predators.

The population and distribution of the most impacted flora and fauna species of conservation importance will be closely monitored inside the LSA. The Biodiversity Management Plan will include extensive monitoring measures for both flora and fauna species.

The results obtained from monitoring during the operational phase will be enabled to either confirm or modify the predicted net loss for the Natural Habitat. If non-conformances occur, remedial actions, including mitigation and offset measures, will be devised.

8.0 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[73], 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[74], 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.

The CCRA is presented in Appendix D.

[73] Task Force on Climate-related Financial Disclosures (TCFD)

[74] TCFD. (2017). *Recommendations of the Task Force on Climate-related Financial Disclosures*. Task Force on Climate-Related Financial Disclosures, June.

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.

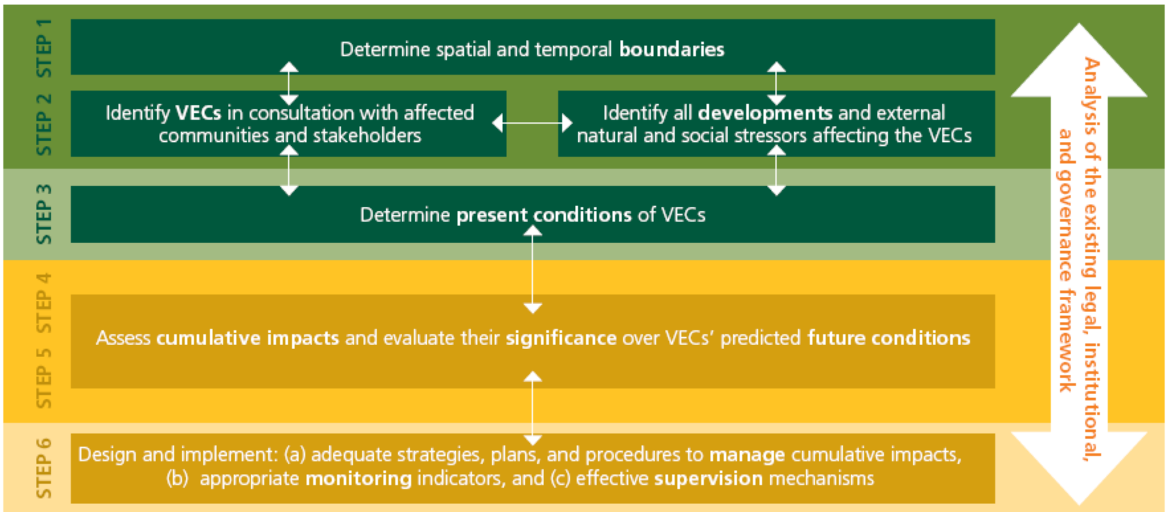


Figure 9-1: Cumulative Impact Assessment Methodology

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 air, water, soil, terrain, vegetation, wildlife, fish, birds and land use 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:

<u>Construction</u>

- Noise
- Air Quality

- Traffic
- Visual Aesthetics
- Terrestrial Biodiversity
- Social (resettlement and land acquisition, community health and safety, labour influx)

Since water will be supplied via tankers from Kemerhisar Municipality during the construction phase of the Project there will be no interaction with the water source of the nearby Villages.

<u>Operation</u>

- Visual Aesthetics
- Terrestrial Biodiversity
- Social (community health and safety, economy, labour influx)

During operation phase water will be supplied either from Kemerhisar Municipality or the well opened in the ISZ, there will be no interaction with the water source of the nearby Villages.

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.

Although the G4-BOR-1 SPP Electricity Transmission Line is defined as an associated facility, the project kept in the CIA to comprehensively assess all possible impacts.

Table 9-1: Existing and Planned Projects (3rd party facilities) and Activities in the CIA Examination Area

No	Project / Activity	Distance to the Project (m)	Capacity	Condition (as of 06.12.2023)
1	G4-BOR-2 Solar Power Plant Project	0	150 MWp / 100 Mwe 202.2 hectare	Operation phase
2	G4-BOR-3 Solar Power Plant Project	550 m	130 MWp / 100 Mwe 201.3 hectare	Operation phase
3	G4-BOR-1 SPP Electricity Transmission Line	0 m	154 kV 1272 MCM	Operation phase
4	G4-BOR-2 SPP Electricity Transmission Line	475 m	154 kV 1272 MCM	Operation phase
5	G4-BOR-3 SPP Electricity Transmission Line	950 m	154 kV 1272 MCM	Operation phase

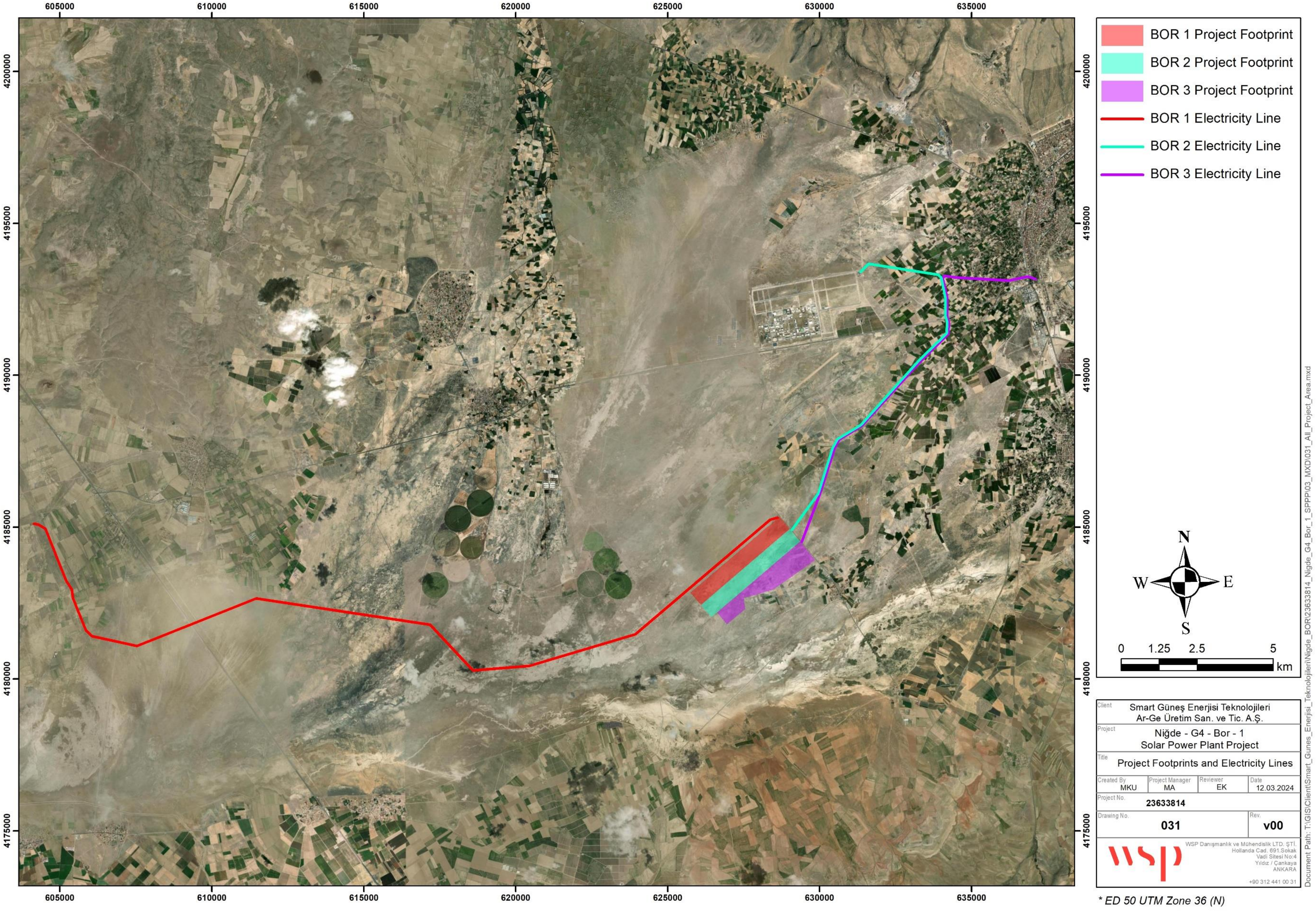


Figure 9-2: Other Activities in the CIA Study Area

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. The information regarding other past, existing, and planned projects and activities that are present in the CIA is gathered from the Online EIA Platform of the Turkish Ministry of Environment, Urbanization and Climate Change.

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	Operation					
	Noise	Air Quality	Traffic	Visual Aesthetics	Biodiversity	Social
G4-BOR-2 Solar Power Plant Project	√	√	√	√	√	√
G4-BOR-3 Solar Power Plant Project	√	√	√	√	√	√
G4-BOR-1 SPP Electricity Transmission Line	√	√	√	√	√	√
G4-BOR-2 SPP Electricity Transmission Line	√	√	√	√	√	√

Project / Activity	Operation					
	Noise	Air Quality	Traffic	Visual Aesthetics	Biodiversity	Social
G4-BOR-1 SPP Electricity 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

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.

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.

Ecosystem Services

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

Education

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

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.

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.

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.

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.

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.

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.
- The increase in the volume of traffic where the village roads used to access the site.

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.

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.

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.

9.5.1 Noise

Two other SPP projects adjacent to the Project area, namely the G4-Bor-3 Solar Power Plant Project to be realized by Kalyon Enerji Yatırımları A.Ş. and G4-Bor-2 Solar Power Plant Project to be realized by Ecogreen Elektrik Enerji Üretim A.Ş., has already been constructed and under operation. Due to the lack of detailed information about operational activities of these projects, it cannot be determined at this stage whether a certain exceedance can be expected in terms of noise.

However, due to similarities between projects in terms of both area and technologies, no significant noise generation is expected from these projects during operation phase.

G4-BOR-1, G4-BOR-2 and G4-BOR-3 SPP ETLs construction was completed. ETLs are linear projects and only very limited portion of the lines are lays within the CIA study area. Moreover, since the noise impact from the ETLs are not expected, they are not included in the modelling study.

Although no cumulative impact is expected originated from these facilities which are already under operation, to be on the safe side, additional mitigation measures to be taken by Smart to further reduce the impacts are given in Chapter 7.1.2.3.2, and Chapter 7.1.2.4.2 and Pollution Prevention Plan. Considering all mitigation measures and commitments specified in the ESIA and the management plan, the expected cumulative impact of this project 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. Two other SPP projects adjacent to the Project area, namely the G4-BOR-3 Solar Power Plant Project to be realized by Kalyon Enerji Yatırımları A.Ş. and G4-Bor-2 Solar Power Plant Project to be realized by Ecogreen Elektrik Enerji Üretim A.Ş., has already been constructed and under operation. Moreover, G4-BOR-1, G4-BOR-2 and G4-BOR-3 SPP ETLs construction was completed.

However, due to similarities between projects in terms of both area and technologies, no significant air emission generation is expected from these projects during operation phase.

With the consideration of status of these facilities which are under operation, the expected cumulative impact with these planned projects will be **Low**.

9.5.3 Terrestrial Biodiversity

A total of three Solar Power Plant Projects, including the present G4-BOR-1 SPP Project, and the three Transmission Lines considered will be located within the salt steppe of the Ereğli Plain Key Biodiversity Area (KBA) and Important Bird and Biodiversity Area (IBA). This site was internationally recognised as a Key Biodiversity Area of International significance in 2004 since meeting the thresholds for KBA criteria A1a, A1c, A1d, D1a, as described in the Global Standard for the Identification of KBAs (Key Biodiversity Areas Partnership, 2023[75]). In addition, the site was internationally recognised as Important Bird and Biodiversity Area in 2004 since meeting the thresholds for IBA criteria A1, A4i, B1i, B2, B3, as described on BirdLife website (BirdLife International, 2023[76]). When the KBA and the IBA were recognised, the area originally included a complex of shallow marshes, reedbeds, freshwater lakes and salt-steppes. However, as a result of water abstraction for agricultural purposes and reduced water inputs, the water level in the freshwater lakes has retreated drastically in the last two decades. The severe degradation of the area caused the disappearance of the wetland ecosystems supporting the presence of migratory and breeding birds. The terrestrial biodiversity field survey performed on the 1st of June 2023 within the Project Area of Influence by the expert zoologist Prof. Şafak Bulut (see section 6.3 for a detailed description of the methodology and of the results of the survey) allowed to observe 32 bird species, among which only 2 species (*Charadrius leschenaultii*, LC and *Falco naumanni*, LC) were included in the list of the 19 bird species triggering KBA and IBA criteria for this internationally recognised area.

---

[75] Key Biodiversity Areas Partnership (2023) Key Biodiversity Areas factsheet: Ereğli Plain. Extracted from the World Database of Key Biodiversity Areas. Developed by the Key Biodiversity Areas Partnership: BirdLife International, IUCN, American Bird Conservancy, Amphibian Survival Alliance, Conservation International, Critical Ecosystem Partnership Fund, Global Environment Facility, Rewild, NatureServe, Rainforest Trust, Royal Society for the Protection of Birds, World Wildlife Fund and Wildlife Conservation Society. Downloaded from http://www.keybiodiversityareas.org/ on 29/11/2023.

[76] BirdLife International (2023) Important Bird Area factsheet: Ereğli Plain. Downloaded from http://datazone.birdlife.org/site/factsheet/ereğli-plain-iba-türkiye on 29/11/2023.

Other important threats are represented by overgrazing and wind erosion. In addition, water inputs are expected to cease entirely once two new reservoirs will be completed.

At this stage, all facilities are under operation; potential impacts on biological components from the Project will mainly be associated with the following impact factors: emission of noise, emission of light, Increase of traffic, introduction of alien species (potential).

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.) will cause a loss of available natural habitat during the entire operation phase, which 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 Solar Power Plants in desertic and steppe areas could determine overall positive effects on biodiversity, in terms of increased plant diversity and increased plant biomass (Bai *et al.*, 2022[77]; Graham *et al.*, 2021[78]; Hassanpour *et al.*, 2018[79]) provided that appropriate long-term management and restoration activates implemented.

Based on these considerations and assuming that appropriate mitigation and monitoring measures will be applied in all SPPs and associated powerlines, the expected cumulative impact of these projects at the regional scale is expected to be **Low**.

9.5.4 Traffic

The Emen Village road is used for access to the SPP areas. Developers of three SPPs established a consortium, and the traffic topic was also included to the list of topics discussed among project owners. Therefore, in order to protect villagers of Emen, traffic signs/labels, speed bumps and two convex mirrors in proper places was placed in the Emen Village road to prevent potential accidents/incidents.

On the other hand, since all the facilities are under operation, the vehicle traffic will be mainly from the maintenance works and staff shuttles/cars entering and leaving the Project Areas. 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

The mitigation measures to be taken by Smart to further reduce the impacts are given in Chapter 7.1.6 and the Traffic Management Plan.

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/PIFs, the expected cumulative traffic impact will be at **low** significance even when the worst-case scenario is considered.

---

[77] 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.

[78] 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.

[79] 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.

9.5.5 Visual

Since all the facilities are under operation, permanent structures and solar panels are presented in the project area. The PV panels have impacts on visual aesthetics in terms of glint and glare impacts. In the Project, with the use of anti-reflection (AR) coatings, no glint-glare impact is foreseen during operation phase of the Project. 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

Three SPPs are part of a process initiated by the Ministry of Energy and Natural Resources, which has allocated 2,539 hectares of land in the Bor district of Niğde province on 29.09.2023. The legal status of the plots was formerly pastureland, and it was declared an industrial zone suitable for the development of solar projects: a Renewable Energy Resource Area.

The land within the Project area and the surrounding SPP Projects is owned by the government, and it is classified as Niğde-Bor Energy Specialized Industrial Zone with the decision taken on 01.06.2018 by Niğde Governorship Revenue Office National Real Estate Directorate.

Within the scope of the project, 5 m of health protection band has been determined within the EIA area of 201.6 ha, and the determined health protection band will also be used as the building approach distance in zoning plans.

The Project area is classified as IV. class lands and determined as treasury land. In the parcels of pasture quality within the borders of Niğde-Bor Energy Specialized Industrial Zone where the project site is located, with the letter dated 01.06.2018 and numbered 7112 of the Niğde Governorship Revenue Office National Real Estate Directorate, a change in qualification was made, and its registration was carried out in the name of the treasury. In this context, the entire project area remains within the treasury land.

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 frequently. 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.

Ecogreen: The project site is located 26.5 km north of Niğde City Centre and 13.3 km north of Bor District Centre. The nearest sensitive structure is located in the Seslikaya neighbourhood, 1.43 km southeast of the project site. The entire project area remains within the treasury land. The project area is categorized as an "Industrial Zone" in the 1/100,000 Scale Environmental Plan. The total area required for the Project development is 202,02 ha.

Kalyon: The project site is located 26.5 km north of Niğde City Centre and 13.3 km north of Bor District Centre. The nearest sensitive structure is located in the Seslikaya neighbourhood, 1.43 km southeast of the project site. The entire project area remains within the treasury land. The project area is categorized as an "Industrial Zone" in the 1/100,000 Scale Environmental Plan. The total area required for the Project development is 201.3 ha.

ETLs: There will be a loss of agricultural area only due to the pole areas during the transition from the agricultural areas. During the crossing of the agricultural areas of the line, the property right will be expropriated for the pole locations and the easement right will be obtained. Thus, the loss of property owners will be compensated in compliance with the Expropriation Law. After the installation of the ETLs, agricultural activities can be carried out by considering the distances specified in the "Regulation on Electric Power Current Facilities" During the construction, excavation, filling and operation process, the surrounding agricultural lands, agricultural infrastructure and agricultural production will not be damaged, and in case of damage, the damages will be compensated by TEİAŞ.

9.5.7 Community Health and Safety

Since other projects are already under operation, developers of three SPPs established a consortium, and the received grievances are discussed in the consortium and necessary actions to resolve grievances are taken regarding noise, air, population changes etc.

According to mitigation measures for both ESIA, the Project´s embedded controls and programs proposed would appropriately mitigate the negative impacts which will be **low**.

9.5.8 Employment

The impact of the Project and the other five projects including 2 SPPs and three ETLs on employment has been assessed as **low** by considering the duration of employment. The employment requirements for each project are provided below.

Ecogreen: 25 personnel are employed during the operation phase.

Kalyon: 20 personnel are employed during the operation phase.

ETLs: No personnel will be employed during the operation phase of the ETLs rather than temporary maintenance and repair times.

9.5.9 Local Procurement

The Project, along with five others comprising two SPPs and three ETLs, as well as external factors, has the potential to enhance local procurement.

These Projects are anticipated to generate economic benefits for the local economy through the acquisition of goods and services, such as fuel for mobile equipment, transportation, food, passenger vehicles for Project use, electrical energy requirements, maintenance materials, office supplies, vehicle maintenance, travel logistics, accommodation, communication, and security. Consequently, the Project is expected to positively impact the local economy of the region. Considering the duration this impact has been assessed as **low**.

9.5.10 National Energy Production

G4 Bor-1 Solar Power Plant Project ("the Project") will have 140 MWp /100 Mwe. The total energy production of the Ecogreen Project will be 150 MWp /100 Mwe and Kalyon SPP will be 140 MWp /100 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 Smart 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, Smart 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 Smart to prepare a specific Stakeholder List for the CIA.
- Smart 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 Smart.
- In case of any grievances about the cumulative impact, Smart will inform the other project owners and joint actions will be taken.
- Smart will conduct close engagement and consultation activities with the projects mentioned in this CIA.
- Collaborative planning/process for protection and enhancement of VECs.

10.0 ENVIRONMENTAL AND SOCIAL MANAGEMENT SYSTEM

10.1 Introduction

The Environmental and Social Management System (ESMS) acts as a comprehensive framework, incorporating the Environmental and Social Management Plans (ESMPs) and other associated documentation. It provides guidance for the effective implementation and continual enhancement of environmental and social commitments for the Niğde G4-Bor-1 Solar Power Plant Project by Smart.

As an integral component of the ESIA, the ESMS stands as a foundational document, underscoring the Project's dedicated commitment to environmental and social sustainability throughout its lifecycle. It is meticulously developed in alignment with Smart's corporate policies, integrating the commitments outlined in the ESIA. Additionally, the ESMP aligns with the pertinent Turkish regulatory framework and adheres to a suite of international Environmental and Social (E&S) Standards, including the International Finance Corporation (IFC) Performance Standards (PSs), Guidance Documents, IFC General Environmental, Health, and Safety (EHS)

Guidelines, Equator Principles (EP), and the Organisation for Economic Co-operation and Development (OECD)'s Common Approaches. Figure 10-1 illustrates the Project's ESMS structure in line with IFC's Environmental and Social Management System Implementation Handbook (2015). This structure consists of multiple sub-management plans to ensure adherence to Project-specific legislation, standards, and limits, and to reflect the mitigation measures identified in the ESIA.

The ESMS is in a state of continuous enhancement to effectively manage environmental and social risks, aligning with Smart's policies and relevant E&S directives. It is imperative that the environmental and social management system, across all project phases, complies with national and international standards, best practices, and Project-specific requirements. The overarching policies aim to guide the Project towards achieving zero waste, zero incidents, and promoting respect for human rights, particularly among vulnerable groups.

The ESMS is structured around nine core elements aimed at assessing, controlling, and promoting continuous improvement in E&S performance. Compliance with these elements is essential for the Project's ESMS.

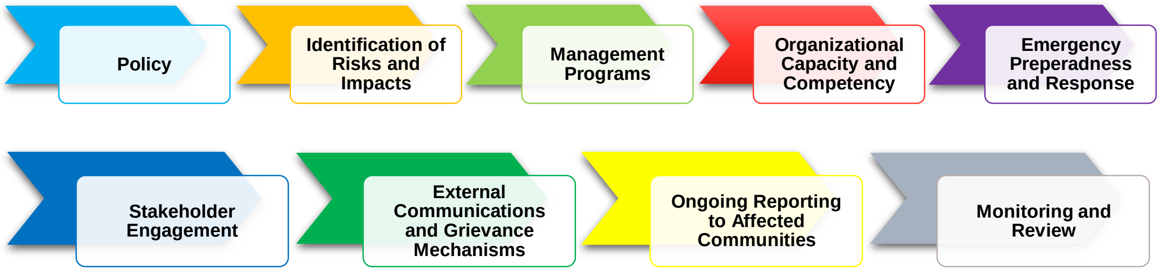


Figure 10-1 Elements of ESMS (IFC, 2015)

The E&S mitigation measures identified during the ESIA process are compiled into a Commitments Register (Chapter 10.8.8). This register serves as a critical tool, guiding the development and implementation of the ESMS, ensuring accurate adherence to Project requirements, regulations, and standards.

10.2 Objectives of the ESMS

The primary objective of the ESMS is to implement and operationalize the environmental and social (E&S), including occupational health and safety, commitments and mitigations identified in the ESIA. This ensures that the Project, including the construction, operation, and decommissioning phases, is executed in a manner that minimizes adverse impacts on the physical, biological, and social environments within the Project-affected area.

Specifically, the ESMS will:

- **Establish Standards:** Set environmental and social management standards that either meet or exceed Good International Industrial Practices (GIIP) and align with community expectations.
- **Employ Mitigation Hierarchy:** Proactively anticipate, avoid, or, when avoidance is unfeasible, minimize and restore E&S impacts.
- **Integrate E&S Considerations:** Formulate and execute policies, plans, and procedures to embed E&S considerations within the overarching project management framework throughout its lifecycle.
- **Facilitate Management Plans:** Implement the management plans as delineated by the ESIA to prevent, minimize, and control E&S impacts.
- **Educate Personnel on Responsibilities:** Ensure Project personnel are educated on their E&S responsibilities and monitor their adherence to these responsibilities.

- **Implement Monitoring Program:** Evaluate residual environmental impacts and monitor ESMS performance through an implemented monitoring program.
- **Conduct Audits and Corrective Actions:** Periodically conduct system audits and identify corrective actions, if needed, to achieve planned objectives.

Further details related to the operational phase of the Project will be developed subsequently. Therefore, this Project ESMS will undergo revisions prior to the commencement of operations to incorporate any new information pertinent to E&S impact and risk management.

10.3 Project Description

The G4 Bor-1 Solar Power Plant Project, with a capacity of 140 MWp / 100 MWe, is planned to be developed and operated by Smart. It will be situated in the Bor district of Niğde province, specifically within the Seslikaya and Badak Villages, covering a total area of 201.3 hectares (2,013,306.5 m^2). The electricity generated will be transmitted to the Yaysun SPP Substation via a 29.5 km long 154 kV Electrical Transmission Line (ETL), which will be constructed by TEİAŞ.

The Ministry of Energy and Natural Resources allocated a total of 2,539 hectares of land in the Bor District of Niğde Province on September 29th, 2018, for the Project's location. The legal designation of this land was subsequently changed to an industrial zone, deemed suitable for the development of solar power projects, specifically under the Renewable Energy Resource Area (known as "YEKA" in Turkish).

The Project will occupy 201.6 hectares of pastureland. The designated Project area has been categorized as an "Industrial Zone" in the 1/100,000 Scale Environmental Plan and falls within the boundaries of the "Niğde-Bor Energy Specialized Industrial Zone".

The Project site covers 201.3 hectares of treasury land, whose designation was modified from pastureland by the Niğde Governorship Revenue Office National Real Estate Directorate's letter dated June 1st, 2018, with reference number 7112. This area has also been classified as an "Industrial Zone" in the 1/100,000 scale Environmental Plan and is situated within the "Niğde-Bor Energy Specialized Industrial Zone".

The project layout is illustrated in Figure 10-2 and the nearest settlements to the Project Site are illustrated in Figure 10-3.

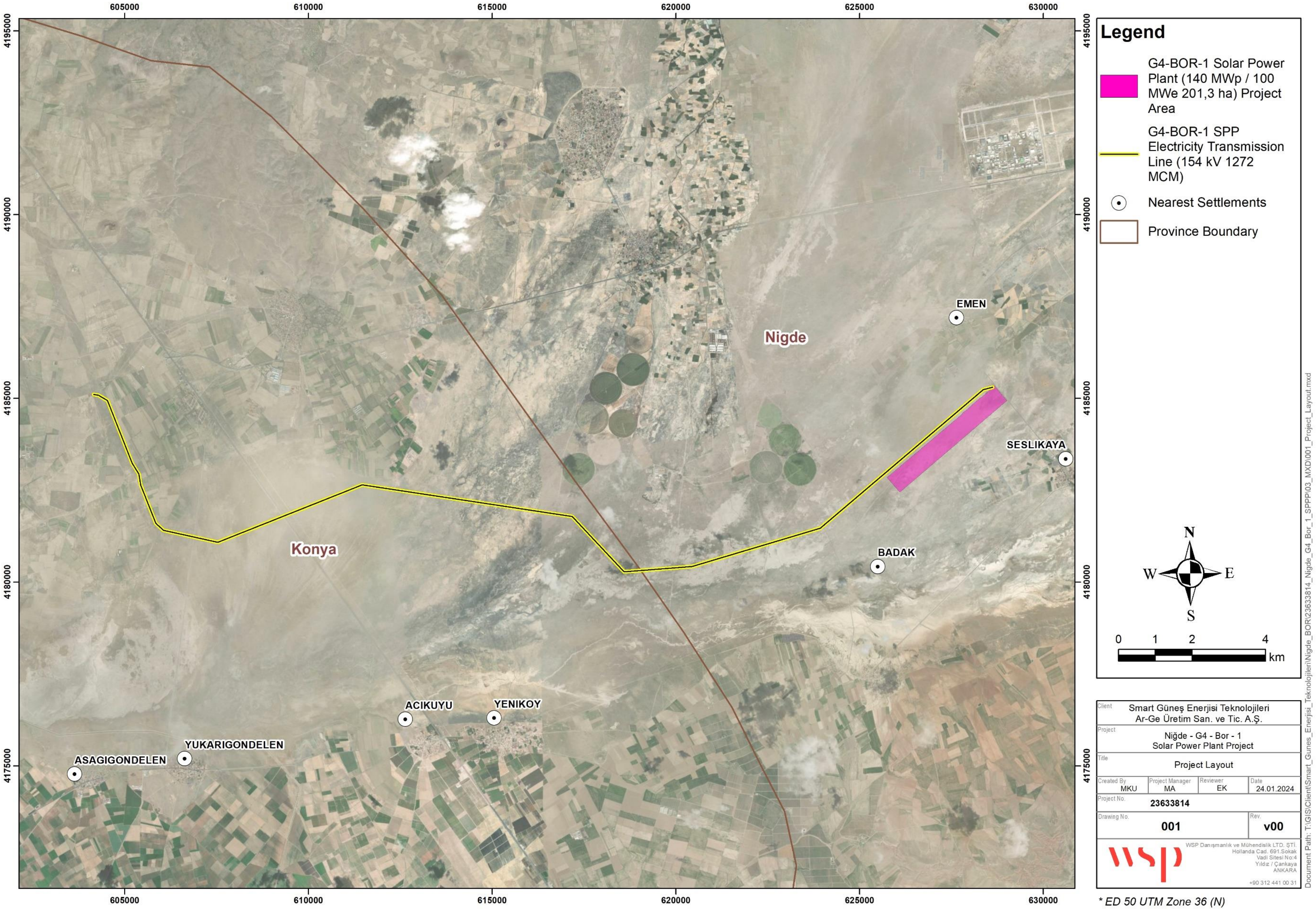


Figure 10-2: Project Layout

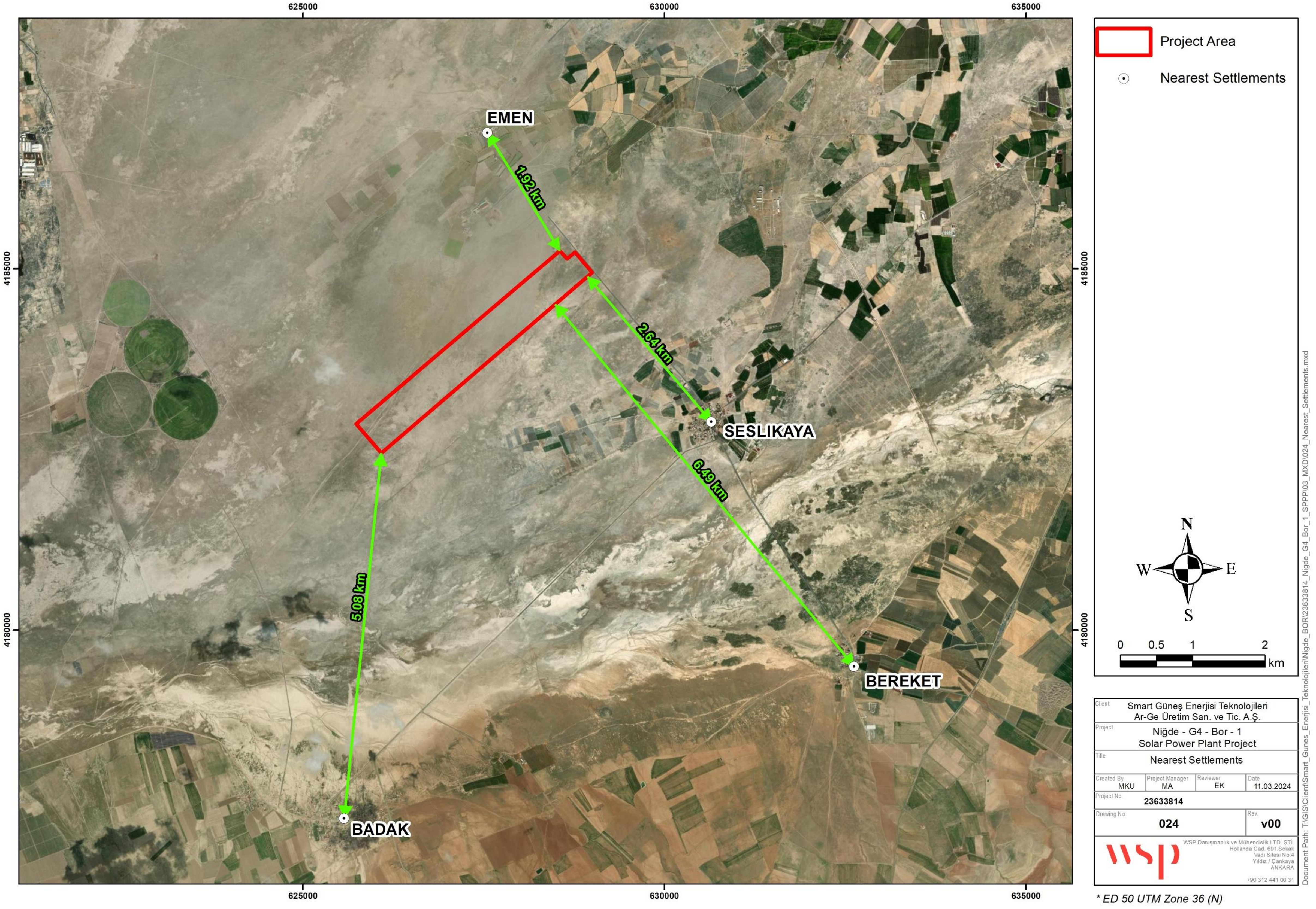


Figure 10-3: Map Showing Nearest Settlements to the Project Site

10.4 Legal, Regulatory and Policy Framework

This section includes policies, standards, and requirements applicable to this Plan, covering the construction, operation, and decommissioning phases of the Project.

It is important to note that the Project will comply with the adopted Project Standards.

It is essential to highlight that the Project will adhere to the established Project Standards. These standards are detailed in the Project ESIA and include:

- National legislative requirements, permits, licenses, and approvals.
- IFC Performance Standards (PSs).
- Equator Principles (EPs) IV.
- Other Good International Industry Practices (GIIP).
- International Conventions and Protocols to which Türkiye is a party.
- Smart Corporate Policies, and related practices and procedures.
- EBRD and IFC's Workers' Accommodation: processes and standards.

For an in-depth breakdown of the project standards concerning air quality, water quality, soil quality, noise, and vibration, please refer to Appendix B.

10.4.1 Applicable Turkish Legislation

The Turkish legal framework for environmental protection aligns with national and international standards, with recent revisions to harmonize with European Union (EU) Directives as part of Türkiye's pre-accession efforts to the EU. The Turkish Environment Law No. 2872, dated 1983, establishes the general framework for environmental protection. It adopts a holistic and integrated approach to environmental management, with principles such as "Polluter pays," "user pays," and carrying capacity forming the basis of regulatory tools. This Law is complemented by various regulations and decrees developed or updated to align with EU legislation.

10.4.2 Applicable International Legislation

Türkiye is a signatory to numerous international agreements on various social and environmental topics, as listed in ESIA - Chapter 2 Regulatory and Policy Framework. The applicability of these agreements is further discussed in the relevant chapters of this ESIA. Türkiye has also ratified several international conventions under the auspices of European, United Nations, and ILO frameworks, covering areas such as labor conditions and human rights.

The Project also adheres to the following international standards:

- 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

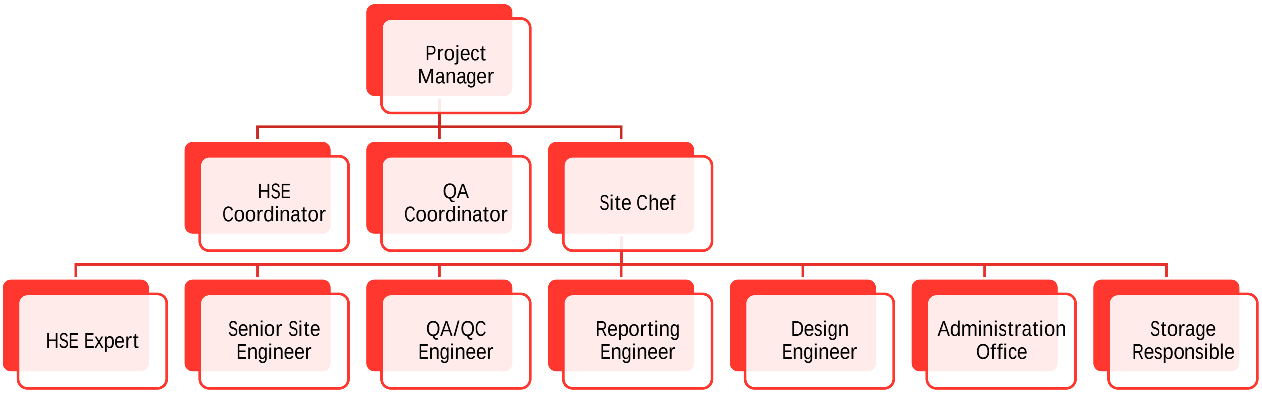
  - Principle 7: Independent Review
  - Principle 8: Covenants
  - Principle 9: Independent Monitoring and Reporting
  - Principle 10: Reporting and Transparency.
- IFC Performance Standards (2012):
  - Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts
  - 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
- Other IFC Guidelines:
  - IFC's General EHS Guidelines (2007)
  - IFC's EHS Guidelines for Electric Power Transmission and Distribution (2007)
  - Performance Indicators and Monitoring, Documents Pertaining to Human Rights (2012)
  - 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 ESMS Components

The Project's ESMS is structured to present the foundational elements established by Smart for the Project, referring to the overarching integrated management system documents and consisting of the following 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 Plans (ESMPs).
- Organisational Capacity and Competency (



- Figure 10-5)
- Communication to and engagement with stakeholders (Project Stakeholder Engagement Plan (SEP) will be disclosed on the Smart website)
- Emergency Preparedness and Response
- Monitoring and review.

The selected subcontractors must develop their management plans in line with the Project's ESMS, as defined and prepared based on the ESIA requirements. These entities should adhere to these documents, including E&S plans and procedures, throughout the Project's lifecycle. All plans and procedures are reviewed and approved by Smart to ensure alignment with the Project's ESMS.

The subsequent sections of this chapter offer an overview of the components that constitute the Project ESMS.

10.5.1 Environmental and Social Policies

Smart has established a comprehensive framework of policies and ethical principles to guide its operations, ensuring commitment to sustainable and ethical conduct across all aspects of its business operations.

- Environment And Climate Change Policy
- Human Rights Policy
- Occupational Health and Safety Policy
- Corporate Social Responsibility Policy
- Anti-Bribery and Anti-Corruption Policy
- Supply Chain Policy
- Sustainability Policy
- Donation and Aid Policy

- Information Policy
- Profit Distribution Policy
- Compensation Policy
- Ethical Principles
- Supplier Code of Conduct

10.5.2 Risks and Impacts Identification Process

During the ESIA process, E&S aspects and impacts related to the Project were identified and assessed, as shown in Figure 10-4. The detailed methodology for impact assessment is provided in ESIA Chapter 5 - Methodology.

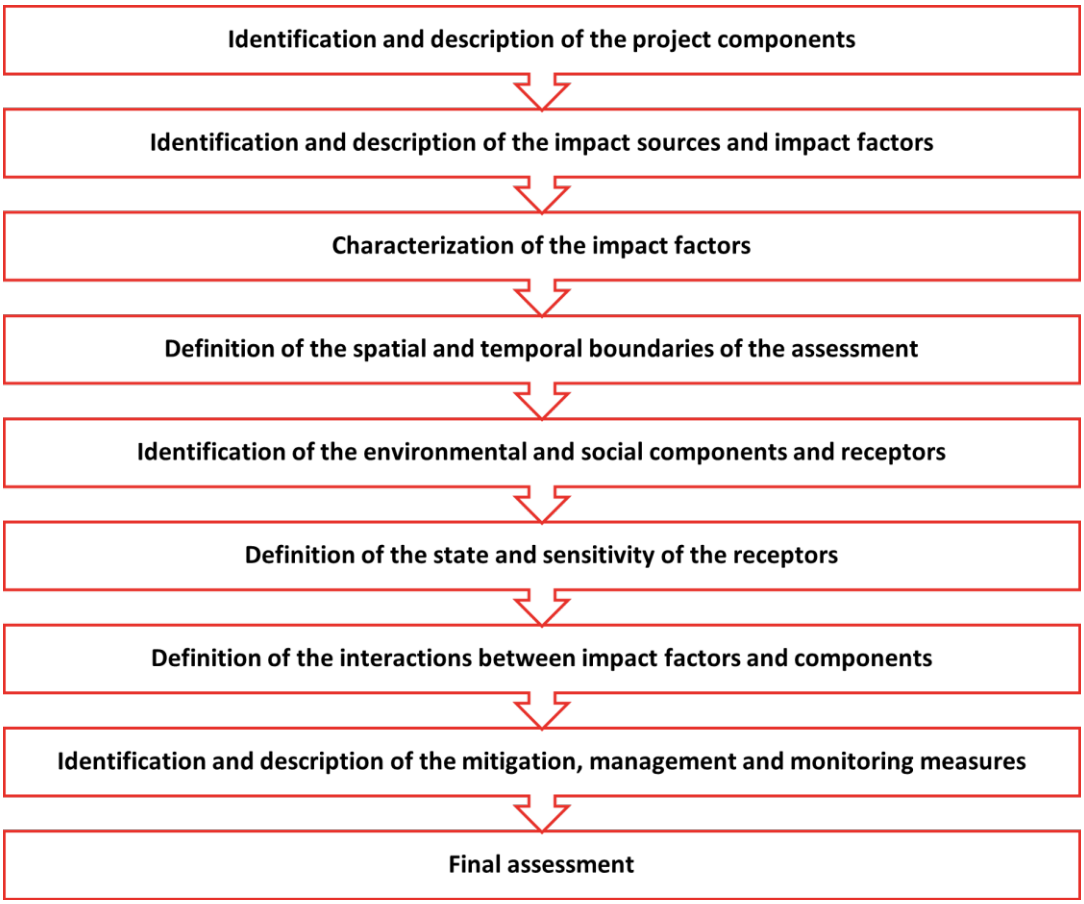


Figure 10-4: Impact Assessment Approach

The ESIA identified E&S risks and potential impact factors. Specific mitigation measures were then developed to address these impact factors. Prepared in compliance with both National Regulations and relevant international standards, the ESIA process consisted of the following steps:

- Review of available Project and environmental and social documentation.
- Conducting a Gap Analysis Study to provide an independent assessment of the Project's E&S risks/aspects. This evaluated the adequacy of the assessments, and the plans and procedures developed for managing the Project's impacts in line with applicable IFIs' E&S Policies and Standards. Initial findings from the Gap

Analysis Study highlighted the need for additional baselines and a re-evaluation of the outcomes of the national EIA to ensure full compliance with lenders' standards.

- Site visits to the Project to observe various project areas and collaborate closely with the Smart team.
- Performance of biological and physical baseline surveys, including air quality, noise, vibration measurements at sensitive receptors, soil, groundwater, and flora and fauna assessments. These surveys provided insights into the environmental context within the Regional Study Area (RSA) and the Area of Influence (AoI) of the Project prior to its commencement.
- Stakeholder Engagement activities, including community-level surveys, focus group discussions, and key informant interviews.
- Compilation of the ESIA report, which includes the results of the ESIA process, an assessment of the Project's adverse and positive impacts, and the proposed mitigation measures. This report will form the foundation for the ESMS of the Project. A Non-Technical Summary (NTS) has also been included in the ESIA report for public disclosure.

10.5.3 Management of Change

Smart will implement a comprehensive system designed to proactively identify and manage potential risks and impacts stemming from alterations to the Project. This system will go beyond the initial ESIA findings and will incorporate the following core principles:

- **Transparent Evaluation:** Each proposed change will undergo a rigorous assessment to determine its potential impacts on health, safety, environment, and project integrity. Using a 1-5 scale, changes will be rated based on their potential significance, from minimal to severe.
- **Adaptive Protocols:** Smart has developed a dedicated MoC Procedure established for Project development. This procedure is dynamic, allowing for real-time adjustments based on the evolving nature of the Project and its external environment.
- **Enhanced Communication:** A robust communication framework will ensure that all stakeholders are informed about proposed changes, their implications, and any consequent modifications in management or procedures. This transparency will foster collaboration and ensure collective understanding.
- **Training and Capacity Building:** Recognizing the importance of human capital, Smart invests in training programs to equip its team and associated stakeholders with the necessary skills and knowledge to adapt to changes effectively.
- **Documentation Integrity:** Smart will maintain an up-to-date repository of all change-related documentation. This will ensure traceability, facilitate auditing, and serve as a valuable resource for future reference.

Smart will classify changes into three distinct levels based on their potential impact:

- **Level III: Significant changes** that could lead to considerable adverse effects beyond the ESIA's study area or scope. These changes will require a comprehensive review and may necessitate amendments to the ESMS, potentially triggering an ESIA addendum and formal approval processes.
- **Level II:** Changes of **moderate importance** that align closely with the ESIA's findings. While they may require adjustments to the ESMS, they will be largely manageable within the existing framework with minor additional assessments.

- **Level I: Minor changes** that have minimal impact on the ESIA's findings and the Project's overall environmental and social commitments. These changes will typically require no additional studies but will still be communicated to relevant stakeholders for transparency.

For changes categorized as Level III or II that could potentially impact the ESMS, Smart will ensure proactive stakeholder engagement. This will involve notifying and consulting with all relevant parties to ensure a collaborative approach to mitigating risks and implementing necessary measures.

10.5.4 Environmental and Social Management Plans

Smart has crafted a comprehensive set of Environmental and Social Management Plans (ESMPs) and procedures, in line with their policies and commitments. These plans target the environmental and social impacts pinpointed in the ESIA for each project component. They include pertinent mitigation measures to address these impacts. The table below outlines the exhaustive set of ESMPs devised and implemented to uphold the Project's commitments, along with the IFC Performance Standards (PSs) each plan contributes to.

Table 10-1: ESMPs and Corresponding IFC PSs

Relevant IFC PS	Plans / Procedures
IFC PS1 5-24: Assessment and Management of Environmental and Social Risks and Impacts	▪ ESMPs - (this chapter) ▪ Stakeholder Engagement Plan
IFC PS2: Labour and Working Conditions	▪ Human Rights Management Plan ▪ Offsite Accommodation Management Plan ▪ Labour 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

Relevant IFC PS	Plans / Procedures
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 Smart has control or influence.
- Apply within the Project Area of Influence, covering 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").

Each ESMPs comprises 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 to assess the effectiveness of the mitigation measures identified during the impact assessment process
- Training and awareness requirements, as needed
- Inspections, audits, and reviews

While each management plan shares a similar structure, the level of detail and complexity aligns with the expected impacts and risks identified in the ESIA. The mitigation measures highlighted in the ESIA's relevant sections are integrated into each management plan, to be disclosed to stakeholders following the SEP.

Smart will disseminate the ESMPs to EPC and subcontractors to ensure alignment in the development of their respective management plans, procedures, and work instructions. Additional mitigation measures adjusted to their activities will be incorporated as deemed necessary.

10.6 Organisational Structure and Competency

10.6.1 Resources, Roles, Responsibility and Authority

Implementing the Environmental and Social Management System (ESMS) in alignment with the IFC Performance Standards (PSs) requires a well-defined organizational structure with clear roles, responsibilities, and authorities for all Project stakeholders.

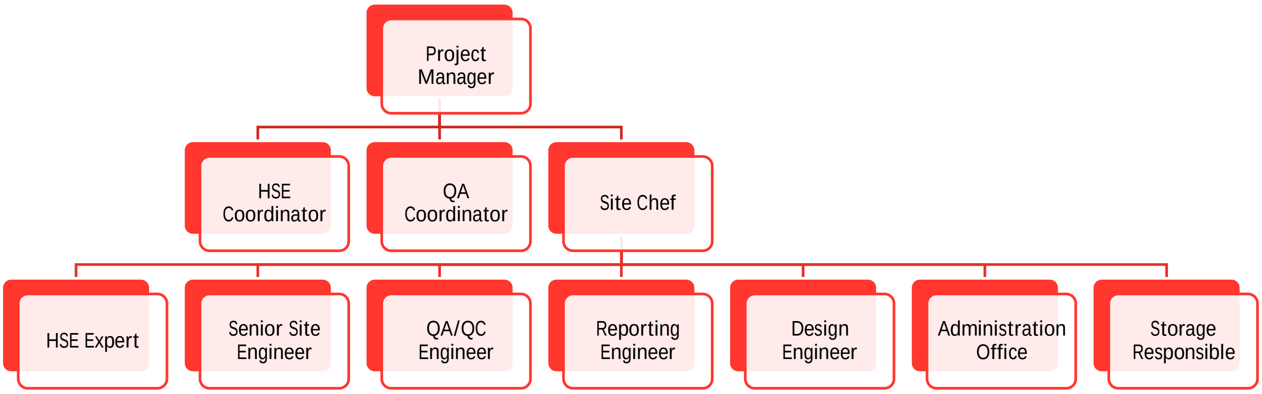


Figure 10-5 illustrates the organizational charts for the key Project entities.

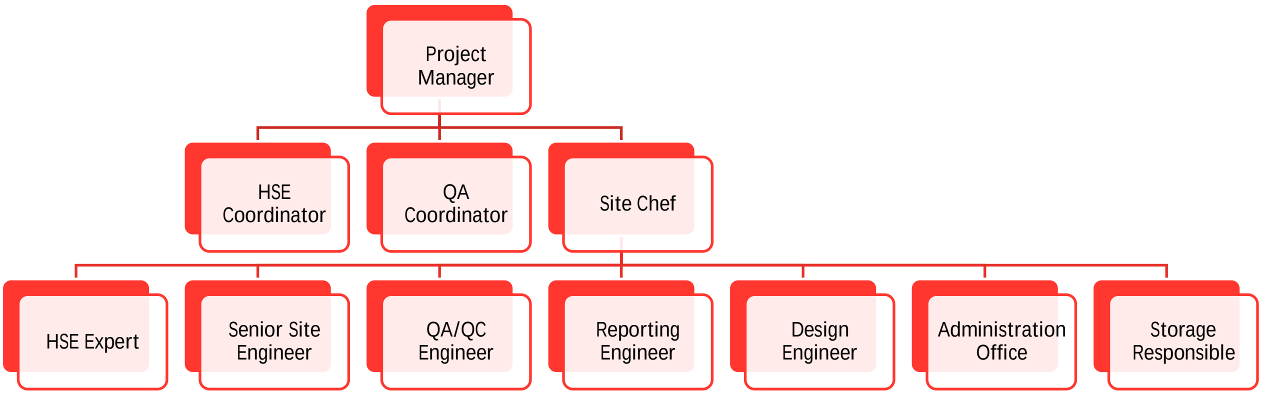


Figure 10-5: Organization Chart

The following table outlines the primary roles and their respective responsibilities. These descriptions are preliminary and will be further refined by Smart to specify the exact positions and staffing requirements.

Table 10-2: Roles and Responsibilities

Role	Overall Responsibilities	Specific responsibilities
Smart Management	▪ Provide strategic E&S direction for the Project. ▪ Monitor and oversee ESMPs implementation. ▪ Approve EPC's documents and plans, ensuring alignment with ESMS requirements. ▪ Allocate adequate resources for ESMS implementation.	▪ Allocate necessary resources (financial and otherwise) for effective ESMP implementation. ▪ Confirm contractors' capabilities and ensure their ESMPs align with Smart's standards. ▪ Appoint qualified specialists for on-site E&S supervision. ▪ Approve ESMPs and plans from contractors and subcontractors.

Role	Overall Responsibilities	Specific responsibilities
	▪ Define clear roles and responsibilities across the organization.	
Smart Site Personnel	▪ Maintain and implement Project ESMP documentation. ▪ Collaborate with EPC to ensure their ESMP aligns with the Company ESMS. ▪ Oversee EPC and subcontractors' ESMP implementation.	▪ Provide daily guidance on Project E&S requirements to contractors. ▪ Conduct necessary training and awareness programs. ▪ Ensure ESMPs are updated and appropriate for Project activities. ▪ Conduct HSSE audits and maintain records of non-conformances. ▪ Review and analyze monitoring data, producing performance reports for stakeholders.
Contractors Management	▪ Ensure subcontractors have ESMPs aligned with the Project. ▪ Monitor ESMP implementation and performance. ▪ Address non-compliance issues.	▪ Train the workforce for specific tasks and enforce HSSE requirements. ▪ Provide monitoring data and reports as required. ▪ Propose modifications to monitoring activities if necessary.
All employees	▪ Understand and adhere to requirements in the management plans relevant to their tasks.	▪ Comply with environmental management protocols. ▪ Report deviations or non-compliance with ESMS requirements. ▪ Implement identified mitigation measures during work.

Job-specific roles and responsibilities, along with detailed descriptions, are provided within individual ESMPs. In accordance with IFC PS1 requirements, Smart will ensure that job-specific training is provided to all employees. Details on this training are covered in 10.6.2 on *Training, Awareness and Competence*. Smart will also mandate that EPC and subcontractors provide necessary training to their Project personnel.

10.6.2 Training, Awareness and Competence

Smart will conduct comprehensive ESMS training sessions designed for their managers and staff based on their specific roles. The primary objectives of this training are:

- To ensure that all team members understand the EHSS-related risks associated with the Project. They should recognize the criticality of adhering to the ESMS and its stipulated requirements. Any lapses in implementing these measures can result in significant EHSS impacts and jeopardize Smart's commitments to align with Lenders' standards.
- To equip staff members who have direct responsibilities for the Project's EHSS performance with the requisite knowledge, skills, and experience. They should be well-versed in the relevant laws and regulations pertinent to their job functions.

- To guarantee that each staff member possesses the necessary expertise to execute the specific measures and tasks outlined in the ESMPs effectively.

Additionally, contractors are mandated to formulate its training and awareness guidelines, including a training program for its own workforce and subcontractors. These guidelines should clearly define the training requirements, planning, and execution processes, offering specific directives for creating and updating a dynamic ESMS training program. The training modules should be designed to cater to varying competency levels, reflective of each individual's ESMS responsibilities and engagement level. Approval from Smart will be essential for validating the suitability of contractors training initiatives for their respective roles.

10.7 Stakeholder Engagement

10.7.1 Engagement Process and Disclosure of Information

According to IFC PS1, effective stakeholder engagement is crucial to mitigate and manage social risks, ensuring the Project maintains a long-term social license to operate. Engaging stakeholders establishes robust, positive, and responsive relationships vital for managing environmental and social risks and impacts associated with the Project.

The primary objective of stakeholder engagement is to offer stakeholders clear information about the Project's potential environmental and social impacts through transparent disclosure. This transparency helps stakeholders develop accurate perceptions of the proposed development. It also involves seeking feedback and opinions from stakeholders and providing mechanisms to address their concerns or complaints. Stakeholders, whether external or internal to Smart, can be individuals or groups:

- 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 aims to:

- Identify and engage all stakeholders potentially impacted by the Project,
- Ensure stakeholders understand Project activities and potential impacts/benefits,
- Detect early issues in the Project cycle that may pose risks to the Project or stakeholders,
- Ensure mitigation measures are appropriate, effective, and efficient,
- Establish a long-term and mutual communication system between the Project and stakeholders beneficial to all parties.

The stakeholder identification process has been performed by Smart 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 activities (legally defined for the project) through regional and local newspapers and the Project website,
- Public hearings as part of the public discussion procedure,
- Consultations with public authorities at national, regional, and local levels.

The SEP presents a systematic approach to stakeholder engagement to help Smart develop and maintain strong and constructive relationships with stakeholders and address their concerns about the Project. The SEP and its implementation are Smart's responsibility. Specifically, the SEP for the construction phase includes:

- Disclosure to 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,
  - A Grievance Mechanism consistent with IFC PS1 requirements scaled to the risks and impacts of the Project.
- Provisions for a stakeholder consultation and participation process suitable for the potentially affected communities, their decision-making process, and the inclusion of disadvantaged or vulnerable groups,
- Documentation showing how feedback from stakeholder consultation and participation has been incorporated into Smart's management decision-making process and used to identify specific mitigation measures as needed,
- Periodic reports to the potentially affected communities updating them on the progress of ESMS implementation and addressing any 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 a living document and will be regularly monitored, reviewed, and updated by Smart throughout all stages of Project implementation to ensure:

- It remains fit for purpose at each phase of the Project,
- It addresses the outcomes of stakeholder consultation activities,
- It addresses the grievances received from stakeholders.

Internal communication among various functions, roles, and different Project parties is addressed in this ESMS.

10.7.2 Internal Grievance Mechanism

An internal grievance mechanism has been established for the Project to address concerns and issues raised by all Project workers, including both direct and indirect personnel. Grievances are defined as formal expressions of dissatisfaction regarding any condition alleged to harm an employee. Such grievances may pertain to internal communication, misuse of responsibilities, abuse of authority, or discrimination based on race, color, ancestry, national origin, religion, age, sex, sexual orientation, gender identity, sexual harassment, or disability status.

To ensure confidentiality, grievance holders have the option to remain anonymous upon request. Smart is committed to safeguarding the identities of grievance holders and will only disclose such information with their explicit consent. In cases where consent is granted, only relevant managers and personnel directly involved in addressing the grievance will be informed.

Details of the internal grievance mechanism, including procedures and the Employee Request and Grievance Register specific to the Project, are provided in the appendix of the Stakeholder Engagement Plan (SEP).

10.7.3 External Grievance Mechanism

Smart has established an external grievance mechanism as part of the Project's management system to address concerns and complaints, particularly from affected stakeholders and communities. The mechanism aims to provide stakeholders with a structured platform to gather information about Smart’s activities, submit their complaints, and receive prompt, fair, and effective responses.

Stakeholders can communicate their comments or concerns verbally, in writing (via post or email), or by completing a designated grievance form. This form is accessible on the Company website, at the Project site, and at the local Mukhtar’s office. Detailed instructions and contact information for the grievance mechanism are also provided alongside the form.

All grievances will:

- Be acknowledged within seven working days of receipt.
- Receive a response no later than 30 working days after acknowledgment.

Trained and designated staff members will manage and document grievances in a dedicated register. This register will include the stakeholder's name, contact details, and specifics of the grievance, along with information on its submission, acknowledgment, response, and closure.

Smart will actively promote the grievance mechanism through stakeholder meetings with project-affected communities. Specialized sessions will be organized to engage with women Project Affected People (PAPs) and vulnerable groups, ensuring they are informed about the grievance process and have the option for anonymous submissions.

To ensure gender equality, a female engineer is part of the Project team. She is responsible for addressing the complaints and demands of women in the Project area. All grievances are reviewed in alignment with the Project's human rights and grievance mechanisms.

10.7.4 Emergency Preparedness and Response

Smart has developed a robust Emergency Preparedness and Response Plan (EPRP) for the Project, in alignment with the IFC EHS Guidelines - 3.7 on Emergency Preparedness and Response. This plan is designed to address a range of potential emergency scenarios to protect both individuals and the environment. The EPRP focuses on:

- Ensuring life and fire safety, including natural disasters,
- Swift response to on-site incidents,
- Managing spills or leaks of hazardous substances,
- Safe transportation of hazardous materials on-site and off-site,
- Protecting against sabotage or attacks,
- Preparing for natural events like landslides and floods,
- Implementing first aid and emergency response procedures.

The EPRP includes detailed information for the following key elements:

- **Legal Framework and Local Support:** Outlining legislative requirements and providing contact details for local emergency response agencies.
- **Risk Identification and Impact Assessment:** Identifying potential emergency situations and the communities and individuals that may be impacted.
- **Standard Operating Procedures:** Providing clear procedures for specific emergency scenarios, ensuring timely and effective response.
- **Roles and Responsibilities:** Defining the roles of each team member for the effective implementation of the EPRP.
- **Resources and Equipment:** Listing essential equipment, tools, and resources required for effective emergency response.
- **Communication and Awareness:** Describing communication channels and awareness campaigns targeting affected communities and local authorities.
- **Training and Capacity Building:** Detailing training initiatives to equip personnel with necessary emergency response skills.
- **Contractor Requirements:** Setting minimum requirements for contractors and subcontractors to develop their emergency response plans.
- **Drills and Testing:** Including provisions for regular emergency drills involving workers and community members to evaluate the response strategy's effectiveness.

The EPRP is a dynamic document that will undergo periodic reviews and updates to ensure it remains relevant and effective throughout the Project's lifecycle.

10.8 ESMS Audit, Monitoring, Review and Performance Reporting

Smart has established a Monitoring Programme, integrated into ESMPs, to ensure compliance with ESIA, ESMS, ESMPs, and pertinent national and international standards. This programme aims to:

- Identify new E&S impacts resulting from Project activities and determine appropriate mitigation measures,
- Track the status and effectiveness of actions addressing previously identified E&S impacts,
- Monitor the resolution status of stakeholder grievances,
- Supervise ESMS activities conducted by EPC, subcontractors, and overall Project performance.

Qualified staff and contractor will conduct the monitoring, with results incorporated into reports evaluating non-compliance severity and suggesting remedial actions.

10.8.1 Environmental and Social Monitoring

The Project-specific ESMPs detail actions for mitigating and monitoring E&S aspects, consistent with ESIA commitments. Management Plans furnish the necessary information for ESMS performance monitoring and compliance. Monitoring efforts will match the ESMS risks and Project impacts and comply with relevant obligations and requirements.

The Management Plans delineate specific monitoring activities, their scope, frequency, methodologies, and responsibilities. The division of responsibilities among the Smart and contractors is outlined, taking into account Project obligations such as ESIA commitments, IFC PSs, and Turkish Regulations. The monitoring process will also accommodate any specific requests or requirements from regulatory authorities. Smart retains ultimate responsibility for data collection, processing, and tool management related to monitoring activities conducted by contractors.

10.8.2 ESMS Monitoring

Smart will develop an ESMS monitoring program designed for their operations and associated risks. This program aims to evaluate the effectiveness of prevention and control strategies and ESMS procedures using Key Performance Indicators (KPIs). The ESMS monitoring program for each contractor should, at a minimum, include:

- Periodic meetings,
- Site inspections with findings and corrective action reports,
- Internal audits and subsequent corrective actions,
- Corrective action reports resulting from external audits conducted by Smart and relevant authorities.

10.8.3 Evaluation of Compliance

Smart will oversee internal auditing to evaluate ESMS compliance concerning:

- Turkish legislative requirements and permits,
- IFC PSs,
- Commitments made in the ESIA and other E&S-related documents,
- ESMPs requirements.

EPC will establish a similar system to evaluate their compliance with the operational requirements, and Smart 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 (NC):** Complete deviations or non-fulfilments leading to significant impacts on Smart's operations. Immediate communication with the Smart Project Level's Quality Manager is required. The Manager will identify and seek approval for appropriate preventative actions/corrective actions (PA/CAs). These NCs and implemented PA/CAs will be disclosed during periodic stakeholder engagement and require immediate communication with lenders.
- **Level 2 Non-Compliance (NC):** Complete deviations or non-fulfilments with limited impacts on Smart operations. These NCs require immediate communication with the Smart Project Level's Quality Manager and the implementation of appropriate PA/CAs. Level 2 deviations must be communicated to lenders during periodic updates.
- **Level 3 Non-Compliance (NC):** Partial deviations with limited impacts. Addressed directly by the Smart Project Level's Quality Manager using appropriate PA/CAs. Progress will be reported to Smart Management. No lender communication is required.
- **Observation (OBS):** Non-breach issues requiring actions to enhance performance and achieve compliance.

Smart can identify NCs and OBSs through audits or site inspections at any phase. A PA/CAs process will address each non-compliance situation, identifying root causes to prevent recurrence. EPC must implement a similar system to address relevant NCs.

10.8.4 ESMS Reporting

Smart will generate ESMS reports in line with national, international, and Project-specific reporting standards. The EPC and subcontractors are responsible for periodic reporting to Smart, submitting weekly reports detailing inspection findings and the subsequent corrective actions taken.

Additionally, a monthly report on ESMS statistics will be prepared, highlighting KPIs such as OHS incidents, environmental incidents, and social grievances.

All Project team members are mandated to report incidents and potential hazards to their immediate supervisors. Incidents will be investigated thoroughly, and reports will be prepared in compliance with national and international reporting standards.

In cases of severe incidents, both Smart and EPC, along with their subcontractors, must ensure that affected employees receive:

- Immediate medical assistance and, if necessary, medical evacuation
- Access to employee support programs
- Notification and communication with their family or next of kin
- Unrestricted communication means, such as phones.

10.8.5 Performance Records

Smart will maintain records that demonstrate ESMS performance and compliance with ESMS guidelines, as well as national and international regulations. Responsibility for record-keeping will lie with the Site Chief. Examples of these records include:

- Internal ESMS audit and inspection reports
- External ESMS audit summaries
- Forms detailing non-conformities and corrective/preventive actions
- Minutes from management review meetings
- ESMS monitoring reports, including analytical certifications
- Logs of submitted grievances
- Incident records and related investigations
- Correspondence with regulatory bodies
- Stakeholder communication and engagement documentation
- Any other pertinent documentation showing ESMS performance.

Contractor is required to establish a comparable system and relay the results to Smart.

10.8.6 Inspection & Audit

Smart will design an inspection and audit program detailing schedule, frequency, objectives, and auditor responsibilities. This program will be regularly executed to ensure:

- Compliance with ESMS and HR policies, and stipulations in the ESMPs.
- Effective execution of Contractor's Management Plans, derived from Smart's ESMP criteria.

- Adherence to national regulations, ESIA commitments, and IFC PSs.
- Contractor alignment with contractual obligations.

Smart will conduct ESMS site inspections to confirm compliance during the construction phase. Contractors are tasked with conducting weekly site ESMS inspections.

Smart's internal audit teams will carry out monthly internal audits and inspections to assess ESMS performance.

External audits will be conducted by various entities, including National Authorities, Lenders' Environmental & Social Consultants, and Integrated Management System Monitoring teams. These audits aim to:

- Evaluate Project alignment with Turkish regulatory mandates, ESIA commitments, and IFC PSs.
- Confirm the effective implementation of ESMS, including policies, manuals, ESMPs, and procedures.

10.8.7 Management Review

Smart's Management will periodically evaluate the ESMS's performance (quarterly during construction and annually during operation) to ensure its adequacy and effectiveness concerning Project activities. The Site Chief will organize management review meetings in situations involving:

- Significant Non-Compliances (e.g., Level 1 and Level 2)
- Severe injuries or fatalities affecting Project stakeholders
- Major alterations to the Project design necessitating a management of change procedure
- Grievances that could attract media attention or lead to claims
- Substantial shifts in regulatory frameworks.

Documentation supporting the management review will include:

- Internal/external audit findings and non-compliance records
- ESMS statistics and incident reports
- Updates on preventive/corrective actions
- Progress updates from prior management review sessions
- ESMS monitoring summaries
- Records of submitted grievances and stakeholder engagement activities.

Meeting minutes, detailing agreed-upon actions, measures taken, and associated responsibilities, will be provided by the Smart Site Chief. Adjustments to ESMS documentation, including policies, procedures, and ESMPs, may be required as deemed necessary.

ESMS Coordinators from contractors may be invited to participate in these management review meetings when actions affecting their operations are under discussion. Contractors are expected to establish a similar management review mechanism and report progress to Smart.

10.8.8 Commitments Register

All mitigation measures identified in the ESIA package to address potential project impacts have been documented in a Commitments Register (provided below). This register comprises tables outlining the pertinent mitigation and monitoring measures for each environmental and social component. The Commitments Register, an integral part of the ESIA package, serves as a consolidated tool detailing the mitigation measures and monitoring activities specified in the ESIA package throughout the Project's 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	▪ Cultural sensitivity training will be provided for both incoming workers and local residents to foster mutual understanding, respect, and cooperation, thereby minimizing the potential for social tensions and conflicts. ▪ An Employee Code of Conduct will be developed and enforced to ensure proper behaviour and respect for local customs. ▪ Priority will be given to the recruitment of local residents for employment opportunities generated by the Project. ▪ When necessary, protocols for managing offsite accommodations will be implemented to safeguard workers' well-being and safety. ▪ Measures will be implemented to mitigate environmental impacts associated with increased population, such as waste management programs, and pollution control measures, to preserve the natural ecosystem and quality of life for residents. ▪ Transparent grievance mechanisms will be established to allow residents to voice their concerns and complaints regarding the Project impacts, ensuring timely resolution and accountability.	▪ Periodic assessments will be conducted to evaluate the condition and adequacy of Project infrastructure, ensuring that they meet the needs of the growing population. ▪ Periodic assessments will be conducted to monitor the effectiveness of environmental protection measures and identify any emerging issues or concerns related to pollution, waste management, or ecosystem health. ▪ Employment statistics will be analysed regularly to track the proportion of local residents employed by the Project and assess the success of training and skills development initiatives in enhancing local employability. ▪ The effectiveness of cultural sensitivity training programs will be evaluated through feedback surveys. ▪ The operation of grievance mechanisms will be reviewed regularly to assess their accessibility, transparency, and responsiveness in addressing community concerns and complaints related to the Project impacts.
	Operation	Plant operation		
Infrastructure, Social Services and Ecosystem Usage	Construction	General engineering/construction works	▪ An Emergency Preparedness and Response Plan will be developed and implemented to ensure timely and effective responses to emergencies, minimizing potential disruptions to infrastructure and services. ▪ A Traffic Management Plan will be prepared and implemented to mitigate congestion and ensure efficient traffic flow, reducing impacts on transportation infrastructure and services. ▪ As previously mentioned, the Emen village road has been disrupted due to other projects. The YEKA area has a Joint Venture ("KES Adi Ortaklığı") comprising three companies operating within the area, each with responsibilities that must be fulfilled. The KES Adi Ortaklığı will collectively address the issue concerning the Emen road and undertake measures to mitigate the damages caused. ▪ Collaboration with other projects will be ensured to develop comprehensive strategies for managing traffic and enforcing speed limits in the area. Physical speed reduction measures	▪ Implementation of relevant management plans, ▪ Tracking traffic-related incidents involving contractor workers, subcontractor workers, and external individuals, ▪ Documenting instances of full road closures attributed to Project activities, ▪ Maintaining records of grievances received from external stakeholders regarding access to education and health, along with the percentage of grievances resolved positively, ▪ Documenting emergency response actions taken, ▪ Monitoring the usage of water resources that impact local communities, ▪ Recording community feedback and satisfaction levels through surveys or engagement sessions.
	Operation	Plant operation		

Component	Phase	Project action	Mitigation measures	Monitoring measures
			will be installed, such as putting speed bumps to naturally slow down vehicles entering the village. ■ A first aid station and medical unit will be established onsite to promptly address any health-related incidents among workers, minimizing the strain on local healthcare facilities. ■ Immediate maintenance will be applied in the event of damage to local infrastructure, such as telecommunications, electricity, roads, and water sources, to minimize disruptions and restore functionality. ■ A Project-specific Grievance Mechanism will be implemented to record, address, and resolve incidents impacting local infrastructure and ecosystem services usage, promoting transparency, accountability, and community engagement in mitigating adverse impacts. ■ Local authorities and communities will be involved in transportation planning to identify and address specific needs and concerns related to commuting and transportation services, ensuring inclusive decision-making and tailored solutions to mitigate transportation-related impacts. ■ Drinking water for personnel will be provided in bottled form, with potable water for mobilization area sourced via water tankers. ■ Continuous monitoring of water usage and quality will be conducted throughout the construction phase to ensure compliance with regulatory standards and environmental protection measures. ■ Regular maintenance and inspection of water supply infrastructure will be carried out in mobilization area to prevent leaks, contamination, or other issues that could compromise water quality or availability	
Land Use and Land-based Livelihoods	Construction	General engineering/construction works	■ 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. ■ Social responsibility projects will be developed and implemented to enhance local infrastructure, education, healthcare, and economic opportunities to mitigate Project impacts on land-based livelihoods. ■ Alternative income-generating activities, vocational training, and entrepreneurship opportunities will be supported for	■ Monitoring local employment figures of community members, with a specific focus on women. ■ Tracking support provided to livestock breeders, including feed, tools, and supplies, along with engagement and grievance records. ■ Monitoring carrying capacity of remaining pastureland through stakeholder engagement and grievance mechanism. ■ Recording support provided to farmers, such as seeds, tools, fertilizer, and collaboration with local cooperatives for agricultural production.
	Operation	Plant operation		

Component	Phase	Project action	Mitigation measures	Monitoring measures
			affected communities to mitigate economic displacement due to the Project and promote sustainable livelihoods. ▪ YEKA area has a Joint Venture (“KES Adi Ortaklığı") comprising three companies operating within the area. Each company within this joint venture holds responsibilities that must be fulfilled. As part of this partnership, including Smart, measures will be implemented to restore the livelihoods of individuals affected by the projects in the region. ▪ Affected households in Seslikaya village will be given priority during the recruitment process. ▪ Feed assistance will be provided to individuals engaged in animal husbandry, particularly in Seslikaya village, to ensure that the nutritional requirements of livestock are met and to support the livelihoods of households. ▪ Since agriculture and animal husbandry are simultaneously practiced in Seslikaya, households engaged in agriculture will receive assistance in agricultural production to support income-generating activities. ▪ Efforts will be made to ensure that the support provided is tailored to the specific needs and circumstances of the households in Seslikaya village. ▪ Training programs/workshops for the local community will be provided on sustainable farming and animal husbandry practices. ▪ Vulnerable groups that will be affected by the Project will be determined and special assistance will be provided. ▪ During the social surveys, vulnerable groups identified within the villages. As per Smart’s request for a list of individuals in need, the identified individuals have been shared with Smart to provide food aid to these groups during the Eid. This approach will be maintained throughout the Project lifecycle. Vulnerable groups in the villages will be periodically identified to update information and ensure that assistance reaches every person who requires support. ▪ Regular monitoring and evaluation mechanisms will be established to assess the impact of the assistance programs and make any necessary adjustments to ensure their continued effectiveness in supporting the livelihoods of the local community. ▪ Transparent and fair negotiations will be conducted with two of the privately owned lands on the ETL route, seeking their	▪ Documenting damage and compensation on lands due to unexpected events. ▪ Tracking adoption of new/improved technologies and their impact on agricultural production. ▪ Documenting new agricultural production patterns and training programs for capacity building and skill development. ▪ Collaborating with local authorities for capacity enhancement strategies and engaging with vulnerable groups. ▪ Recording grievances related to vulnerable groups and resolution processes, as well as prioritizing them for employment opportunities. ▪ Documenting social responsibility projects targeting vulnerable groups and measures taken to mitigate negative impacts.

Component	Phase	Project action	Mitigation measures	Monitoring measures
			consent for land acquisition and ensuring fair compensation for any loss of land and livelihoods. ■ Legal support and assistance will be provided to the landowners to protect their rights during the land acquisition process. ■ Any loss of or damage to crops caused by Project activities (including associated facilities) will be compensated. ■ Meaningful consultation and participation with affected communities and actively seeking their input and feedback on livelihood restoration initiatives will be ensured to incorporate their perspectives into decision-making processes. ■ Grievance mechanisms will be established to address any grievances raised by affected landowners and communities promptly. ■ A Community Liaison Officer will be employed to facilitate communication and engagement with the local communities throughout all Project phases, ensuring concerns are addressed and feedback is incorporated into decision-making processes	
Economy and Employment	Construction	All project activities during the construction phase	■ An assessment will be conducted to evaluate the availability of local workforce skills and identify actions necessary to enhance local employment opportunities. ■ Preference criteria for hiring will focus on settlements directly impacted by the Project activities. If required skills cannot be met locally, the Project will then employ workers from the regional and national levels. ■ Priority will be given to individuals previously engaged in grazing on the Project site, as well as those who are unemployed or living in poverty. ■ A formal and transparent recruitment process will be established to ensure equal opportunities for all applicants. ■ Both the village Mukhtars and local residents will be informed about the Project's recruitment opportunities through announcements and banners, ensuring equal access to information for all. ■ Scholarship programs and vocational training initiatives will be implemented aimed at supporting local communities, providing educational opportunities, and enhancing skill sets to facilitate employment prospects generated by the Project,	■ Regular monitoring of economic indicators and employment statistics to assess the Project's impacts on the local economy and employment rates. ■ Assessment of training plans to determine their effectiveness in meeting Project objectives and improving worker skills. ■ Documentation and tracking of grievances received, along with details of the issue, actions taken, and resolution status. ■ Verification of annual energy production data to ensure accuracy and reliability. ■ Timely and transparent publication of energy production information on the Project website.-

Component	Phase	Project action	Mitigation measures	Monitoring measures
			promoting socio-economic development and reducing dependency on Project-related services. ■ Local suppliers will be identified prior to procurement, with priority given to sourcing goods and services from local businesses. ■ Equal procurement opportunities will be provided to local small businesses through the Supplier Management Plan to be developed, ensuring an impartial and equal tender process.	
	Operation	Plant Operation	■ Opportunities for skills development and career advancement through training programs and promotions will be offered for workers affected by retrenchment, enabling them to transition into other employment opportunities or sectors. ■ Initiatives aimed at diversifying the local economy to create new job opportunities beyond the Project could be supported, such as promoting small business development, entrepreneurship, and tourism within the scope of corporate responsibility projects. ■ Opportunities for infrastructure investment or development projects in the area could be explored to stimulate economic growth and create new employment opportunities for post-decommissioning. ■ Assistance programs could be established to provide financial support and assistance with essential needs for retrenched workers during their transition period. ■ Engagement with local communities, labour unions, and relevant stakeholders will be conducted to identify additional measures to mitigate the impact of retrenchment and support affected workers. ■ Continuous monitoring and evaluation of the socio-economic impacts of the operation and decommissioning phase will be conducted to identify any emerging challenges or opportunities and adjust mitigation measures accordingly. ■ The Worker Grievance mechanism to be developed during the construction phase will be implemented.	
Labour and Working Conditions	Construction	All project activities during the construction phase	■ The following policies and plans will be developed and implemented to prevent and regulate risks associated with labour and working conditions: ▪ Human Resources Policy	■ Regular monitoring and assessment of working conditions will be conducted to identify and address potential hazards. ■ Policies and procedures will be regularly reviewed and updated to adapt to changing labour laws and industry standards.

Component	Phase	Project action	Mitigation measures	Monitoring measures
	Operation	Plant operation	▪ Human Resources Management Plan ▪ Labour Management Plan ▪ Occupational Health and Safety Plan ▪ Offsite Accommodation Management Plan ▪ Community Health and Safety Plan ▪ Security Management Plan ■ The Human Resources Policy and Management Plan will observe wage standards and working hour regulations and eliminate child and forced labour, discrimination, bullying, and harassment. ■ Information on entitlements, benefits, and rights such as wages, hours of work, overtime arrangements and overtime compensation, and any benefits (sick, maternity/paternity, or holiday leave) will be provided to all workers. ■ All workers will receive verbal explanations of their contracts as needed, ensuring they fully understand their rights before signing any employment agreements. ■ Fair and timely payment of wages and benefits, including overtime compensation, will be ensured. ■ Wages, benefits, and working conditions provided to workers will be aligned with industry standards in Niğde and the relevant sector, ensuring comparability with equivalent employers. ■ Adequate rest periods and breaks during shifts will be provided to prevent fatigue and promote well-being. ■ Open communication and dialogue between management and workers to address concerns and improve working conditions will be encouraged. ■ Workers will be allowed to join trade unions and engage in collective bargaining. ■ A grievance mechanism for workers will be established and implemented, providing a channel for addressing grievances related to Gender-Based Violence and Harassment (GBVH) as well as facilitating anonymous submission of grievances. ■ Recruitment processes will be transparent and non-discriminatory.	■ Monitoring and oversight mechanisms will extend to third-party contractors to ensure compliance with labour regulations, safety standards, and project requirements. ■ Compliance of contractors and supply chain companies will be monitored. ■ Independent audits and inspections will be conducted as part of the monitoring process. ■ Regular monitoring will be conducted for the following documentation: ▪ Employment agreements with contractors and subcontractors, ▪ Documentation of employment contracts and employee registration, ▪ Records of employee training activities, including training materials, participant lists, training schedules, and photographs, ▪ Incident records documenting any workplace incidents or accidents, ▪ Records of grievances raised by workers will be documented and resolutions, ▪ Collective agreements, if applicable, ▪ Occupational health and safety records, including documentation of safety measures and compliance with regulations.

Component	Phase	Project action	Mitigation measures	Monitoring measures
			■ Child and forced labour will be prohibited, adhering to national legislation and international standards. ■ Occupational health and safety standards will be strictly adhered to, promptly addressing hazards or concerns. ■ Regular training sessions and workshops on occupational health and safety practices will be conducted. ■ First aid and medical facilities, along with safety provisions against potential hazards, will be established. ■ Accommodation for workers will be clean and safe, meeting basic needs of workers such as sanitary, laundry and cooking facilities and avoiding overcrowding. ■ Heating, air-conditioning, and ventilation will be provided appropriately to ensure a comfortable and healthy environment for workers to rest and spend their spare time. ■ Drinking water and water for food preparation, washing, and bathing will meet the requirements of the Turkish Regulation Concerning Water Intended for Human Consumption. ■ Workers will be informed of accommodation rules and provided access to grievance mechanism. ■ It will be ensured that third-party contractors adhere to labour laws and international standards, providing adequate protections and benefits for the workers. ■ Third-party workers will be treated fairly and equitably, regardless of their employment arrangement. Discrimination or exploitation of third-party workers will not be tolerated.	
Community Health and Safety	Construction	General engineering/construction works	■ A Community Grievance Mechanism will be implemented and accessible to all stakeholders to submit grievances regarding community health and safety issues. **Increased and/or modified road traffic** ■ Measures will be implemented to manage traffic effectively during peak hours, with equipment and material transportation scheduled during quieter times to prevent congestion on local roads. Road suitability for heavy vehicle use will be ensured through permits and maintenance and promptly addressing necessary repairs. Adequate lighting will be installed at the Project site to maintain visibility, and construction on existing roads will commence only after obtaining permits, with necessary precautions taken.	■ Traffic-related incidents involving workers and external persons will be recorded and tracked, with incident investigations used to improve mitigation strategies. ■ Compliance with speed limits will be monitored to protect both community and employee safety. ■ Road conditions and necessary road improvements will be monitored regularly. ■ Records of driver training and community health and safety training will be maintained. ■ Operator licenses and medical surveillance will be monitored to ensure compliance.
	Operation	Plant operation		

Component	Phase	Project action	Mitigation measures	Monitoring measures
			▪ Compliance with speed limits will be enforced to protect both community and employee safety. Collaboration with other projects will be ensured to develop comprehensive strategies for managing traffic and enforcing speed limits in the area. Physical speed reduction measures will be installed, such as putting speed bumps to naturally slow down vehicles entering the village. ▪ Vulnerable areas such as schools will be identified for construction traffic access planning, and driving trainings will be given to the personnel. Vehicles **will** strictly follow designated routes, with off-road driving **allowed only in emergency situations**. If reversing cannot be avoided in the work areas, necessary reversing procedures will be identified, including using reversing aids and trained personnel when necessary. ▪ Designated parking areas will be marked, reverse parking will be implemented for emergencies, and pedestrian routes will be segregated from heavy vehicle paths where feasible. Traffic signs, signals, and barriers will be deployed to prevent accidents All vehicle operators will hold appropriate licenses and undergo medical checks, with repair and maintenance conducted by authorized bodies. Regular monitoring of road conditions and improvements will be undertaken as needed, with fatigue and distraction procedures established by local regulations. ▪ Community engagement will include informing residents about traffic management controls with collaboration sought to enhance signage and visibility, especially in areas with children. Additional driver training programs will enhance road safety, while increased speed control mechanisms and enforcement will be implemented. Collaborative scheduling adjustments for public transit will minimize school bus stop and pedestrian crossing times, with multi-stakeholder cooperation seeking to mitigate negative road safety impacts. ▪ A Traffic Management Plan that includes the above measures will be prepared and implemented to maintain traffic safety on the roads and to prevent the risks associated with the Project activities ensuring a “safe site, safe vehicle and safe driver” at all times. The Traffic Management Plan will be applicable and implemented during the construction and operation phases. **<u>Risk of Communicable Diseases</u>**	▪ The number of road closures caused by Project activities will be tracked. ▪ Vehicle maintenance records will be controlled to ensure regular maintenance. ▪ Grievances related to traffic will be recorded, and resolution rates will be tracked. ▪ Traffic density will be monitored through regular traffic counts and analysis of congestion levels during peak hours, with adjustments to transportation schedules as necessary to alleviate congestion. ▪ Inadequate waste management will be monitored through regular inspections of waste disposal practices, including audits of waste handling procedures and assessments of compliance with waste management regulations. ▪ The risk of communicable diseases will be monitored through regular health surveillance, including screening for symptoms, and tracking disease prevalence among workers and the local community. ▪ In case of any Project related dust and degradation of air quality grievance, particulate matter measurement campaign will be carried out immediately at the area where the related grievance is received. ▪ 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. ▪ Security risks and employment of security personnel will be monitored through regular assessments of security protocols and personnel conduct, including evaluations of security measures effectiveness and compliance with applicable laws and standards.

Component	Phase	Project action	Mitigation measures	Monitoring measures
			The population influx due to the Project may contribute to a rise in communicable and infectious diseases. To prevent the spread of such illnesses, the following measures need to be implemented: ■ Pre-employment health screening and regular medical checks of workers will be conducted in compliance with Turkish regulatory requirements. ■ Adequate hygiene facilities, such as handwashing stations and sanitation equipment, will be provided throughout the Project site. ■ Regular cleaning protocols will be applied across the Project site to maintain hygiene standards. ■ Shared facilities and common areas will be regularly disinfected to minimize the spread of pathogens. ■ Isolation protocols will be established for individuals displaying symptoms of illness to prevent transmission. ■ Collaboration with local healthcare authorities will facilitate rapid response and containment in case of disease outbreaks. ■ Workers will be encouraged to use social distancing measures and personal protective equipment (PPE) to reduce the risk of transmission. ■ Employee training will be provided to raise awareness and promote healthy lifestyles among workers and the community. **Disposal of waste deriving from construction activities** ■ Appropriate waste disposal facilities, such as licensed landfills or recycling centres, will be utilized for the safe and environmentally responsible disposal of waste materials. ■ Project personnel will receive training on proper waste management practices to minimize the generation of waste and maximize recycling and reuse opportunities. ■ Measures will be implemented to prevent littering and illegal dumping of waste materials, including the installation of signage and barriers to deter unauthorized disposal. ■ Regular monitoring and inspection of waste disposal practices will be conducted to ensure compliance with applicable laws and regulations.	

Component	Phase	Project action	Mitigation measures	Monitoring measures
			■ Regular audits and reviews of waste management practices will be conducted to identify areas for improvement and implement corrective actions, as necessary. ■ A comprehensive waste management plan outlining procedures for proper handling, storage, and disposal of all waste materials generated during the Project activities will be implemented. **Emission of dust and particulate matter** ■ Dust control measures such as using dust suppression systems on construction machinery and covering stockpiles of materials will be implemented. ■ Transportation routes will be regularly watered. ■ Construction activities will be enclosed whenever feasible to minimize the dispersion of dust into the surrounding air. ■ Air quality levels in the Project AoI will be monitored in case of any grievances occurred regarding air quality. ■ Strict adherence to emission standards for construction equipment and vehicles will be ensured, including regular maintenance and inspection. ■ Collaboration with local environmental authorities will be established to develop and implement best practices for dust control and air quality management. ■ Dust control measures will be integrated into the relevant management plan to ensure comprehensive management of environmental impacts throughout the Project lifecycle. **Emission of Noise** ■ Noise-reducing equipment and machinery will be utilized where possible. ■ Sound barriers or enclosures of the equipment will be installed around noisy operations. ■ Noisy activities will be scheduled during off-peak hours to minimize disturbance to nearest settlements. ■ Mufflers or silencers will be installed on equipment to reduce noise emissions. ■ Periodic inspections, regular maintenance and repair of machinery will be conducted by the authorized services to minimize noise from mechanical operations.	

Component	Phase	Project action	Mitigation measures	Monitoring measures
			■ Workers will be trained on noise management techniques and the importance of minimizing noise pollution. ■ Regular noise monitoring surveys will be conducted to assess the effectiveness of mitigation measures and identify areas for improvement. ■ Community engagement will be prioritized to address concerns and solicit feedback on noise mitigation efforts and grievance mechanism to record and respond to complaints will be developed. **Security Risks and Employment of Security Personnel** ■ Security personnel, who are members of the local community and familiar with local customs, will be employed, if possible, as a positive and visible point of contact between the Project and the local communities. ■ Security services at the Project site will be provided by third-party company or in-house security personnel with clean criminal records and no history of abuse. Background checks will be conducted on all security personnel to ensure suitability for their roles. ■ Security personnel will receive continuous training and professional development opportunities in their designated roles and responsibilities, including the use of force (and, where applicable, firearms) and appropriate conduct toward workers and affected communities in compliance with the requirements of applicable laws and international standards. ■ Stakeholder consultations and transparent communication channels will be established allow workers and the local community to express their concerns about security arrangements and the conduct of security personnel. ■ Regular performance evaluations and monitoring of security personnel conduct will be carried out to maintain professionalism and adherence to established protocols. ■ Unauthorized entry will be prevented using appropriate tools and gadgets, with warning signs about unauthorized entry displayed at various locations at the Project crossings. ■ Hazardous areas within the Project site will be marked with appropriate signs. ■ Entry and removal of equipment/material will be strictly controlled at designated control points, with movement allowed only after approval from the relevant department.	

Component	Phase	Project action	Mitigation measures	Monitoring measures
			■ Relevant Project officials will continuously accompany visitors during their stay on the Project site, and all visitors will be documented. ■ Visitors will be provided with informational brochures detailing the Project area, site rules, and emergency procedures. ■ Personal Protective Equipment will be provided to all visitors entering the Project site. ■ Regular security patrols will be conducted at scheduled intervals. ■ A Security Management Plan will be developed in accordance with both national (Private Security Services Law No: 5188, 2004) and international (e.g., IFC PS4) standards to address security-related impacts and safeguard the activities, assets, and premises at the Project site, while also mitigating potential impacts on workers and the local community. **<u>Abandoned Infrastructure</u>** ■ A decommissioning plan will be developed and implemented to outline procedures for the safe removal, disposal, or repurposing of infrastructure to minimize negative impacts on the community. ■ Community outreach and communication efforts will be undertaken to inform residents about the decommissioning process, potential risks associated with decommissioning works, and safety precautions to be observed. ■ Resources and support will be provided for community-led initiatives aimed at repurposing or revitalizing abandoned infrastructure to benefit the community while mitigating safety concerns.	
	Construction	General engineering/construction works	■ A Chance Find Procedure will be prepared in compliance with the project organization, and it will be implemented that is necessary for the management of the “chance finds”. All construction workers should receive a training on project requirements, protection of cultural and archaeological heritage, laws and legislations related with the archaeological and cultural heritage and chance find procedure. ■ When any chance find occurs during the construction activities, the further steps should be taken in accordance with the Chance Find Procedure and the relevant bodies, and the Directorate of the Museum will be notified immediately. Relevant instructions about the sensitivity of	■ During construction phase of the Project, especially during land preparation phase, excavated areas should be visually monitored in case of chance finds.
	Operation	-		-

Component	Phase	Project action	Mitigation measures	Monitoring measures
			the site will be shared with all construction team a few days before the construction activities, in case of any find or information associated with archaeological potential of the site is already discovered. Chance finding should not be moved, removed or further disturbed. The proper equipment will be identified and used with the consideration of the directorate of the museum and the construction teams. ▪ All construction personnel working during land preparation phase of the construction phase should receive training on project requirements, protection of cultural and archaeological heritage, laws and regulations regarding archaeological and cultural heritage and Chance Find Procedure.	
Visual Aesthetics	Construction	General engineering/construction works;	▪ The areas used as construction area will be returned to their original use. ▪ Dust suppression will be implemented during construction phase. ▪ The housekeeping of the entire Project Area will be given importance throughout the life of the Project. ▪ The number of lights will be minimized to decrease light spillage from the site in line with health and safety standards. Also, all lights should be shielded and pointed to the ground to avoid direct light effects on the resettlements around the Project Area. ▪ Affected people's grievances on visual impacts should be regularly monitored. For this purpose, the external grievance mechanism should be implemented, and all stakeholders should have access to this mechanism	Monitoring visual impacts involves observing how the community and stakeholders are affected. Any concerns raised will be documented and addressed through the Grievance Mechanism outlined in the Project's Stakeholder Engagement Plan, consistently throughout construction and operation phases. The Client will oversee regular checks on the visual and aesthetic state of Project facilities. These checks will occur during construction and operation phases with qualified personnel for evaluating aesthetic standards and taking necessary actions in coordination with contractors or upper management, as necessary.
	Operation	Plant Operation		

Table 10-4: Mitigation measures and monitoring actions for the Physical components

Component	Phase	Project action	Mitigation measures	Monitoring measures
Air Quality	Construction	▪ Vegetation clearing/soil removal (earthworks) ▪ General engineering/construction works ▪ Transportation of construction materials	▪ Construction sites and transportation routes will be sprayed with water, especially during hot-dry seasons and windy conditions, while dust-generating work will be slowed or halted during strong winds, supplemented by additional water spraying as needed. ▪ Material handling will be minimized, and where dust levels remain problematic, additional control measures such as spraying with water during material handling will be implemented. ▪ Trucks carrying dust-generating materials will be covered with tarp and have their loads sprayed with water to minimize dust. ▪ Loading and unloading will be carried out without skidding to prevent dust generation.	▪ Monitoring PM10 levels at the closest sensitive receptors in case of grievance, ▪ 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 exceptional incidents that cause extra dust or gas emissions, either on- or offsite, and the action taken to resolve the situation in the logbook. ▪
	Operation	▪ Plant/infrastructure operation	▪ Construction traffic will avoid passing through settlements whenever possible; if unavoidable, measures such as speed limits will be implemented to minimize emissions, and affected communities will be informed of activities and schedules. ▪ Speed limits will be enforced, and vehicle movements and idling will be minimized. ▪ Vehicle engines and machinery will be operated only when essential to reduce emissions. ▪ Lighting fires and burning materials will be strictly prohibited. ▪ Minimum necessary number of equipment/vehicles will be used simultaneously. ▪ Transportation distances will be minimized where feasible. ▪ Regular checks and maintenance of machinery and equipment will be conducted for providing optimal working conditions and compliance with environmental standards and regulations. ▪ Vehicle exhaust emissions must comply with regulations, with routine maintenance and emission measurements conducted accordingly. ▪ Stockpiles will be kept for the shortest possible duration and sited considering prevailing wind directions to minimize impacts on sensitive receptors.	▪ Routine maintenance program will be set-up and maintenance records will be kept for all vehicles, machinery/equipment; ▪ Maintaining a logbook 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.

Component	Phase	Project action	Mitigation measures	Monitoring measures
			▪ Electric powered equipment mechanization will be used when feasible. ▪ Personal protective equipment, such as dust masks, will be provided to workers where excessive dust levels are expected. ▪ Grievance mechanism to record and respond to complaints will be developed;	
Noise and Vibration	Construction	▪ Vegetation clearing/soil removal (earthworks) ▪ General engineering/construction works ▪ Transportation of construction materials	▪ Machinery and equipment which have lower sound power levels, will be selected; ▪ Operation hours of specific operations, machinery or equipment, especially mobile sources that will operate through the community areas, will be limited; ▪ Noise sources will be re-located to less sensitive areas to take advantage of distance and shielding where possible; ▪ Speed limit applications will be applied for the Project machinery and vehicles that will transport construction materials and equipment; ▪ Project traffic will be reduced by routing out of community areas wherever possible; ▪ Suitable mufflers on compressor components and engine exhausts will be installed; ▪ Acoustic enclosures for equipment casting radiating noise will be installed; ▪ Engine covers will be kept closed to minimize noise when the equipment is in operation; ▪ Idling of construction machinery and vehicles will be avoided; ▪ New and/or properly refurbished and regularly maintained machinery, vehicles and equipment will be used to the extent possible; ▪ Any component of machinery or equipment, which generates excessive noise (e.g., broken or loosely placed engine hood, a defective muffler, etc.) will be discarded if the related components cannot be repaired/maintained and they will be replaced as appropriate;	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.

Component	Phase	Project action	Mitigation measures	Monitoring measures
			▪ Workers will be trained regarding to best practices, including switching off equipment when it is not required and avoiding unnecessary operation of engines; ▪ Grievance mechanism to record and respond to complaints will be developed; ▪ Regular maintenance of the construction machinery and equipment will be carried out, in order to minimize the possible high noise levels that might be generated by the machinery and equipment.	
	Operation	▪ Plant operation	▪ Maintenance of the equipment will be done on regular basis in order to ensure that possible noise emissions are minimized; ▪ In case of any noise related grievance, noise measurement campaign will be carried out immediately at the area where noise related grievance is received; ▪ In case of any exceedance in the defined noise limit values, noise levels will be monitored at the receptors where the noise levels are exceeded, at least for a year on monthly basis; and ▪ In cases when monitoring results indicate that noise levels are exceeded the defined noise limit values, then noise abatement measures such as soundproofing, noise barriers at the source, etc. will be implemented.	During the operation phase of the Project, noise measurements will be carried out in case of any Project related noise grievance. In case of any exceedance in the defined noise limit values, noise levels will be monitored at the receptors where the noise levels are exceeded, at least for a year on a monthly basis.
Soil and Subsoil	Construction	▪ Vegetation clearing/soil removal (earthworks) ▪ General engineering/construction works ▪ Transportation of construction materials ▪ Temporary stockpiling of material (storage)	**Minor Leakage of Contaminants into Soil** ▪ Specific plans for pollution prevention and waste management will be enforced to ensure prompt control of releases and spills before they reach significant levels that could potentially impact soil quality. ▪ Hazardous material storage area, where chemicals and liquids are stored, has been constructed to prevent soil contamination. This involves paving these areas with adequate secondary containment, installing proper drainage systems, and adhering to Material Safety Data Sheet (MSDS) requirements. Additionally, the Project will adhere to relevant legal and safety regulations to prevent leaks from on-site hazardous material storage facilities. ▪ Temporary waste storage area has been constructed in accordance with regulations outlined in the Waste Management Regulation issued in the Official Gazette on April 2, 2015, and GIIP. These areas has been situated away	▪ Regular site inspections will be conducted to confirm that drains remain clear of sediment buildup, ensuring unimpeded flow of runoff at sediment traps. ▪ Visual inspections of stormwater and wastewater drainage systems, as well as septic tanks, will be conducted periodically to assess their integrity and functionality. ▪ Site inspections will be regularly conducted and documented to detect any potential leaks. ▪ Periodic site inspections will be performed to identify any damage to hazardous materials storage areas and waste storage areas. ▪ Training sessions on spill response and the proper use of containment and cleanup materials will be documented for all workers, including subcontractor personnel. ▪ Site inspections will be conducted at regular intervals to verify the availability of an adequate supply of spill response materials,
	Operation	▪ Plant operation		

Component	Phase	Project action	Mitigation measures	Monitoring measures
			from facilities and human traffic, with space provided for licensed waste vehicle access. Precautions against fires and spills, such as fire extinguishers and spill kits, will be in place. Hazardous and non-hazardous wastes will be stored separately, with different entrance doors. Suitable drainage systems will be installed to collect any leaks. The storage area floor will be covered with impermeable concrete, and hazardous waste compartments will have raised concrete walls/parapets to prevent leaks. Wastes will be stored in tanks and containers, with labels indicating the waste type. Regular waste removal will be ensured to prevent storage area overcapacity. ■ Industrial Waste Management Plans for temporary waste storage areas established by contractors will be submitted to the relevant Provincial Directorate of the Ministry of Environment, Urbanization, and Climate Change as per defined format. ■ Temporary Waste Storage Permits will be obtained from the related Provincial Directorate of the Ministry of Environment, Urbanization, and Climate Change for temporary waste storage sites generating hazardous waste exceeding 1,000 kg per month. ■ Hazardous Materials and Hazardous Waste Compulsory Liability Insurance will be acquired for hazardous waste temporary storage areas/containers, regardless of the stored hazardous waste amount, following regulations outlined in the Waste Management Regulation. ■ Agreements for waste reuse, recycling, recovery, and disposal will be made with the municipality and licensed firms. ■ Official waste declarations for all generated waste will be submitted to the online system of the Ministry of Environment, Urbanization, and Climate Change annually. ■ Storage of waste outside designated areas will be prohibited and wastes from interim storage areas will be transferred to temporary storage areas. ■ Regular maintenance of vehicles and machinery/equipment will be conducted to prevent oil/fuel leaks. ■ Refuelling and maintenance of machinery/vehicles will be conducted on impervious surfaces or with drip trays to prevent soil contamination during refuelling operations.	such as spill kits and metal trays, at the site and within each heavy machinery, with detailed records maintained. ■ A routine maintenance program will be established for all vehicles and machinery/equipment, with maintenance records meticulously kept.

Component	Phase	Project action	Mitigation measures	Monitoring measures
			■ Generators and equipment containing chemicals will be placed in contained areas to minimize drainage, spillages, and leaks. ■ Secondary containments, ponds, and drip trays will be regularly inspected, especially during extreme weather conditions. ■ Portable spill containment materials will be provided and spill response training will be given to workers. ■ In case of spills or leaks, accredited laboratories will conduct sampling and analysis to identify contamination levels and plan corrective actions accordingly. ■ Emergency Preparedness and Response Plans will be implemented to manage spills and leaks. **Discharge of Wastewater** ■ Septic tanks will be made leakproof, and measures will be taken to prevent deformation in extreme weather. ■ No untreated wastewater discharge to land will be allowed, and polluted water resulting from accidental leaks will be collected or managed to prevent soil pollution.	
Geology and Geomorphology	Construction	▪ Vegetation clearing/soil removal (earthworks) ▪ General engineering/construction works ▪ Temporary stockpiling of material (storage)	■ Comprehensive studies of geological and geotechnical aspects, including seismicity, have been conducted for the Project prior to the construction phase as part of the local Environmental Impact Assessment (EIA). The suggestions outlined in these studies must be put into practice. ■ The worksite will be reduced to the minimum necessary extent to fulfil the Project's tasks and activities. ■ The construction site will be minimized as much as possible to fulfil the Project's tasks and activities. ■ The foundations' dimensions, both in terms of footprints and depths, have been appropriately sized, thereby minimizing excavations and the resulting physical-mechanical disturbances. ■ The flattening and excavation process will be minimized as much as possible to restrict morphological disturbances. ■ If the removed material possesses appropriate geotechnical characteristics, a portion of it will be reused as fill material in the Project Area, aiming to minimize the consumption of raw materials	There is no need for specific monitoring activities for this component.

Component	Phase	Project action	Mitigation measures	Monitoring measures
	Operation	-	-	-
Seismicity	Construction	-	▪ Prior to and throughout construction activities within the study area, adherence to the "Türkiye Building Earthquake Regulation" (Official Gazette Number: 30364 Date: 18.03.2018) will be ensured. ▪ Thorough examinations will be carried out to evaluate the stability of structural elements under both regular operational loads and seismic loads. The Türkiye Building Earthquake Regulation mandates the determination of specific parameters before construction, and these parameters have been identified through geological and geotechnical investigations in the Project Area. ▪ Numerous structures will be constructed as integral components of the Project, and their design will adhere to both Turkish and international standards, incorporating specific structural features related to slope gradients in excavations and embankments, footing dimensions, and various other considerations. ▪ Prior to the construction phase, comprehensive studies (including geological, geotechnical, hydrological studies, flood risk assessments, etc.) will be finalized for the Project.	There is no need for specific monitoring activities for this component.
	Operation	-		
Hydrology and Surface Water	Construction	▪ General engineering and construction work, ▪ Management of the workforce	▪ The Project will adhere to safety protocols to prevent leaks of hazardous chemicals/materials and liquids (such as diesel fuel, oil) stored on-site. ▪ Design and construction of areas housing diesel/fuel storage tanks (referred to as hazardous material storage areas) will prevent potential soil contamination (using paved areas with ample secondary containment, effective drainage systems, and collection ponds). ▪ Temporary waste storage areas will be built in accordance with the stipulations outlined in the "Regulation on Regular Storage of Wastes," published in the Official Gazette No: 27533, dated 26/03/2010 (Amended: OG-24/06/2022-31876), and the "Regulation on Waste Management," published in the Official Gazette, dated 02/04/2015, No: 29314 (Amended: OG-23/03/2017-30016).	▪ Evaluation of surface water runoff and flooding conditions following heavy rainfall events to assess the efficiency of water conveyance systems. ▪ Design checks will be conducted to ensure the implementation of specified measures (e.g., concrete pavement in storage areas, collection pond underneath, gravel spread to unpaved areas). ▪ Scheduled site inspections will be conducted to monitor dust suppression activities and detect any potential leakages, with records maintained. ▪ Periodic site inspections will be undertaken to identify potential damage in hazardous materials storage areas and waste storage areas. ▪ Routine site inspections will ensure the presence of an adequate amount of spill-response materials, such as spill-
	Operation	▪ Plant operation		

Component	Phase	Project action	Mitigation measures	Monitoring measures
			▪ Safe Fuelling and Gasoline Handling Guidelines will be established in construction areas. Refuelling of vehicles or equipment will be prohibited within excavated areas. If it is impractical to move heavy equipment to designated fuelling points, an impermeable surface, like a drip-tray, will be employed to prevent accidental releases to groundwater aquifers. ▪ Excavated areas will not be used for storing hazardous materials, and the handling of such materials will adhere to the Control of Substances Hazardous to Health Procedure, aligning with the Environmental, Health, and Safety (EHS) Guidelines for Environmental Hazardous Material Management ▪ A procedure for managing the construction site during heavy rainfall periods will be developed. If necessary, exposed surfaces and stored materials will be covered to minimize sediment erosion into surface waters. ▪ The management plans will include specific measures related to surface water and protection, such as: ▪ Design and management of spoil and soil storage areas and the opening of construction material stores, aiming to control sediment loss into runoff by minimizing slope length and angle. ▪ Implementation of strategies to prevent rainfall erosion and avoid construction activities during heavy rainfall periods. ▪ Diversion of external 'clean' runoff away from the construction area to prevent the mixing of 'clean' and 'dirty' runoff, thereby reducing the required size of sediment basins. ▪ Routing of all 'dirty' runoff to designated sediment basins. ▪ Installation of barrier fences and/or markings to define the limits of the structure/work area susceptible to damage. ▪ Restriction of soil exposure and minimizing degradation during construction. ▪ Covering and safeguarding degraded fertile ground using soil, vegetation, mulch, or erosion-resistant material. ▪ Collection and proper management of polluted water (if generated by accidental leakages) to prevent its mixing with any water body. ▪ Protection of existing drainage and irrigation channels, sediment barriers, green areas, and protection strips through	kits and metal trays, at the site and in each heavy machinery, with records maintained. ▪ Training sessions on spill response, the use of containment and clean-up materials will be conducted for workers, including subcontractors' workers, and records of these training sessions will be kept.

Component	Phase	Project action	Mitigation measures	Monitoring measures
			appropriate measures, such as drains and erosion control pits. ▪ Regular inspection and maintenance of all structures and facilities to ensure proper and efficient operation, particularly after heavy rainfall. Removal of sediment deposits, either by spreading on site (if uncontaminated) or at a properly licensed facility. ▪ Training workers, including subcontractor workers, on spill response and the use of containment and cleanup materials (spill kits). The hydrology and surface water quality mitigation measures for the operation phase are outlined as follows: ▪ The Project will adhere to safety requirements to prevent leakages from hazardous chemicals/materials and liquids stored on-site. ▪ Temporary waste storage areas will be constructed in accordance with the stipulations outlined in the "Regulation on Regular Storage of Wastes," published in the Official Gazette No: 27533, dated 26/03/2010 (Amended: OG-24/06/2022-31876), and the "Regulation on Waste Management," published in the Official Gazette, dated 02/04/2015, No: 29314 (Amended: OG-23/03/2017-30016). ▪ Leak-proof septic tanks of high quality will be installed for the collection of generated domestic wastewater. The collected wastewater will be either transported by vacuum trucks and then will be disposed of via vacuum trucks to the nearest wastewater collection system.	
Hydrogeology and Groundwater	Construction	▪ General engineering and construction work ▪ Temporary stockpiling of material (storage) ▪ Management of the workforce	▪ Guidelines for the safe handling and fuelling of gasoline will be established within the construction zones. Fuelling of vehicles or equipment will be strictly prohibited within excavated areas. In cases where heavy equipment cannot be relocated to designated fuelling points, an impermeable surface, such as a drip-tray, will be utilized during the refuelling process to prevent inadvertent releases to groundwater aquifers. ▪ Hazardous materials will be prohibited from storage in excavated areas, and the handling of all such materials will adhere strictly to the Control of Substances Hazardous to Health Procedure. These procedures will align with the	▪ Design checks will be conducted to confirm the implementation of the mentioned measures (e.g., concrete pavement in storage areas, collection pond underneath). ▪ Recorded documentation will be maintained for the training provided on spill response and the use of containment and clean-up materials for workers, including subcontractors' personnel. ▪ Regular site inspections will be carried out to guarantee the presence of an adequate supply of spill-response materials, such as spill kits and metal trays, at the site and within each heavy machinery, with records maintained.

Component	Phase	Project action	Mitigation measures	Monitoring measures
			Environmental, Health, and Safety (EHS) Guidelines, specifically the Environmental Hazardous Material Management (IFC, 2007). For instance, secondary containment structures, including berms, dikes, or walls, will be implemented to contain at least 100 percent of the largest tank or 25 percent of the combined tank volumes in areas where hazardous materials are managed (e.g., fuel storage and loading areas, concrete mixing, hazardous material storage) to prevent the entry of hazardous materials into the site drainage. ■ A comprehensive Emergency Response Plan (ERP) will be formulated following the Environmental, Health, and Safety (EHS) Guidelines: General EHS guidelines (IFC, 2007). This plan will be designed to effectively address spills of hazardous materials, including fuels, that may occur during construction activities. ■ The specific items in the management plans will address the measures below related to groundwater and protection:	■ A scheduled maintenance program will be established, and maintenance records will be documented 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.
	Operation	■ Plant operation	■ Preventing the release of untreated wastewater, residues, or any waste materials into groundwater or surface water. ■ Regulating and preventing wastewater discharges from various on-site activities, such as excavations and vehicle/equipment washing. ■ Managing and containing any contaminated water resulting from accidental leakages to prevent its mixing with water bodies and to avoid topsoil/soil pollution. ■ Ensuring the maintenance of vehicles and equipment, when necessary, in designated areas with impermeable surfaces (e.g., concrete floors) and implementing secondary containment systems as needed. ■ Providing readily available portable spill containment and clean-up materials (spill kits) at the construction site, along with clear instructions on their usage. ■ Training workers, including subcontractor workers, on spill response and the proper use of containment and clean-up materials (spill kits). ■ Supplying sufficient and well-maintained tanks, paved ground, spill containment materials, and appropriate secondary containment systems with adequate volume for the storage of fuel/oil and other fluids and hazardous substances to prevent soil contamination.	■ The implementation of the mentioned measures, such as the presence of concrete pavement in storage areas and an underlying collection pond will be checked. ■ Documentation will be maintained for the training provided to workers, including subcontractors' personnel, regarding spill response and the proper use of containment and clean-up materials. ■ Regular site inspections will be conducted to verify the presence of a sufficient quantity of spill-response materials, including spill kits and metal trays, both at the site and within each heavy machinery. Detailed records will be maintained. ■ A scheduled maintenance program will be established, and comprehensive records of maintenance activities will be maintained for all vehicles and machinery/equipment.

<table>
<tr><th>Component</th><th>Phase</th><th>Project action</th><th>Mitigation measures</th><th>Monitoring measures</th></tr>
<tr><td rowspan="2">Traffic</td><td>Construction</td><td>▪ General engineering/construction works
▪ Transportation of construction materials
▪ Management of the workforce</td><td rowspan="2">▪ 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.
▪ 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.
▪ Traffic and road safety assessments for construction and operation phases will be undertaken. 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.
▪ 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 improved to make 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.
▪ If reversing of vehicles cannot be avoided at the work areas, necessary reversing procedures will be identified including installing reversing aids on vehicles, reversing sensors etc. Trained flagmen will be used when reversing cannot be avoided.
▪ Parking areas will be designated with signs and reverse parking will be implemented for emergency situations.</td><td rowspan="2">▪ Investigating incidents and accidents and utilizing lessons learned to enhance traffic mitigation measures.
▪ Ensuring compliance with licenses and conducting medical surveillance of operators to verify currency.
▪ Regularly monitoring road conditions to promote safe driving practices.
▪ Maintaining control over vehicle maintenance records to guarantee adherence to scheduled maintenance activities.
▪ Monitoring weather forecasts to safeguard the well-being of operators.
▪ Close monitoring of adherence to speed limits to safeguard the health and safety of both the public and employees.
▪ Reviewing comments and complaints received through the grievance mechanism to improve traffic mitigation efforts and mitigate any potential air quality and noise impacts.
▪ Implementing monitoring protocols specifically aimed at identifying any shortcomings or inefficiencies in road safety mitigation measures.</td></tr>
<tr><td>Operation</td><td>Plant operation</td></tr>
</table>

Component	Phase	Project action	Mitigation measures	Monitoring measures
			▪ 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 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 was already placed at the required areas (especially in the Emen Village Road) to prevent potential accidents/incidents. These signs will be maintained regularly. Barriers will be placed at the required areas to protect both human health and assets.	

Table 10-5: Mitigation measures and monitoring actions for the Biological components

				Monitoring measures
Biological Components	Construction	▪ Vegetation clearing/soil removal (earthworks) ▪ General engineering/construction works ▪ Transportation of construction materials ▪ Temporary stockpiling of material (storage) ▪ Management of the workforce	6) **Avoidance** Avoidance measures have been taken into account, especially during the design phase of the facilities, and include: a. Reducing the footprint of individual facilities. b. Prioritizing the utilization of existing modified habitat for the placement of temporary facilities whenever feasible. 7) **Minimization** 8) vegetation disturbance: 9) Minimizing disturbance to natural vegetation to the extent necessary during construction activities. This involves clearly marking the boundaries of temporary and permanent facilities to mitigate the risk of footprint expansion. 10) To minimize wildlife mortality, pre-construction biological surveys will be conducted to identify and potentially relocate fauna species. These surveys, performed by an	▪ The existence and proliferation of invasive plant species within and in the vicinity of the building site will be checked biannually during the period of plant growth by a specialist botanist. If deemed required, an extirpation campaign will be implemented to prevent the proliferation of the invasive species. ▪ Observations of fauna species, specifically the reptile species of conservation concern (*Testudo graeca*) and the terrestrial mammal species of conservation concern (*Mesocricetus brandti, Microtus anatolicus, Spermophilus xanthoprymnus*, and *Vormela peregusna*), within and around the LSA, must be recorded along with photographic evidence and reported to the on-site Site Chief. ▪ Incidents involving wildlife or the sighting of live animals or carcasses on the access road or construction site shall be documented. If necessary, further precautions will be implemented to deter wildlife from entering the site and prevent incidents of roadkill.

				Monitoring measures
			expert wildlife ecologist, will focus on species with limited mobility, such as mammals and reptiles, within the areas designated for temporary and permanent facilities. Surveys will be conducted no earlier than 7 days before construction. If any of these species are found, they will be collected by the ecologist and translocated to undisturbed but similar sites within the designated LSA. 11) Reptiles will be captured and relocated to a suitable receptor site, which is no smaller than the capture site and exhibits similar habitat characteristics and prey availability. The relocation will be conducted at a minimum distance of 50 meters from the Project footprint during the construction phase. In case essential works are necessary during winter when tortoises are hibernating, the works area will be thoroughly inspected for hibernation burrows. If a hibernating reptile is discovered during such works, it will be carefully moved to an alternative undisturbed part of the site. If relocation on-site is not feasible, the animal will be placed in care until it can be safely released the following spring. 12) Monitoring of small mammal species identified as species of conservation concern, including the Brandt's Hamster (*Mesocricetus brandti*, NT), Anatolian Vole (*Microtus anatolicus*, DD and Restricted Range), and Anatolian Ground Squirrel (*Spermophilus xanthoprymnus*, NT), will be conducted using endoscopic cameras placed within their burrows. If any living specimen is observed and essential ground-breaking works are required in areas where burrows are present, a gradual increase in disturbance levels over several days (at least first 4 days) will be implemented. This approach allows the animals to autonomously leave their burrows before they are fully excavated. For instance, machinery and equipment will be brought to the working area on day 1, followed by manual excavation on day 2, and mechanical excavation in the vicinity of the burrow on day 3. 13) Vehicle movement will be confined to the Project Site and existing roads connecting construction sites with surrounding areas. Off-road driving will be strictly prohibited to prevent any unnecessary disturbance of natural vegetation. 14) emission of noise and vibrations: a. Works will be made to minimise night works between the hours of 8 pm and 6 am in order to	

				Monitoring measures
			minimise the negative effects on nocturnal wildlife species. b. Restricting both the quantity and velocity of vehicular traffic on the current access routes. 15) emission of dust and particulate matter: 16) Dust generated from construction material handling will be minimized by utilizing covers and/or control equipment such as water suppression, bag house, or cyclone systems. Additionally, moisture content will be increased through water spraying to mitigate dust dispersion. A speed limit will be enforced for all vehicles to prevent the generation of dust emissions, and all trucks will be regularly maintained to ensure proper functioning at all times. Internal roads will be appropriately compacted, maintained, and sprayed with water as necessary to minimize dust from vehicle movements. If water spraying is found to be insufficient, alternative surface treatment methods such as hygroscopic media like calcium chloride or natural-chemical binding agents for unpaved internal roads will be employed. This may involve using a sprinkler system or a "water-mist cannon. 17) "Increased and/or modified road traffic: 18) Speed limits and animal crossing signs (If available) will be installed on the access roads. Efforts should be made to prevent the accumulation of stagnant water and organic waste within the construction site and on the roads to avoid attracting wildlife. If employees and contractors come across any fauna species, they will either wait for it to go away on its own or seek the help of the environmental technician to safely remove and relocate it to a suitable habitat. Training will be given to enhance the knowledge and understanding of employees and contractors regarding the presence of protected species and habitats in the area. This will enable continuous monitoring and facilitate appropriate responses in the event of animal encounters. 19) accidental introduction and spreading of alien species: 20) During rehabilitation/restoration works, the use of non-native flora species, especially those classified as invasive alien species, must be avoided. If the proliferation of invasive species is detected, a suitable eradication plan will be devised and executed. 21) **Rehabilitation/Restoration**	

				Monitoring measures
			Temporary cleared areas resulting from construction will be expeditiously restored, with the objective of establishing a stable vegetative cover to mitigate erosion, dust accumulation, and the proliferation of invasive alien species. The ultimate goal is to restore the original habitat and positively impact biodiversity. Restoration and habitat rehabilitation will exclusively involve the use of native plant species from the region. Seeding and planting of grass and shrub species typical of the local flora will be carried out to achieve optimal ground cover. It will be crucial to prioritize the use of autochthonous adult plants and seeds collected from locations nearest to the restoration sites to maximize the success of translocation operations (Abeli & Dixon 2016)[80].	
	Operation	▪ Plant operation	▪ **Avoidance**: ▪ Avoidance measures have been taken into account, especially during the design of the facilities, and these measures include: ▪ minimisation of the footprint of individual facilities. ▪ using the already modified environment to accommodate temporary infrastructure. ▪ **Minimization** 5) Presence of permanent infrastructures (occupation of land): ▪ The new permanent infrastructures will be enclosed by fences, however the fencing will be modified to reduce its barrier impact. Modifications to fencing can include creating regular gaps along the fence line, with a frequency of one gap per 100 metres. These spaces are maintained between the base of the fence and the ground. Furthermore, each individual gap could have a height of 10 cm and a width of 1 m. ▪ Non-reflective coating will be used on the panels to reduce reflection. ▪ Vehicle travel will be limited to the current roads that link the operation locations with the nearby regions. Off-road driving will be banned to prevent any unwarranted disruption of the natural vegetation.	▪ A floristic and vegetational monitoring will be conducted in the areas beneath the photovoltaic panels where plant translocation and restoration activities have taken place. This monitoring aims to evaluate the effectiveness of these activities in improving species richness and diversity and restoring the original natural habitat. This monitoring will also assess the occurrence and population size of the flora species that have been classified as species of conservation concern, namely *Gypsophila oblanceolata, Onopordum davisii*, and *Petrosimonia nigdeensis*. An expert botanist will undertake this monitoring once per year during the vegetative season. The monitoring will continue for at least 3 years after the end of construction and during the operation phase. ▪ The existence and proliferation of invasive plant species in the regions covered by the photovoltaic panels will be evaluated biannually throughout the growing season by an expert botanist for a minimum of 3 years . If deemed required, an extirpation campaign will be implemented to prevent the proliferation of the invasive species. ▪ A monitoring programme will be conducted after construction to assess the impact of solar panels on the identified reptile species of conservation concern (*Testudo graeca*) and the identified terrestrial mammal species of conservation concern (*Mesocricetus brandti*, *Microtus anatolicus*, *Spermophilus xanthoprymnus*, and *Vormela peregusna*). This monitoring will focus on the areas located under the photovoltaic panels. The aim is to observe whether the panels provide protection and benefits to these animals from predators, hence a potential increase in local fauna species richness and abundance. This

[80] Abeli T. & Dixon K. (2016). Translocation ecology: the role of ecological sciences in plant translocation. Plant Ecology. 217. 10.1007/s11258-016-0575-z.

				Monitoring measures
			6) <u>Emission of noise</u>: No further steps of minimization are considered essential in addition to those already provided in Chapter 7.1.2. 7) <u>Emission of light</u> (Presence of artificial lights): ▪ It is advisable to limit the number of light sources to a minimum; ▪ preferred types of light in exterior lighting (e.g.: lights on site due to security reasons) applications are: - It is advisable to limit the number of light sources to a minimum. The recommended types of light for exterior lighting applications, such as lights for security purposes, are low pressure sodium lamps (SOX) and light emitting diodes (LEDs). LEDs are the preferred choice as they emit light in a more focused direction and have warmer colour temperatures, closer to 3000°K. Additionally, it is recommended to use lights triggered by presence detectors and lights that are directed towards the ground. ▪ Avoid using these sorts of lights: – Mercury lamps (MBF) are bluish-white lights that attract insects and are tolerated by bat species. High pressure sodium lamps (SON) are brighter pinkish-yellow lamps that are commonly used for road illumination. 8) <u>Accidental introduction of alien species (potential risk):</u> ▪ Avoid using non-native flora species, particularly those classed as invasive alien species, during rehabilitation and restoration projects. ▪ If the proliferation of invasive species is detected, a suitable eradication programme will be devised and executed. ▪ **Rehabilitation/Restoration:** The areas devoid of vegetation beneath the PV panels will be as soon as possible recovered, with the aim of reestablishing the original natural ecosystem and potentially augmenting the richness and diversity of plant species. The restoration studies will be implemented according to a comprehensive and enduring strategy, with the objective of establishing a consistent plant cover to reduce erosion, dust accumulation, and the proliferation of non-native species.	monitoring will be carried out annually for a minimum duration of 3 years by a specialist in terrestrial fauna. ▪ Incidents involving wildlife or the sighting of live animals or carcasses on the permanent access roads or in areas occupied by permanent infrastructure shall be recorded. If necessary, further precautions will be implemented to deter wildlife from entering the site and prevent incidents of roadkill.

				Monitoring measures
			Restoration and habitat rehabilitation will exclusively employ indigenous plant species. The implementation of seeding and planting of grass and shrub species indigenous to the area will be carried out to guarantee the most favourable ground coverage. In order to optimise the success of the translocation operations, it is crucial to utilise mature plants or seeds that are native to the area or obtained from the closest practical distance to the restoration sites[61]. Research indicates that building Solar Power Plants (SPPs) in desert and steppe regions, primarily selected for their high sun exposure and significant solar power generation potential, can have beneficial impacts on biodiversity. These include an increase in plant diversity and plant biomass.[81,82,83]. The favourable impacts mostly result from the shading provided by the PV panels, leading to a reduction in temperature and an increase in soil moisture in the regions covered by the panels[84]. The fence and PV panels could provide safety for small-sized mammals, reptiles, and birds, offering good impacts for terrestrial fauna species by shielding them from predators.	

[81] 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.

[82] 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.

[83] 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.

[84] 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.

11.0 CONCLUSION

The ESIA for the project was carried out in a number of phases, including scoping studies, baseline studies, impact assessment, stakeholder engagement, Environmental and Social Management System Plans.

The ESIA was developed in compliance with Turkish legislation and aligns with the 2012 IFC Performance Standards and General EHS Guidelines. The various activities have been carried out by a working group comprising Turkish and international experts in environmental and social disciplines.

A number of environmental and social surveys, modelling work and assessments have been conducted as part of the Environmental and Social Impact Assessment (ESIA). These are the key elements of the Environmental and Social Impact Assessment (ESIA):

- Baseline surveys:
  - Environmental, biological and social components
  - 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). These are aspects of the physical, biological and social environment that are considered worthy of protection by the relevant legislation or by international standards. Assessment Endpoints are specific and measurable aspects of the VECs that allow for the assessment of impacts (both positive and negative).

The impact assessment process has followed these steps:

- Identifying Project Components, which are individual parts of the project with similar features and procedures for construction, operation, and decommissioning.
- Identifying Impact Factors, which are elements that can alter the environmental and social quality of the VECs, such as air emissions and water discharge.
- Defining the sensitivity of the VECs to the identified Impact Factors, based on environmental and social data collected during the baseline studies.
- Defining the Impacts as the interaction between the Impact Factors and the Sensitivity of the VECs for each identified Assessment Endpoint.

Each of the project components has been associated with one or more impact factors for each phase of construction, operation and decommissioning.

The assessment of impacts has been conducted in accordance with the correct application of a set of standard mitigation measures that are drawn from good industry practice. In addition, site-specific or issue-specific mitigation measures have been identified with a view to addressing areas where high residual impacts are likely to occur. This is with a view to ensuring that the impacts resulting from the implementation of these additional measures are kept at an acceptable level.

The 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 are substantially different.

The findings of the Environmental and Social Assessment Study have led to the following conclusions:

- The project team should maintain continuous engagement with stakeholders in order to effectively manage the social risks associated with the project. A Stakeholder Engagement Plan, including the internal and external grievance mechanisms, will be prepared for the Project.
- Air and noise monitoring programmes will be implemented for the Project in order to ensure compliance with the relevant regulatory requirements.
- With regard to the biodiversity components, a list of mitigation measures is defined for the project phases within the scope of the Environmental and Social Impact Assessment (ESIA), including additional field studies for data collection.
- The Project will develop an Environmental and Social Management System (ESMS) in accordance with both corporate requirements and those defined as part of the Environmental and Social Impact Assessment (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 Environmental and Social Management System requirements are also included in the Environmental and Social Impact Study, which focuses on the Environmental and Social Management System Structure, Environmental and Social Management Plan(s) and Labour Issues and Health & Safety Management Plan(s).

Residual Impacts

The surveys, studies and impact assessments have enabled the Client to implement robust mitigation measures for residual impacts. As discussed in Section 5.7, the Residual Impact Value (RIV) is the result of 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. The overall impact is a synthesis of the residual impacts on a component from all the impact factors generated by the project actions.

The assessment conducted in Section 7 has been used to determine the overall residual impact value on each component, which is presented in the following sections.

Physical

The overall residual impact is assessed to be *negligible* for *Air Quality* and *Noise and Vibration* components during construction an operation phase. The actual impact for these components corresponds mainly in construction phase. During the construction phase of the Project, a monitoring program of air quality and noise levels at the baseline noise measurement locations will be in place in case of grievances.

The Soil and Subsoil component was 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 7.1.3.

The overall residual impacts for *Hydrogeology and Groundwater and Hydrology and Surface Water* and *Traffic* -were assessed as negligible during construction and operation phases. Mitigation measures listed in Section 7.1.8 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.

Biological

The residual impact of the biological components was found to be negligible, low, and medium during the construction phase. The overall residual impact during the operational phase has been assessed as low.

Detailed mitigation measures for biological components are presented in Sections 7.3. These 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. The goal is to produce a stable vegetative cover to minimize erosion, dust and the spreading of invasive alien species. The aim is to recreate the original natural habitat and possibly enhance flora species richness and diversity.

Monitoring and additional site surveys will be conducted for biological components in accordance with the recommendations set out in Sections 7.3 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 low during construction phase and negligible during operation phase with the proposed mitigation measures.

The residual impact for *Infrastructure, Social Services and Ecosystem Usage* component was found as medium, low and negligible during construction and operation phase of the Project with the defined mitigation measures. The medium residual impact during construction phase was found due to village road usage for transportation and traffic.

Land Use and Land-based Livelihoods component was assessed as medium and low during construction and operation phase with the defined mitigation measures.

The *Economy and Employment* are expected to have high positive impact on both the construction and operation periods.

Components on *Labor and Working Conditions were* assessed as low with the implementation of the defined mitigation measures. The residual impacts for *Community Health and Safety* are assessed as both negligible and low for all phases of the Project.

The overall residual impacts for *Land Use, Cultural Heritage* and *Visual Aesthetics* were assessed as negligible during construction and operation phases.

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.

Signature Page

WSP Danışmanlık ve Mühendislik Ltd. Şti.

Eylül Kırbaç / Gizem Altınkaya Kurtulmuş
Senior Environmental Engineer / H&S Expert

Merve Acırlı
Project Manager

Team Member	Duty
WSP Türkiye	
Beyza Kozak	Project Director
Merve Acırlı	Project Manager
Eylül Kırbaç	Senior Environmental Specialist
Çağrı Tekatlı	Senior Biologist
İpek Karasu	Geological Engineer
Necati Erdem Kalaycıoğlu	Hydrogeological Engineer
Serkan Küçükünsal	Environmental Engineer
Elçin Kaya	Senior Sociologist
Esra Güven	Sociologist

Registered in Türkiye Registration No. 53/3069

Vat No. 396 056 79 79

APPENDIX A

List of Applicable National Legislation and International Agreements Ratified by Türkiye

Table 6: Current Relevant Environmental Laws and Regulations in Türkiye

Law/Regulation
Environment Law
Permitting
Regulation on Environmental Impact Assessment
Regulation on Environmental Auditing
Regulation on Environmental Permit and License
Law on Use of Renewable Energy Resources for Electrical Energy Production
Law on Industrial Zones
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
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 Water Pollution Control Regulation Sampling and Analysis Methodology
Communique on 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
Law on Pasture
Waste Management
Regulation on Waste Management
Regulation on Zero Waste
Regulation on Control of Excavation Soil, Construction and Demolition Wastes
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 Management of Waste Electrical and Electronic Goods
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 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 Material
Regulation on the Transportation of Hazardous Goods by Road
Regulation on the Classification, Labelling and Packaging of Substances 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

Law/Regulation
Regulation on Wildlife Protection and Wildlife Enhancement Areas
Law on Forestry
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 2023 List
Regulation on Collection, Production and Export of Natural Floral Onions from Nature
Energy Efficiency
Law on Energy Efficiency
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
Regulation on Research, Drilling and Excavation of Cultural and Natural Assets
Principal Decision No. 658 issued on 5 November 1999
Law on the Approval of the Convention for the Protection of the Intangible Cultural Heritage
Other Applicable Legislation

Law/Regulation
Türkiye Building Earthquake 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
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 Distribution System Regulation
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 7: 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.)

Existing Labour and H&S Law and Regulations
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 Environments
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
Regulation on Protection of Buildings Against Fire
Regulations on the Prevention of Biological Exposure Risks

Existing Labour and H&S Law and Regulations
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 Public Health

Table 8: International Conventions/Protocols Türkiye Has Signed

International Convention / Protocol	Date and Number of Issuing Turkish Official Gazette
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
Agreement on an International Energy Program; Paris, 1974	23/01/1981

International Convention / Protocol	Date and Number of Issuing Turkish Official Gazette
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	Date and Number of Issuing Turkish Official Gazette
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 9: 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/m³)	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/m³)	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/m³)	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/m²/day)	Short-term limit	390 (for 2019-2023) **390 (for 2024 and after)**	-	-
	Long-term limit	210 (for 2019-2023)	-	-

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]
			210 (for 2024 and after)		
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 $\mu g/m^3$		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.

DRINKING WATER QUALITY

Table 10: 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****	**-**
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

Parameter	Unit	Turkish[1]	WHO[2]
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**	-
Tritium[85]	Bq/l	**100****	**100**
Indicative dose	mSv	**0.10**	-
Taste	Acceptable to consumers and no abnormal change		
Colony count 22ºC	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			

[85] 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)

Parameter	Unit	Turkish[1]	WHO[2]
*** 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 8th, 2010 (Official Gazette: 27605) and was fully implemented on June 8th, 2015. In accordance with Soil 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 11: 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

Soil Quality Standards in the "Soil Regulation* related to the above-mentioned activity codes are given below.

Table 12: 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

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**
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 13: 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 23:00 - 07:00
Industrial facilities, transportation sources	LAeq,5min.	65 dB(A)	60 dB(A)	55 dB(A)
Music broadcasting establishments	LAeq 63-250 Hz	60 dB(A)	55 dB(A)	50 dB(A)
Workplaces	LAeq,5min.	Background + 5 dB(A)		Background + 3 dB(A)
In case of more than one workplace	LAeq,5min.	Background + 7 dB(A)		Background + 5 dB(A)
All sources	LCmax	100 dB(C)		

Table 14: 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 15: Vibration Standards (Turkish Regulation on 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
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 16: 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 17: 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 Industrial and heavy commercial buildings	50	50
Unreinforced or light-framed structures	15-20	20-50

Type of building	Peak component particle velocity in the frequency range of predominant pulse, $[mm/s]$	
	4 $\boldsymbol{Hz}$ to 15 $\boldsymbol{Hz}$	15 $\boldsymbol{Hz}$ and above
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 17 and major damage to a building structure can occur at values greater than four times the tabulated values.

In addition, the values in Table 17 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 17 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 18: 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

List of species

Flora Species

Family	Species	Global IUCN Status	Local IUCN Status	End./ RR	Lit./ Obs.*
Asteraceae	*Taraxacum farinosum*	NE	-	-	O 2023
Amaranthaceae	*Camphorosma monspeliaca*	NE	-	-	O 2023
Amaranthaceae	*Halocnemum strobilaceum*	NE	-	-	O 2023
Amaranthaceae	*Salsola crassa*	NE	-	-	O 2023
Amaranthaceae	*Salsola inermis*	NE	-	-	O 2023
Amaranthaceae	*Salsola nitraria*	NE	-	-	O 2023
Amaranthaceae	***Salsola stenoptera***	NE	VU	Widespread endemic	O 2023
Amaranthaceae	*Halimione verrucifera*	NE	-	-	O 2023
Amaranthaceae	*Petrosimonia brachiata*	NE	-	-	O 2023
Amaranthaceae	***Petrosimonia nigdeensis***	NE	VU	Regional endemic	O 2023
Asteraceae	*Achillea wilhelmsii*	NE	-	-	O 2023
Asteraceae	*Artemisia santonicum*	LC	-	-	O 2023
Asteraceae	***Onopordum davisii***	NE	NT	Regional Endemic	O 2023
Caryophyllaceae	***Gypsophila oblanceolata***	NE	VU	Regional Endemic	O 2023
Frankeniaceae	*Frankenia hirsuta*	NE	-	-	O 2023
Nitrariaceae	*Peganum harmala*	NE	-	-	O 2023
Plumbaginaceae	*Limonium globuliferum*	NE	-	-	O 2023
Plumbaginaceae	*Limonium iconicum*	NE	LC	Widespread endemic	O 2023
Plumbaginaceae	*Limonium lilacinum*	NE	-	Widespread endemic	O 2023
Plumbaginaceae	***Limonium tamaricoides***	NE	EN	Regional endemic	O 2023
Poaceae	*Puccinellia koeieana subsp. anatolica*	NE	LC	Widespread endemic	O 2023
Poaceae	*Aeluropus littoralis*	LC	-	-	O 2023
Scrophulariaceae	***Verbascum helianthemoides***	NE	VU	Widespread endemic	O 2023
Zygophyllaceae	*Zygophyllum album*	NE	-	-	O 2023

*L:Literature, O: Observation, H: Habitat, A:Field G: Interview with locals

Herpetofauna species

Family	Species	Global IUCN Status	Lit./ Obs.*
Ranidae	*Pelophylax ridibundus*	LC	G-L
Bufonidae	*Bufotes variabilis*	DD	G-L
Lacertidae	*Ophisops elegans*	LC	G-L
Lacertidae	*Parvilacerta parva*	LC	G-L
Agamidae	*Stellagama stellio*	LC	L
Scincidae	*Heremites vittatus*	LC	L
Gekkonidae	*Mediodactylus orientalis* **	LC	L
Colubridae	*Natrix natrix*	LC	G-L
Colubridae	*Platyceps najadum*	LC	L
Colubridae	*Elaphe sauromates*	LC	L
Testudinidae	*Testudo graeca*	VU	G-L

*L:Literature, O: Observation, H: Habitat, A:Field G: Interview with locals
** Based on syn. *Mediodactylus kotschyi*

Aves Species

Family	Species	Turkish Name	English Name	Global IUCN Status	Lit./Obs.
Accipitridae	*Aegypius monachus*	Kara Akbaba	Black Vulture	NT	O
Accipitridae	*Circaetus gallicus*	Yılan Kartalı	Short-Toed Eagle	LC	O
Accipitridae	*Circus aeruginosus*	Saz Delicesi	Marsh Harrier	LC	H
Accipitridae	*Circus cyaneus*	Gökçe Delice	Hen Harrier	LC	H
Accipitridae	*Circus macrourus*	Bozkır Delicesi	Pallid Harrier	NT	H
Accipitridae	*Accipiter nisus*	Atmaca	Sparrowhawk	LC	O
Accipitridae	*Buteo rufinus*	Kızıl Şahin	Long-Legged Buzzard	LC	O
Accipitridae	*Aquila nipalensis*	Bozkır Kartalı	Steppe Eagle	**EN**	H
Accipitridae	*Aquila heliaca*	Şah Kartal	Imperial Eagle	VU	H
Accipitridae	*Aquila chrysaetos*	Kaya Kartalı	Golden Eagle	LC	O
Accipitridae	*Hieraaetus pennatus*	Küçük Kartal	Booted Eagle	LC	H
Falconidae	*Falco naumanni*	Küçük Kerkenez	Lesser Kestrel	LC	H

Family	Species	Turkish Name	English Name	Global IUCN Status	Lit./Obs.
Falconidae	*Falco tinnunculus*	Kerkenez	Kestrel	LC	O
Falconidae	*Falco cherrug*	Ulu Doğan	Saker Falcon	**EN**	H
Falconidae	*Falco peregrinus*	Gök Doğan	Peregrine	LC	H
Phasianidae	*Alectoris chukar*	Kınalı Keklik	Chukar	LC	A
Otididae	*Otis tarda*	Toy	Great Bustard	VU	A
Charadriidae	*Charadrius leschenaultii*	Büyük Cılıbıt	Greater Sand Plover	LC	O
Charadriidae	*Vanellus vanellus*	Kızkuşu	Lapwing	NT	H
Pteroclidae	*Pterocles orientalis*	Bağırtlak	Black-Bailled Sandgrouse	LC	H
Columbidae	*Columba livia*	Kaya Güvercini	Rock Dove	LC	O
Columbidae	*Streptopelia decaocto*	Kumru	Collared Dove	LC	O
Strigidae	*Athene noctua*	Kukumav	Little Owl	LC	O
Apodidae	*Apus apus*	Ebabil	Swift	LC	O
Meropidae	*Merops apiaster*	Arıkuşu	Bee-Eater	LC	O
Upupidae	*Upupa epops*	İbibik	Eurasian Hoopoe	LC	O
Alaudidae	*Melanocorypha calandra*	Boğmaklı Toygar	Calandra Lark	LC	O
Alaudidae	*Calandrella brachydactyla*	Bozkır Toygarı	Short-Toed Lark	LC	O
Alaudidae	*Calandrella rufescens*	Çorak Toygarı	Lesser Short-Toed Lark	LC	H
Alaudidae	*Galerida cristata*	Tepeli Toygar	Crested Lark	LC	O
Hirundinidae	*Hirundo rupestris*	Kaya Kırlangıcı	Crag Martin	LC	O
Hirundinidae	*Hirundo rustica*	Kır Kırlangıcı	Swallow	LC	O
Hirundinidae	*Delichon urbicum*	Ev Kırlangıcı	House Martin	LC	O
Motacillidae	*Anthus campestris*	Kır İncirkuşu	Tawny Pipit	LC	H
Muscicapidae	*Oenanthe isabellina*	Boz Kuyrukkakan	Isabellina Wheatear	LC	O
Laniidae	*Lanius collurio*	Kızıl Sırtlı Örümcekkuşu	Red-Backed Shrike	LC	O
Corvidae	*Pica pica*	Saksağan	Magpie, Black-billed Magpie	LC	O
Corvidae	*Corvus monedula*	Küçük Karga	Jackdaw, Eurasian Jackdaw	LC	O
Corvidae	*Corvus frugilegus*	Ekin Kargası	Rook	LC	O
Corvidae	*Corvus cornix*	Leş Kargası	Hooded Crow	LC	O
Sturnidae	*Sturnus vulgaris*	Sığırcık	Starling	LC	O
Passeridae	*Passer domesticus*	Serçe	House Sparrow	LC	O
Fringillidae	*Carduelis carduelis*	Saka	Goldfinch	LC	O

Family	Species	Turkish Name	English Name	Global IUCN Status	Lit./Obs.
Fringillidae	*Carduelis cannabina*	Ketenkuşu	Linnet	LC	O
Emberizidae	*Emberiza hortulana*	Kirazkuşu	Ortolan	LC	O
Emberizidae	*Emberiza melanocephala*	Karabaşlı Kirazkuşu	Black-Headed Bunting	LC	O
Emberizidae	*Miliaria calandra*	Tarla Kirazkuşu	Corn Bunting	LC	O

*L:Literature, O: Observation, H: Habitat, A:Field G: Interview with locals

Fauna species

Family	Species	Turkish Name	English Name	Global IUCN Status	Lit./Obs.*
Erinaceidae	*Erinaceus concolor*	Kirpi	Southern White-breasted Hedgehog	LC	O
Soricidae	*Crocidura leucodon*	Çiftrenkli Böcekçil	Bicolored Shrew	LC	H, L
Vespertilionidae	*Myotis mystacinus*	Bıyıklı Yarasa	Whiskered Myotis	LC	H, L
Vespertilionidae	*Myotis blythii*	Farekulaklı Küçük Yarasa	Lesser Mouse-eared Myotis	LC	H, L
Vespertilionidae	*Pipistrellus pipistrellus*	Adi Yarasa	Common Pipistrelle	LC	H, L
Vespertilionidae	*Eptesicus serotinus*	Genişkanatlı Yarasa	Serotine Bat	LC	H, L
Vespertilionidae	*Plecotus macrobullaris*	Uzunkulaklı Kafkas Yarasası	Mountain Long-eared Bat	LC	H, L
Molossidae	*Tadarida teniotis*	Kuyruklu Yarasa	European Free-tailed Bat	LC	H, L
Leporidae	*Lepus europaeus*	Yaban Tavşanı	European Hare	LC	O
Sciuridae	*Spermophilus xanthophyrmnus*	Anadolu Yersincabı	Asia Minor Ground Squirrel	NT	O
Cricetidae	*Mesocricetus brandti*	Türk Hamsteri	Brandt's Hamster	NT	O
Cricetidae	*Microtus anatolicus*	Anadolu Tarlafaresi	Anatolian Vole	DD	O
Cricetidae	*Nannospalax xanthodon*	Anadolu Körfaresi	Nehring's Blind Mole Rat	DD	O
Muridae	*Mus macedonicus*	Sarı Evfaresi	Macedonian Mouse	LC	H
Dipodidae	*Allactaga williamsi*	Araptavşanı	William's Jerboa	NT	O
Canidae	*Canis lupus*	Kurt	Gray Wolf	LC	A
Canidae	*Vulpes vulpes*	Kızıl Tilki	Red Fox	LC	O
Mustelidae	*Vormela peregusna*	Alaca Sansar	European Marbled Polecat	VU	O
Mustelidae	*Meles meles*	Porsuk	Eurasian Badger	LC	A

O: From direct observation in the field, L: From Literature, A: From public survey, interviews and questionary, H: From habitat Suitability

APPENDIX D

CCRA

FINAL REPORT

Niğde G4-Bor-1 Solar Power Plant Project

Environmental and Social Impact Assessment - Climate Change Risk Assessment

Submitted to:

Smart Güneş Enerjisi Teknolojileri Ar-Ge Üretim San ve Tic A.Ş.

Rüzgarlıbahçe Mah., Feragat Sk. Energy Plaza No:2, 34805 Beykoz/İstanbul

Submitted by:

WSP Danışmanlık ve Mühendislik Ltd. Şti.

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

+90 312 4410031

23633814_final

April, 2024

Distribution List

1 copy - Lenders

1 copy - Smart Güneş Enerjisi Teknolojileri Ar-Ge Üretim San ve Tic A.Ş.

1 copy - WSP Danışmanlık ve Mühendislik Ltd. Şti.

Record of Issue

Company	Client Contact	Version	Date Issued	Method of Delivery
Smart Güneş Enerjisi Teknolojileri Ar-Ge Üretim San ve Tic A.Ş.	Ebru Sağ	Draft_R0	09.04.2024	E-mail (word)
Smart Güneş Enerjisi Teknolojileri Ar-Ge Üretim San ve Tic A.Ş.	Ebru Sağ	Final	09.04.2024	E-mail (word)

Table of Contents

TABLES

FIGURES

APPENDICES

No table of contents entries found.

8.0 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.

The CCRA is presented in Appendix D.

[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

Niğde G4-Bor-1 Solar Power Plant Project

Environmental and Social Impact Assessment - Climate Change Risk Assessment

APPENDIX-XX

Submitted to:

Smart Güneş Enerjisi Teknolojileri Ar-Ge Üretim San ve Tic A.Ş.
Rüzgarlıbahçe Mah., Feragat Sk. Energy Plaza No:2, 34805 Beykoz/İstanbul

Submitted by:

WSP Danışmanlık ve Mühendislik Ltd. Şti.
Hollanda Cad. 691. Sok. Vadi Sitesi No:4, Yıldız 06550 Ankara, Türkiye

+90 312 4410031

23633814_final

April, 2024

Distribution List

1 copy - Lenders

1 copy - Smart Güneş Enerjisi Teknolojileri Ar-Ge Üretim San ve Tic A.Ş.

1 copy - WSP Danışmanlık ve Mühendislik Ltd. Şti.

Record of Issue

Company	Client Contact	Version	Date Issued	Method of Delivery
Smart Güneş Enerjisi Teknolojileri Ar-Ge Üretim San ve Tic A.Ş.	Ebru Sağ	Draft_R0	09.04.2024	E-mail (word)

Table of Contents

TABLES

FIGURES

1.0 INTRODUCTION

Smart Güneş Enerjisi Teknolojileri Ar-Ge Üretim San ve Tic A.Ş. (hereinafter referred as “Smart”) has retained WSP Danışmanlık ve Mühendislik Ltd. Şti. (hereinafter referred as “WSP Türkiye” or “WSP”) to prepare the Environmental and Social Impact Assessment (“ESIA”) for the Niğde G4-Bor-1 Solar Power Plant Project (hereinafter referred as “the Project’”) in compliance with the national and international requirements. The Project will have a total installed capacity of 140 MWp / 100 Mwe and located in Seslikaya and Badak Villages Bor District, Niğde Province.

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 (Please see Section 2.2), 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”).

The Solar Power Plant (“SPP”) will consist of solar panels, an assembly structure, an inverter, a substation, an administrative building and Supervisory Control and Data Acquisition (“SCADA”) system as main components. The energy transmission line (“ETL”) will be established as an associated facility. With the establishment of the Project, it is planned to produce 100 MWe of electrical energy annually during the operation phase, and the produced energy will be transmitted to the Yaysun SPP Substation by approximately 29.5 km long 154 kV ETL that will be constructed by Turkish Electricity Transmission Corporation (“TEİAŞ”). Details of the Project components are provided in Chapter 3 of the ESIA 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 October 2023. Within the scope of the Project, construction phase is estimated around 11 months, while operation phase is estimated as 30 years.

The Project is set to be developed on a 201.3 ha of former pastureland. Designated as an "Industrial Zone" in the 1/100,000 Scale Environmental Plan, the Project site falls within the borders of the "Niğde-Bor Energy Specialized Industrial Zone."

The location of the Project is given in Figure below

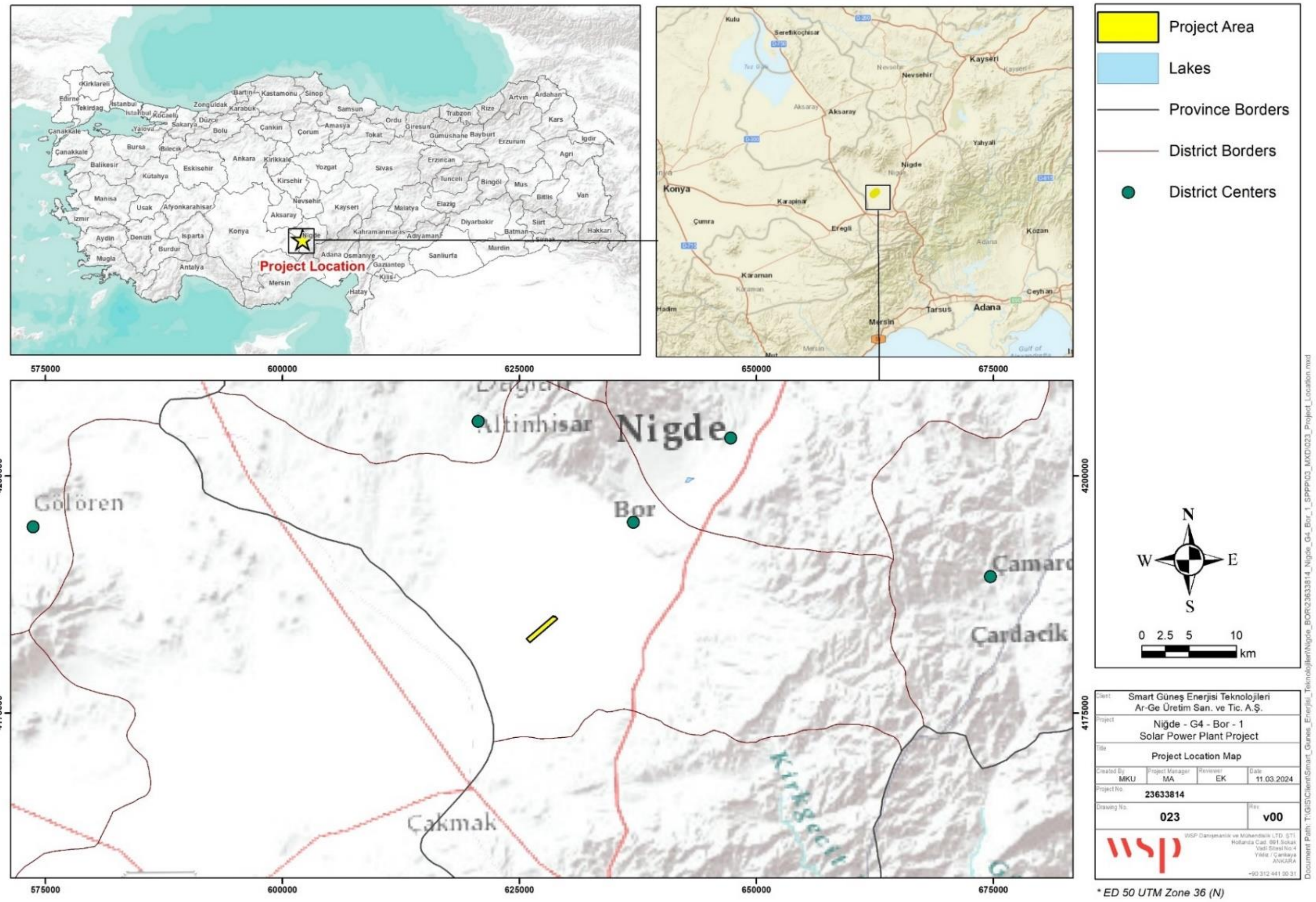


Figure 1: Location of the Project

2.1 Preliminary NCC/NDCs Compatibility Review

Parties to the Paris Agreement have been obliged since 2015 to submit Nationally Determined Contributions (NDCs), or national climate action plans. While not required, countries are also encouraged to submit Long-Term Strategies (LTS) for a low-carbon economy.

The primary means via which nations publicly declare their self-defined intentions for establishing long-term decarbonization targets to keep global temperature rise below 1.5 degrees Celsius and to set goals for improving climate resilience are the Nationally Determined Contributions (NDCs) filed under the Paris Agreement.

As outlined in the EPIV Guidance Note on Climate Change Risk Assessment, the purpose of the preliminary NCC compatibility review of physical risks is to assess their alignment with the host country's National Climate Contributions (NCCs) and relevant global adaptation objectives under the Paris Agreement. This includes objectives such as enhancing adaptive capacity, strengthening resilience, and reducing vulnerability to climate change, all with the aim of contributing to sustainable development.

According to Republic of Türkiye Updated First Nationally Determined Contribution (NDC) Report[5], Türkiye has made significant investments in many sectors to mitigate the impacts of climate change, especially in the energy sector, which greatly resulted in the reduction in GHG emissions. Like many other countries, the energy sector has the highest GHG emission share compared to others. Therefore, policies and measures to reduce GHG emissions have had a higher focus on energy policies with clear renewable energy generation targets, particularly in the power sector. Türkiye aims to raise this rate even further. The nation's energy policy has placed a high priority on making the most use of renewable energy sources while reducing reliance on imports by enhancing supply security. Türkiye's primary energy sector mitigation strategy for 2030 is to make the most use of renewable energy and energy efficiency while taking market conditions, energy security, and feasibility into account. Investments in renewable energy, particularly solar and wind power, have accelerated thanks in large part to YEKA and the Renewable Energy Sources Support Mechanism (YEKDEM).

As of September 2022, the total installed capacity is 102,281 MW. Renewable energy sources have 55,630 MW and constitute 54 percent of Türkiye's electricity generation installed power capacity. In 2023, Türkiye has become one of the 14 countries in the world with an installed power exceeding 100 thousand megawatts. Among 54% in the share of renewable energy sources, the share of hydro, wind, solar, geothermal, and biomass are 30.9%, 10.9%, 8.8%, 1.6%, and 1.8%, respectively. In the last two years, 97% of commissioned energy sources were from renewables; the rest is cogeneration, which is a good practice of efficiency. Approximately 3,000 MW of solar plus wind power was commissioned in 2021. Given these circumstances, the project aligns with national policies and commitments for climate adaptation or resilience. Project-related physical climate risks been identified and addressed in the following chapters.

The 2022 Sustainability Report[6] published by Smart states that the Company aims to be net zero in 2040. Smart has created a road map and projected all the steps it will take to achieve its net zero target. Adopting a responsible and sustainable production approach, the Company's greenhouse gas emissions from electrical energy consumption in management and factory buildings were zeroed in 2022 by obtaining I-REC certification. The International REC Standard (I-REC) is an international standard created by the International REC Standard Foundation to track the source and prove the consumption of energy produced from renewable sources in any country in the world. The I-REC Certificate, called Renewable Energy Certificate or Green Energy Certificate in Türkiye, certifies that electricity is produced from renewable energy sources by ensuring the traceability of the source and attribute of the energy produced.

[5] https://unfccc.int/sites/default/files/NDC/2023-04/T%C3%9CRK%C4%B0YE_UPDATED%201st%20NDC_EN.pdf

[6] https://smartsolar.com.tr/pdf/Surdurulebilirlik-Raporu.pdf

2.2 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, furnaces 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.

2.2.1 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.

2.2.1.1 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,[7] the client will quantify direct emissions from the facilities owned or controlled within the physical project boundary,[8] as well as indirect emissions associated with the off-site production of energy[9] used by the project. Quantification of GHG emissions will be conducted by the client annually in accordance with internationally recognized methodologies and good practice.[10]

According to the EP2, GHG emissions should be calculated in line with the GHG Protocol[11] 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.

2.2.1.2 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.

2.2.1.3 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.

---

[7] 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.

[8] 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.

[9] Refers to the off-site generation by others of electricity, and heating and cooling energy used in the project.

[10] Estimation methodologies are provided by the Intergovernmental Panel on Climate Change, various international organizations, and relevant host country agencies.

[11] The GHG Protocol is based on a comprehensive globally standardised framework to measure and manage GHG emissions from operations. Available from ghgprotocol.org.

Table 1: 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.

2.2.2 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 since the activities at the closure phase yet to be clear right now.

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), Mobile Sources that are owned or controlled by the Owner (e.g., emissions from combustion in vehicles, and fugitive emissions) and blasting activities.

GHG emissions are assessed based on Project schedules and information provided by Client regarding to amounts of fuel and explosive use, 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[12] 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 by Section 2.2.2.1 below. Table 2 provides a summary of the activities for which GHG emissions are calculated.

Table 2: GHG Emission Sources of the Project

Phase	Source	GHG Emissions
Construction	Generators - Combustion of Diesel Oil	Emissions from the generator
	Vehicles - Combustion of Diesel Oil Mobile Heaters – Combustion of Diesel Oil	On-site vehicle emissions, due to diesel combustion
	Loss of Carbon Sink	Reduction of carbon sink due to loss of vegetation
Operation	-	-

2.2.2.1 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 3 provides the GWPs used in the GHG calculations.

Table 3: Global Warming Potentials from the Intergovernmental Panel on Climate Change

GHG Compound	GWP
CO_2	1
CH_4	25
N_2O	298

[12] Türkiye National Inventory Report (NIR) for UNFCCC, 2023, https://unfccc.int/documents/627786

2.2.2.2 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.

2.2.2.2.1 Stationary Combustion

Stationary combustion sources for the Project include diesel generators. GHG emissions from Project is determined based on the fuel consumption as provided by Smart.

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 4 below.

Table 4: 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 Oil	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
Operation	Use of Generators - Combustion of Diesel Oil	40.4		74,100	3.0	0.6	IPCC 2006 guidelines, Chapter 2 – Stationary Combustion Table 2.2

* 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.

2.2.2.2.2 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 5 below.

Table 5: 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 Date/Number: 22.07.2014/29068), Table 5.1	74,100	4.15	28.6	IPCC 2006 guidelines, Chapter 3 – Mobile Combustion Table 3.3.1	832

* 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:

$$EF_{CO_2}\left(\frac{kg\ CO_2}{L}\right) = \text{Energy based EF}\left(\frac{\text{t } CO_2}{\text{TJ}}\right) \times \text{Net Calorific Value}\left(\frac{\text{TJ}}{\text{kT}}\right) \times \text{Density of Diesel}\left(\frac{\text{kg}}{\text{m}^3}\right) \times \frac{1{,}000\text{ kg } CO_2}{1\text{ t } CO_2} \times \frac{1\text{ kT}}{1{,}000{,}000\text{ kg}} \times \frac{1\ m^3}{1{,}000\text{ L}}$$

Total CO_2 Emissions from Mobile Equipment:

$$E_{CO_2} = \text{Fuel Combustion}\left(\frac{\text{L}}{\text{yr}}\right) \times \text{Emission Factor}\left(\frac{\text{kg } CO_2}{\text{L}}\right) \times \frac{1\text{ tonne}}{1{,}000\text{ kg}}$$

2.2.2.3 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.

2.2.2.3.1 Electricity Consumption

The Scope 2-Indirect GHG emissions are expected to be from electricity consumption. For the emission factor of electricity consumption, Turkish National Electricity Grid Emission Factor (0.7424 t CO_2/MWh) calculated by the Turkish Ministry of Energy and Natural Resources is used. The equation for calculating the indirect GHG emissions due to the electricity purchased is given below.

$$E_{CO_2} = \sum_i E_i * EF$$

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.

2.2.2.4 *Emissions Not Included in Scope 1 or Scope 2*

2.2.2.4.1 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 6: Carbon Stock Change Values

Parameter	Values			Unit	Reference
	Forestland	Grassland	Cropland		
Annual area of Land Converted to Other Land	0.82	50.64	579.81	ha	IPCC 2006 IPCC Guidelines for National Greenhouse Gas Inventories V4 Chapter 4 -Table 4.12, Chapter 5 - Table 5.9, Chapter 6 - Table 6.4.
Biomass stocks before the conversion	100.0	13.5	2.1	tonnes dm ha^{-1}	
Biomass stocks after the conversion	0	0	0	tonnes dm ha^{-1}	
Carbon fraction of dry matter	0.5	0.5	0.5	tonnes C $(tonne\ dm)^{-1}$	

2.2.3 Impact Analysis

2.2.3.1 *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.

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 approximately 29,000 liters.

Then the total Stationary Combustion GHG Emissions were calculated using the equations given in Section 7.1.7.2.2.1. The yearly GHG emissions due to Stationary Combustion were calculated as 25.7 tonne CO^2/year

Mobile Combustion Emissions

During the construction phase of the Project, GHG emissions areexpected to occur due to mobile combustion during 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 approximately 103,000 liters. Then the total GHG Emissions from Mobile Combustion were calculated using the equations given in Section 2.2.2.2.2. The yearly GHG emissions due to Mobile Combustion were calculated as 288.02 tonne CO_2/year.

Electricity Consumption

During the construction phase, electricity will be utilized for construction activities. The project has an off grid system with a daily electricity production capacity of 66 kW. According to the information provided by the Client, electrical energy required will be supplied from the off grid system. Therefore, the plant would not need to purchase electricity from external sources, and no greenhouse gas emissions are expected due to electricity consumption.

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 is set to be developed on a 201.3 ha of former grassland. Designated as an "Industrial Zone" in the 1/100,000 Scale Environmental Plan, the Project site falls within the borders of the "Niğde-Bor Energy Specialized Industrial Zone."Using the equation given in 2.2.2.4.1, the total indirect GHG emissions due to land use change is calculated as 1,358.7 tonne CO_2/year.

Total GHG Emissions in Construction Phase

The annual GHG emissions for construction phase of the Project are presented in Table 7. These annual emissions are calculated for the maximum construction scenario described above. They are based on rough estimates and may significantly overestimate the actual emissions.

Table 7: Annual Project GHG Emissions for Construction Phase

Source	Calculated GHG (as t CO_2e/y)			Total GHG amount	
	t CO_2/y	t CH_4/y	t N_2O/y	t CO_2e/year	Percentage (%)
Stationary Sources (Generators) - Combustion of Diesel Oil	71.48	0.0723	0.172	71.72	4.17
Vehicles - Combustion of Diesel Oil	257.99	0.36	29.67	288.02	16.77
Loss of Carbon Sink	1,358.7	-	-	1,358.7	79.06

Source	Calculated GHG (as t CO_2e/y)			Total GHG amount	
	t CO_2/y	t CH_4/y	t N_2O/y	t CO_2e/year	Percentage (%)
TOTAL				1,718.4	100.00

The table above presents the annual emissions from the 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 2.2.2.1 above.

Table 8: Comparison of Project GHG Emissions to National and Global Emissions

Source	Data
Project GHG Emissions (tonnes CO_2e/year) (during construction)	1,718.4
Comparison to Türkiye-wide Total (%)	0.0003%
Comparison to Global Total (%)	0.0000089%
Türkiye-wide GHG Emissions (2021)[13] (tonnes CO_2e/year)	564,389,750
UNFCCC Annex-I 2021 GHG Emissions[14] (tonnes CO_2e/year)	19,207,285,450

Table 8 summarizes the annual 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 2021) for UNFCCC and total of Annex-I countries GHG releases are obtained from UNFCCC GHG database for the last inventory year 2021. 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.

The combined annual emissions from the construction phase of the Project are about **1,718.4 t CO_2e per annum**. This annual value is below the 25,000 t CO2e threshold defined in IFC PS3 and Equator Principles IV. Therefore, no additional monitoring will be required.

2.2.3.1.1 Operation Phase

During the operation phase, no greenhouse gas emissions is expected considering the nature of the Project. Thus, no impact regarding greenhouse gas emissions is expected.

2.2.3.1.2 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.

[13] Obtained from UNFCCC, Türkiye NIR for the year 2021, https://unfccc.int/documents/627786

[14] Obtained from UNFCCC GHG database, https://di.unfccc.int/time_series

2.2.3.2 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.

Project's GHG emissions will be managed in accordance with the Resource Efficiency Plan, and Air Quality Management Plan to be prepared for the Project.

Section 2.2.2 describes methodology for estimation of GHG emissions originated from the Project and Section 2.2.3 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 not high 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.
- 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.
- 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.

2.2.3.3 Residual Impacts

2.2.3.3.1 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 9: 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	**Medium**	Medium high	**Low**
	Frequency:	Continuous					
	Geo. Extent:	International					
	Intensity:	Low					

2.2.3.3.2 Operation Phase

During the operation phase, no greenhouse gas emissions is expected considering the nature of the Project. Thus, no impact regarding greenhouse gas emissions is expected.

2.2.3.3.3 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.

2.2.3.4 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 standards, 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 10: 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	Monthly	• Amounts consumed 1. [L] 2. [L]	N.A.	Client / Contractors

Source Document	Monitoring Action/Measure Description	Frequency/Timing	KPI	Target/Acceptance Criteria	Responsible Parties
	the following resources: 1. Generators - Diesel Oil (construction); 2. Vehicles - Diesel Oil (construction); • Location of flow meters and counters must be clearly identified on a Site layout. Records on the data resources (such as fuel invoices that include consumption amounts) must be kept.				
• GHG Protocol • IPCC	• Quantify the net calorific value and density of consumed resources and specifications on a periodic (i.e. monthly) basis by appropriate methods; record and aggregate data on consumption of the following resources: 1. Generators - Diesel Oil (construction);	Monthly	• The example units are provided below, other similar related units are acceptable. • Net calorific value: TJ/Gg • Density: kg/lt	N.A.	Client / Contractors

Source Document	Monitoring Action/Measure Description	Frequency/Timing	KPI	Target/Acceptance Criteria	Responsible Parties
	2. Vehicles - Diesel Oil (construction); • Records on the data resources (such as fuel invoices that include consumption amounts) must be kept.				
• 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.	Annual	• GHG Emission Report	Compliance with international standards	Client / Contractors
• GIIP	• Number of employees that have completed the climate, resource and energy efficiency	Semi-annually	• Training records	100%	Client / Contractors

Source Document	Monitoring Action/Measure Description	Frequency/Timing	KPI	Target/Acceptance Criteria	Responsible Parties
	awareness trainings will be checked.				
• GIIP	• Maintenance records of machinery and equipment will be checked for regular maintenance periods.	Monthly	• Maintenance records	100%	Client / Contractors
• 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 / Contractors
• GIIP	• Records on waste types and corresponding amounts will be recorded.	Monthly	• Waste records	Decrease in amount of waste generated and continuous improvement	Client / Contractors
• 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 / Contractors

3.0 METHODOLOGY

According to the ISO 14091 Standard "Adaptation to climate change – Guidelines on vulnerability, impacts and risk assessment[15]" 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.

[15] 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.

- 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)[16] and the World Bank Group[17] 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.
- 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 2. 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.

[16] The Intergovernmental Panel on Climate Change (IPCC) is the United Nations body for assessing the science related to climate change.

[17] The World Bank Group (WBG) is a family of five international organizations that make leveraged loans to developing countries.

Figure 2: 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 Niğde, Türkiye. Information collected from the World Bank Group – Climate Change Knowledge Portal[18] 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 Niğde 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.

Niğde is located in the Central Anatolia region of Türkiye. The continental climate is prevailing in the Niğde province and winters are cold and snowy, and summers are hot and dry with transitional periods of mild weather in spring and autumn. According to the observation records of Niğde Meteorology Station between 1960 and 2021, the annual average temperature is 11.2°C. The highest temperature was recorded in July and August with 38.5°C, and the lowest temperature was measured in February with -24.2°C. Temperature observations show that Niğde has warmed significantly in recent decades. Between 1901 and 2022, the average annual temperature increased by about 1.1°C as can be seen from **Figure 3** below.

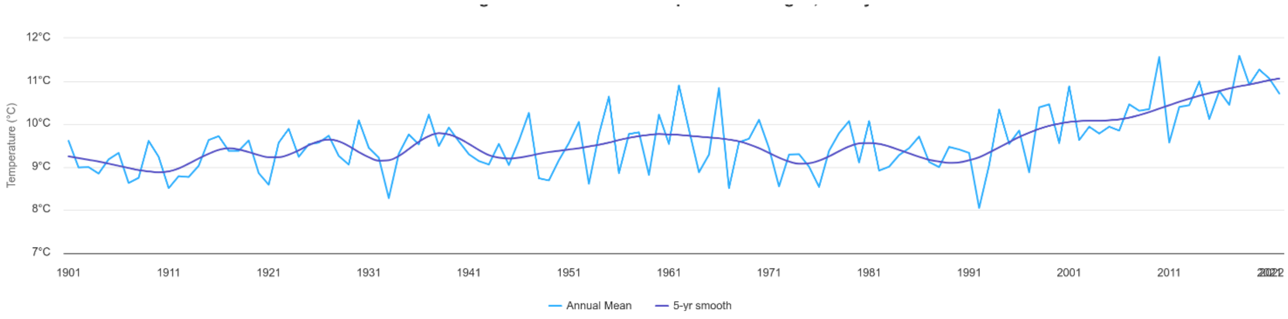


Figure 3: Observed Average Annual Mean-Temperature of Niğde for 1901-2022

Historical climate trends show that between the years 1901 and 2020 the average annual precipitation in Niğde decreased about 3 mm as presented in **Figure 4**. According to the observation records of Niğde Meteorology Station between 1960 and 2021, the annual average total precipitation is 336.9 mm. The maximum amount of precipitation per day was measured in December with 54.5 mm.

[18] The Climate Change Knowledge Portal (CCKP) provides global data on historical and future climate, vulnerabilities, and impacts.

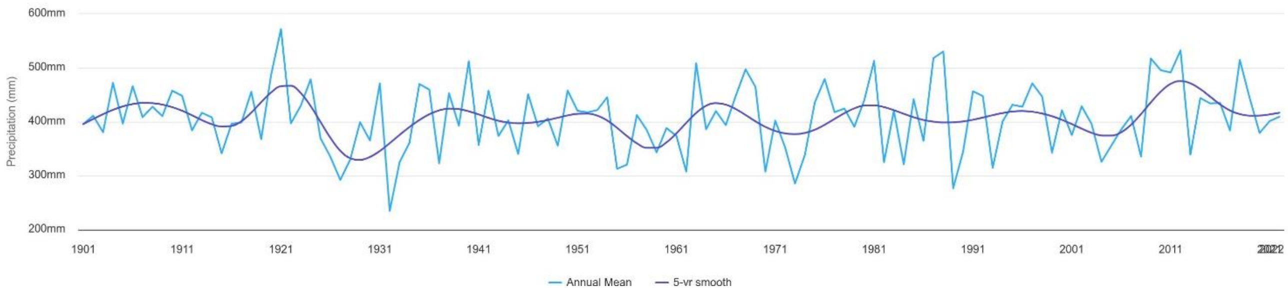


Figure 4: Observed Average Annual Precipitation of Niğde for 1901-2022

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 8 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 Niğde, under SSP5-8.5 by the end of the century as can be seen from **Figure 5**.

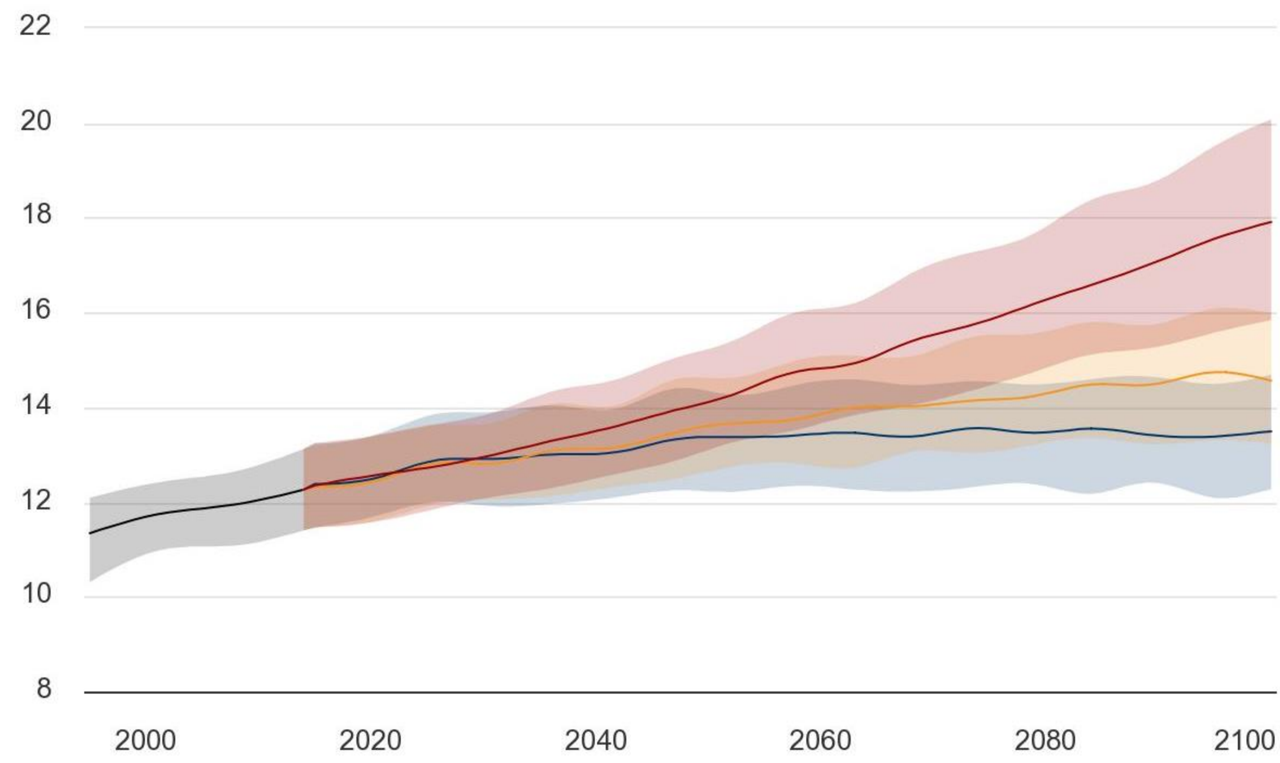


Figure 5: Projected Mean Temperature - Niğde (Ref. Period: 1995-2014), Multi-Model Ensemble

The projections for the mean temperatures according to the years under all scenarios are given in **Table 11**.

Table 11: Projected Mean-Temperature for Niğde

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	13.03°C	12.08 to 13.90°C	13.16°C	12.32 to 14.02°C	13.55°C	12.53 to 14.39°C
2060	13.41°C	12.42 to 14.47°C	13.89°C	12.76 to 14.97°C	14.81°C	13.70 to 16.03°C
2080	13.50°C	12.40 to 14.47°C	14.39°C	13.29 to 15.51°C	16.28°C	14.93 to 17.72°C
2100	13.48°C	12.34 to 14.51°C	14.62°C	13.31 to 15.92°C	18.07°C	16.08 to 19.97°C

The projections for the mean temperature anomaly for each month between the years 2021 and 2100 under each scenario are given in **Table 12**, **Table 13**, **Table 14**.

Table 12: Projected Mean-Temperature Anomaly Niğde, (SSP1-2.6, Multi Model Assemble)

Years / Months	2021-2030	2031-2040	2041-2050	2051-260	2061-2070	2071-2080	2081-2090	2091-2100
January	0.67°C	1.19°C	1.09°C	1.24°C	1.32°C	1.29°C	1.37°C	1.5°C
February	0.8°C	0.83°C	0.95°C	1.1°C	1.58°C	1.41°C	1.52°C	1.35°C
March	0.8°C	0.83°C	0.77°C	1.16°C	1.11°C	1°C	1.25°C	1.48°C
April	0.87°C	0.66°C	0.78°C	1.14°C	1.13°C	1.32°C	1.36°C	0.99°C
May	1.08°C	1.15°C	1.39°C	1.75°C	1.63°C	1.53°C	1.77°C	1.5°C
June	1.11°C	1.34°C	1.64°C	1.59°C	1.66°C	1.56°C	1.67°C	1.46°C
July	1.19°C	1.56°C	1.79°C	1.88°C	1.85°C	1.95°C	2.12°C	1.89°C
August	1.29°C	1.43°C	1.97°C	1.99°C	1.94°C	2.17°C	2.15°C	2.05°C
September	1.08°C	1.27°C	1.9°C	1.8°C	1.86°C	2.14°C	1.95°C	1.59°C
October	0.94°C	1.42°C	1.6°C	1.66°C	1.48°C	1.48°C	1.54°C	1.16°C
November	1.08°C	0.9°C	1.18°C	1.13°C	1.44°C	1.2°C	1.14°C	1.11°C
December	0.97°C	0.99°C	1.04°C	1.41°C	1.3°C	1.51°C	1.25°C	1.04°C

Table 13: Projected Mean-Temperature Anomaly Niğde, (SSP2-4.5, Multi Model Assemble)

Years / Months	2021-2030	2031-2040	2041-2050	2051-260	2061-2070	2071-2080	2081-2090	2091-2100
January	0.73°C	0.96°C	1.02°C	1.37°C	1.8°C	1.65°C	2.1°C	2.11°C
February	0.81°C	0.98°C	1.29°C	1.54°C	1.86°C	2.05°C	2.23°C	2.38°C
March	0.44°C	0.73°C	1.32°C	1.49°C	1.63°C	1.85°C	1.97°C	2.23°C
April	0.53°C	0.95°C	1.39°C	1.59°C	1.74°C	1.91°C	2.53°C	2.34°C
May	0.87°C	1.23°C	1.51°C	1.88°C	2.39°C	2.55°C	2.66°C	2.75°C
June	1.03°C	1.58°C	1.84°C	2.15°C	2.38°C	2.86°C	3.04°C	3.16°C
July	1.13°C	1.84°C	2.12°C	2.39°C	2.86°C	3.26°C	3.47°C	3.79°C
August	1.09°C	1.62°C	2.05°C	2.49°C	3.08°C	3.34°C	3.65°C	3.75°C
September	1.21°C	1.58°C	2.08°C	2.46°C	2.62°C	2.92°C	3.05°C	3.69°C
October	1.08°C	1.27°C	1.59°C	2.11°C	2.47°C	2.5°C	2.87°C	3.06°C
November	0.75°C	1.05°C	1.26°C	1.62°C	2.1°C	2.14°C	2.29°C	2.54°C
December	0.94°C	1.14°C	1.35°C	1.78°C	1.93°C	2.01°C	2.02°C	2.02°C

Table 14: Projected Mean-Temperature Anomaly Niğde, (SSP5-8.5, Multi Model Assemble)

Years / Months	2021-2030	2031-2040	2041-2050	2051-260	2061-2070	2071-2080	2081-2090	2091-2100
January	0.65°C	0.99°C	1.26°C	2.01°C	2.67°C	2.79°C	3.63°C	4.12°C
February	0.6°C	0.83°C	1.33°C	2.06°C	2.35°C	3.05°C	3.59°C	4.3°C
March	0.55°C	0.96°C	1.48°C	1.98°C	2.44°C	3.07°C	3.57°C	4.25°C
April	0.6°C	1.03°C	1.81°C	2.15°C	2.59°C	3.41°C	4.02°C	4.76°C
May	1.06°C	1.45°C	1.86°C	2.78°C	3.29°C	4.28°C	5.34°C	6.02°C
June	1.23°C	1.64°C	2.35°C	3.06°C	3.72°C	4.91°C	5.44°C	6.39°C
July	1.2°C	1.8°C	2.65°C	3.51°C	4.09°C	5.26°C	6.2°C	7.1°C
August	1.18°C	1.86°C	2.63°C	3.55°C	4.41°C	5.46°C	6.18°C	7.07°C
September	1.19°C	1.69°C	2.59°C	3.43°C	4.14°C	5.06°C	6.08°C	6.85°C
October	0.98°C	1.59°C	2.16°C	2.85°C	3.69°C	4.33°C	5.14°C	6.09°C
November	0.8°C	1.13°C	1.66°C	2.37°C	2.82°C	3.31°C	4.4°C	4.88°C
December	0.65°C	1.15°C	1.63°C	2.11°C	2.37°C	2.95°C	3.63°C	4.49°C

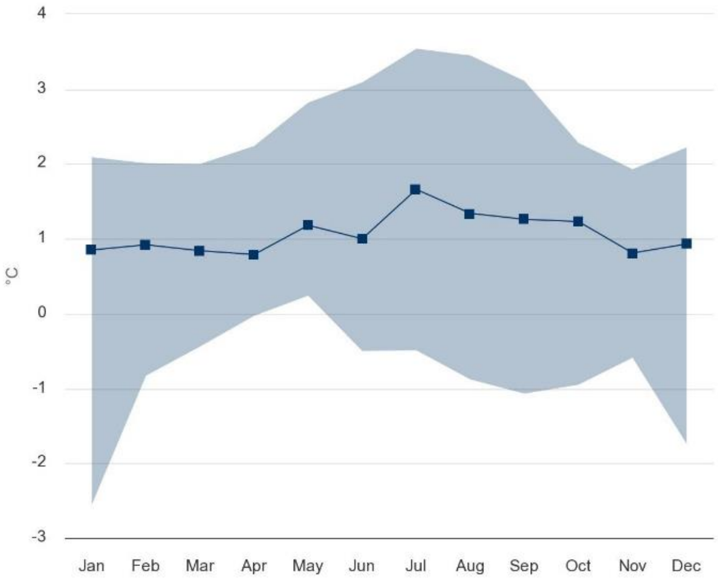
2020-2039

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.

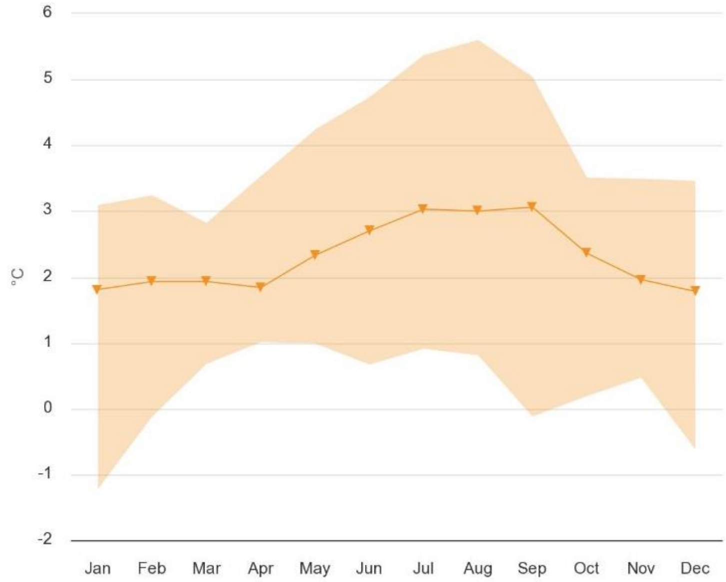
The graph represents monthly temperature anomalies (differences from the long-term average) from January to December for the years 2020 to 2039.

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.

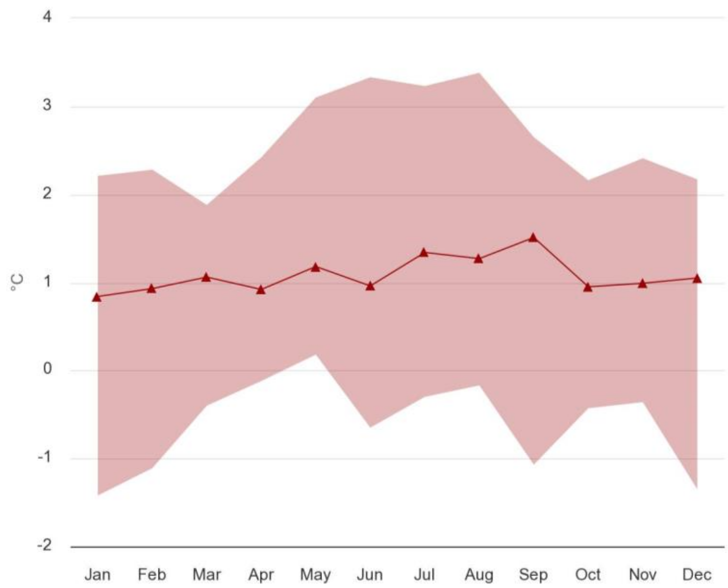
The highest deviation is expected as an increase of 3.83 ˚C in July under the SSP2-4.5 scenario and -2.55 ˚C as a decrease in January under the SSP1-2.6 scenario as can be seen from the **Figure 6** (b) and (a), respectively.



SSP1-2.6 (a)



SSP2-4.5 (b)



SSP5-8.5 (c)

Figure 6: Projected Mean Temperature Anomaly for 2020-2039 - Niğde (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 5.14 ˚C in August under the SSP5-8.5 scenario and -1.62 ˚C as a decrease in December under the SSP1-2.6 scenario as can be seen from the

Figure 7 (c) and (b), respectively.

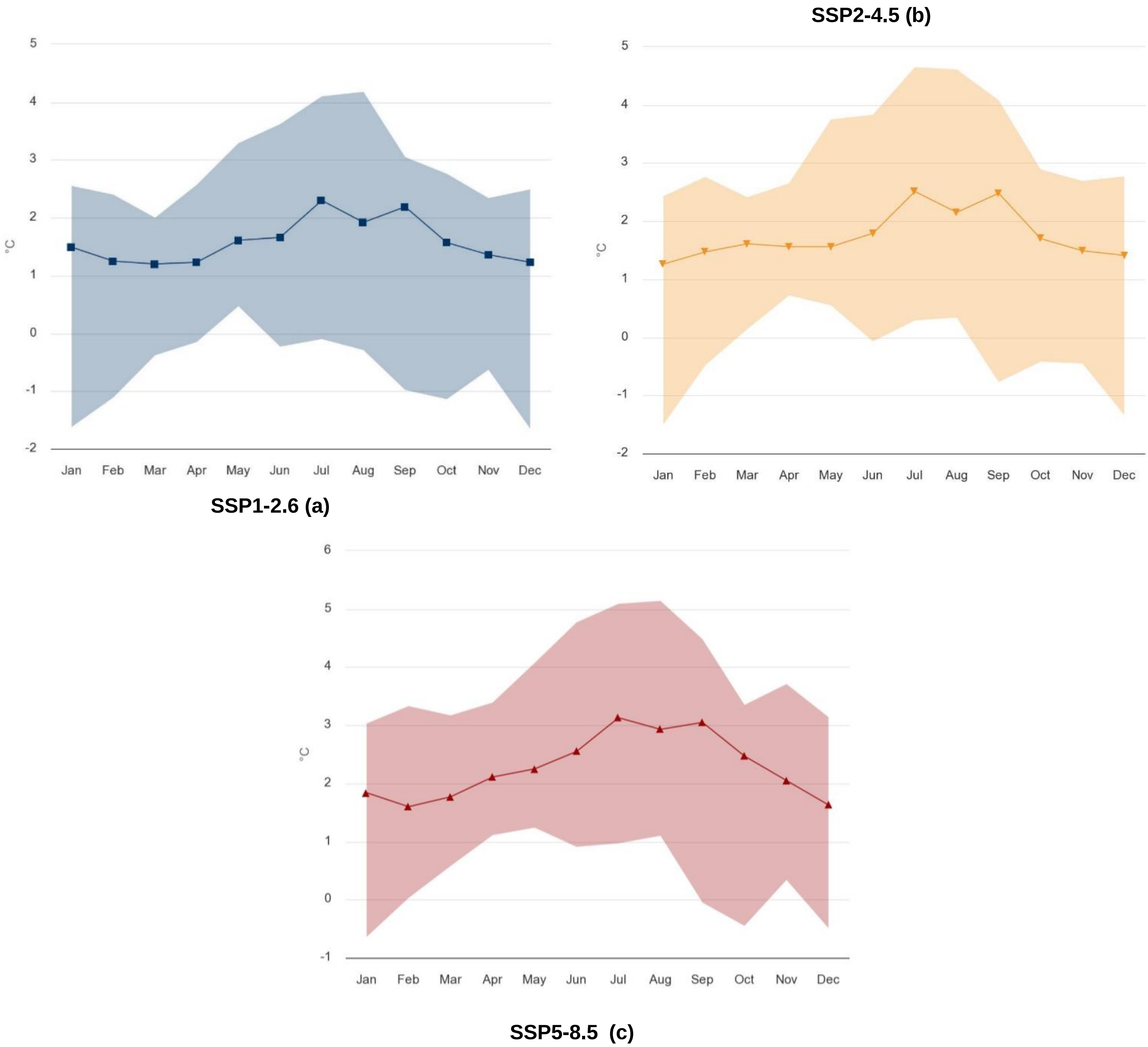


Figure 7: Projected Mean Temperature Anomaly for 2040-2059 - Niğde (Ref. Period: 1995-2014), Multi-Model Ensemble

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 Niğde, under SSP5-8.5 by the end of the century as can be seen from **Figure 8**.

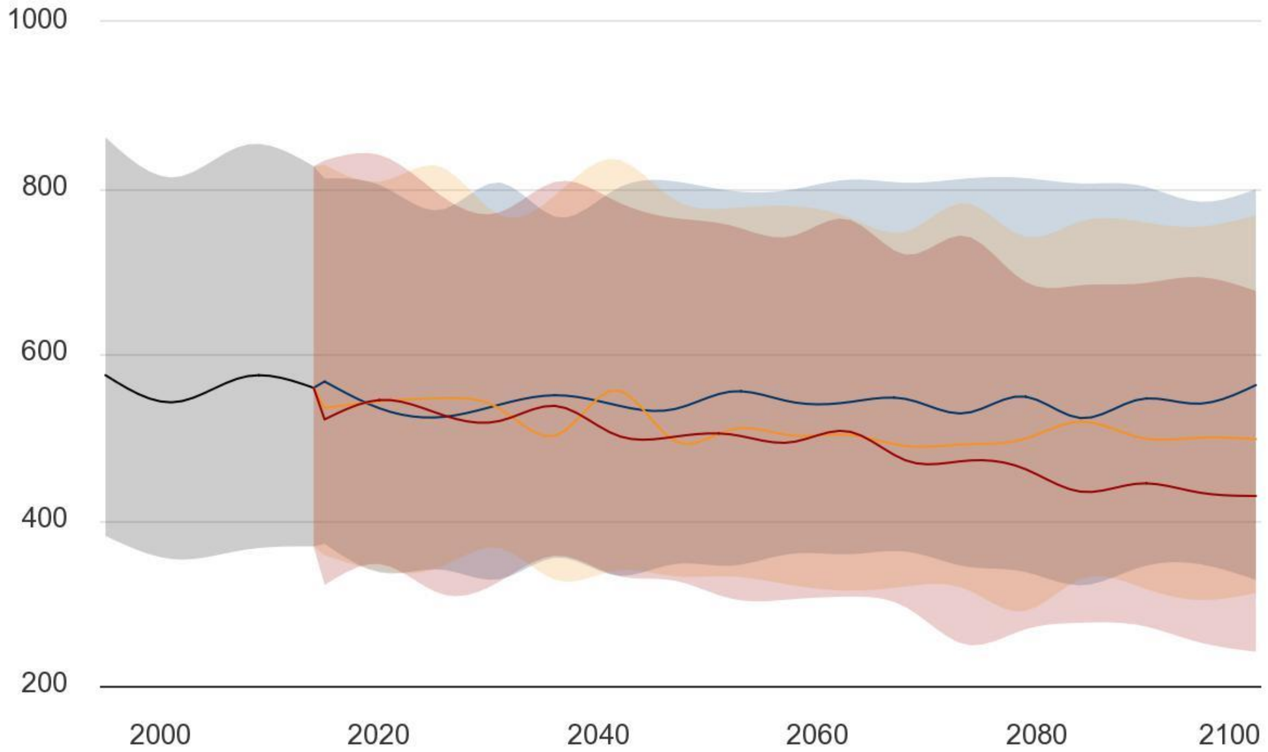


Figure 8: Project Precipitation - Niğde (Ref. Period: 1995-2014), Multi-Model Ensemble

The projections for the precipitation according to the years under all scenarios are given in Table 15.

Table 15: Projected Precipitation - Niğde

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	543.18 mm	338.87 to 784.97 mm	547.17 mm	333.42 to 831.52 mm	513.12 mm	340.88 to 795.07 mm
2060	539.18 mm	359.59 to 804.32 mm	501.65 mm	316.92 to 774.90 mm	501.86 mm	306.21 to 754.95 mm
2080	544.66 mm	333.28 to 810.54 mm	502.68 mm	295.15 to 740.58 mm	454.83 mm	271.48 to 681.31 mm
2100	562.39 mm	327.55 to 798.51 mm	497.30 mm	311.81 to 767.09 mm	428.70 mm	241.02 to 675.87 mm

The projections for the projected precipitation anomaly for each month between the years 2021 and 2100 under each scenario are given in **Table 16**, **Table 17**, **Table 18**.

Table 16: Projected Precipitation Anomaly Niğde, (SSP1-2.6, Multi Model Assemble)

Years / Months	2021-2030	2031-2040	2041-2050	2051-260	2061-2070	2071-2080	2081-2090	2091-2100
January	-1.94 mm	-4.26 mm	-4.11 mm	-0.58 mm	-1.29 mm	-1.39 mm	-4.9 mm	2.24 mm
February	-4.51 mm	-5.22 mm	-5.77 mm	-6.04 mm	-2.94 mm	-4.09 mm	-3.93 mm	-5.25 mm
March	0.74 mm	0.03 mm	3.25 mm	-1.54 mm	-1.7 mm	0.68 mm	-2.69 mm	0.43 mm
April	-0.35 mm	-0.99 mm	1.41 mm	3.4 mm	0.13 mm	0.97 mm	-1.33 mm	3.21 mm
May	-2.07 mm	-0.99 mm	0.98 mm	-0.39 mm	2.9 mm	-0.26 mm	2.69 mm	2.09 mm
June	2.35 mm	0.82 mm	0.62 mm	-1.28 mm	-0.84 mm	-1.3 mm	-0.29 mm	3.63 mm
July	-0.11 mm	-0.71 mm	-0.27 mm	-0.34 mm	-0.63 mm	-0.29 mm	-0.4 mm	-0.3 mm
August	-0.54 mm	-0.27 mm	-0.37 mm	-0.6 mm	-0.51 mm	-0.58 mm	-0.55 mm	-0.42 mm
September	-1.26 mm	-0.54 mm	-0.86 mm	-2.1 mm	-1.39 mm	-2.52 mm	-1.42 mm	-1.86 mm
October	-2.65 mm	-6.13 mm	-0.43 mm	-0.37 mm	-4.71 mm	-1.99 mm	-4.03 mm	-2.02 mm
November	-7.2 mm	-2.32 mm	-11.26 mm	-2.1 mm	-7.58 mm	-8.57 mm	-4.71 mm	-9.42 mm
December	-7.04 mm	-4.97 mm	-3.47 mm	-3.89 mm	2.95 mm	-6.08 mm	-0.46 mm	-7.85 mm

Table 17: Projected Precipitation Anomaly Niğde, (SSP2-4.5, Multi Model Assemble)

Years / Months	2021-2030	2031-2040	2041-2050	2051-260	2061-2070	2071-2080	2081-2090	2091-2100
January	-1.62 mm	-11.16 mm	-4.51 mm	-7.05 mm	-4.7 mm	-7.07 mm	-7.85 mm	-8.17 mm
February	-5.59 mm	-0.9 mm	-1.66 mm	-1.37 mm	-6.1 mm	-9 mm	-10.58 mm	-8.68 mm
March	-1.65 mm	-4.77 mm	-4.64 mm	-3.62 mm	-4.6 mm	-3.71 mm	-3.28 mm	-5.24 mm
April	0.56 mm	1.7 mm	2.42 mm	-3.96 mm	-0.63 mm	-5.8 mm	-0.35 mm	-0.73 mm
May	-1.58 mm	-3.1 mm	-1.86 mm	-1.53 mm	-6.48 mm	-2.61 mm	1.56 mm	-1.83 mm
June	1.53 mm	-0.46 mm	-0.92 mm	1.09 mm	-1.79 mm	-1.28 mm	0.43 mm	-1.4 mm
July	-0.27 mm	-0.35 mm	-0.27 mm	-0.89 mm	-0.9 mm	-1.45 mm	-0.92 mm	-1.57 mm
August	-0.38 mm	-0.25 mm	-0.37 mm	-0.66 mm	-0.42 mm	-0.77 mm	-0.92 mm	-0.43 mm
September	-0.38 mm	-1.64 mm	-2.05 mm	-1.95 mm	-1.66 mm	-3.18 mm	-3.43 mm	-2.42 mm
October	-2.8 mm	-0.21 mm	-0.12 mm	-2.8 mm	-4.94 mm	-6.05 mm	-5.63 mm	-5.62 mm
November	-7.45 mm	-12.15 mm	-8.32 mm	-6.76 mm	-14.97 mm	-15 mm	-11.8 mm	-12.04 mm
December	-4.04 mm	-4.37 mm	-6.03 mm	-16.57 mm	-13.5 mm	-3.26 mm	-7.76 mm	-11.14 mm

Table 18: Projected Precipitation Anomaly Niğde, (SSP5-8.5, Multi Model Assemble)

Years / Months	2021-2030	2031-2040	2041-2050	2051-260	2061-2070	2071-2080	2081-2090	2091-2100
January	-8.91 mm	-3.64 mm	-5.97 mm	-5.91 mm	-17.16 mm	-17.53 mm	-17.21 mm	-14.7 mm
February	-1.54 mm	-7.51 mm	-4.96 mm	-15.35 mm	-8.76 mm	-14.54 mm	-16.13 mm	-12.95 mm
March	-4.87 mm	-3.74 mm	-5.11 mm	-4.15 mm	-4.81 mm	-9.9 mm	-7.28 mm	-14.72 mm
April	-3.3 mm	2.31 mm	-6.03 mm	-3.93 mm	-5.64 mm	-6.82 mm	-6.24 mm	-10.91 mm
May	-3.03 mm	-0.18 mm	-3.35 mm	-4.52 mm	-2.49 mm	-6.73 mm	-6.79 mm	-11.31 mm
June	0.9 mm	-1.33 mm	-1.37 mm	-0.8 mm	-1.01 mm	-0.07 mm	-1.89 mm	-5.32 mm

Years / Months	2021-2030	2031-2040	2041-2050	2051-260	2061-2070	2071-2080	2081-2090	2091-2100
July	-0.74 mm	-0.45 mm	-0.88 mm	-0.85 mm	-1.59 mm	-0.98 mm	-0.95 mm	-1.87 mm
August	-0.29 mm	-0.36 mm	-0.23 mm	-1.08 mm	-0.7 mm	-1.54 mm	-1.78 mm	-1.47 mm
September	-1.19 mm	-0.98 mm	-2.27 mm	-2.83 mm	-3.4 mm	-4.61 mm	-4.82 mm	-5.4 mm
October	-0.7 mm	-4.2 mm	-2.95 mm	-3.3 mm	-3.5 mm	-6.52 mm	-9.42 mm	-9.26 mm
November	-7.86 mm	-7.86 mm	-11.79 mm	-20.49 mm	-8.93 mm	-16.84 mm	-21.97 mm	-22.13 mm
December	-8.66 mm	-7.83 mm	-15.57 mm	-18.9 mm	-20.96 mm	-21.3 mm	-19.69 mm	-26.63 mm

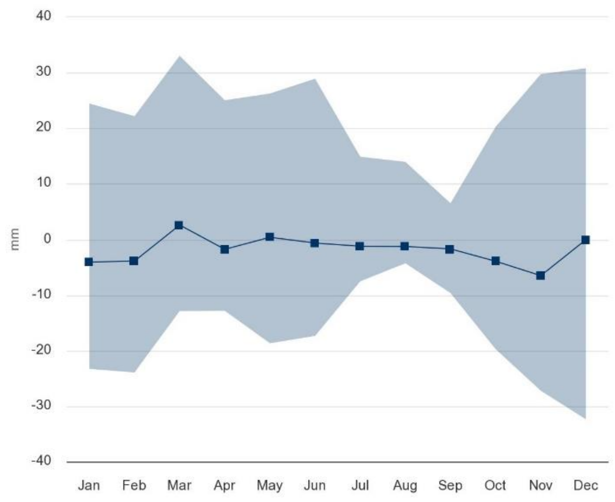
2020-2039

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.

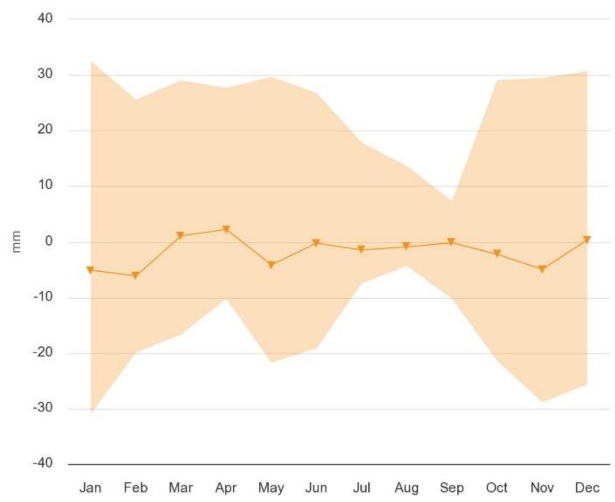
The graph represents projected precipitation anomalies (differences from the long-term average) from January to December for the years 2020 to 2039.

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.

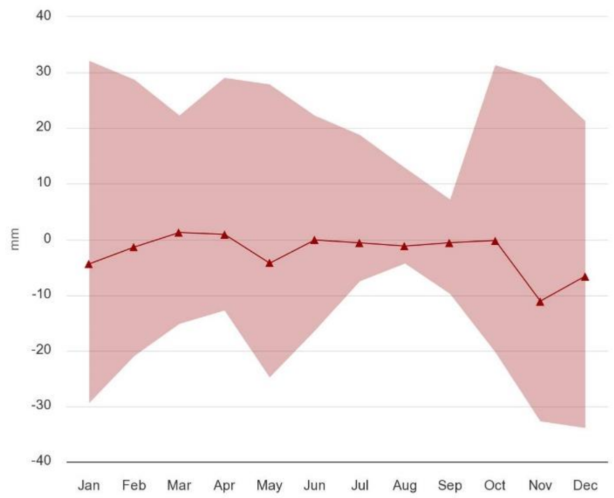
The highest deviation from the baseline values is expected as an increase of 32.48 mm in January under the SSP2-4.5 scenario and -33.94 mm as a decrease in December under the SSP5-8.5 scenario as can be seen from the Figure 9 (b) and (c), respectively.



SSP1-2.6 (a)



SSP2-4.5 (b)



SSP5-8.5 (c)

Figure 9: Projected Precipitation Anomaly for 2020-2039 - Niğde (Ref. Period: 1995-2014), Multi-Model Ensemble

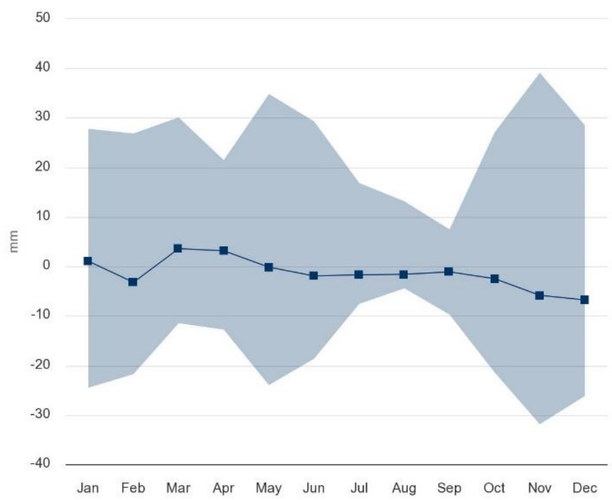
2040-2059

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.

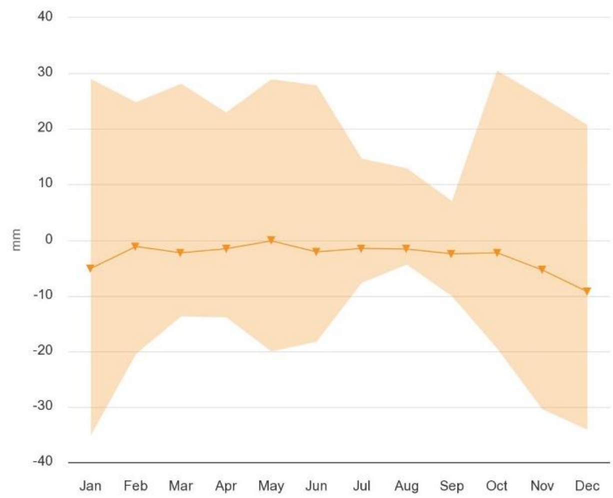
The graph represents projected precipitation anomalies (differences from the long-term average) from January to December for the years 2020 to 2039.

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 39.09 mm in November under the SSP1-2.6 scenario and -41.33 mm as a decrease in December under the SSP5-8.5 scenario as can be seen from the Figure 10 (a) and (c), respectively.



SSP1-2.6 (a)



SP2-4.5 (b)

SSP5-8.5 (c)

Figure 10: Projected Precipitation Anomaly for 2040-2059 - Niğde (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:

- What are the past events and what are the main issues that affected the site and may be related to climate change?
- What is 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 Niğde.

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 a recurring natural hazard throughout Niğde.

The flood risk in Niğde is influenced by its geographic location in the Central Anatolia region of Türkiye. While the city is not located directly on the coast, it can still be affected by heavy rainfall from weather systems passing over the area.

During periods of intense precipitation, rivers and streams in and around Niğde can swell, potentially leading to localized flooding in low-lying areas and areas with inadequate drainage. Urbanization and changes in land use can also contribute to increased flood risk by altering natural drainage patterns.

Therefore, this hazard has been scoped in for the climate change risks assessment and assessed as "HIGH".

- **Extreme Heat Hazard**

The mean annual temperature in Niğde has increased by an average of 0.5°C per decade since 1971, adding up to a 1.5°C temperature increase since last century. Temperatures are projected to keep rising. This can have significant implications for extreme heat.

Projections indicate prolonged exposure to extreme heat, resulting in heat stress, is expected to occur at least once in the next five years.

Therefore, this hazard has been scoped in for the climate change risks assessment and assessed as "HIGH".

- **Extreme Cold Hazard**

In Niğde Province, in January, which is typically the coldest month of the year, average minimum temperatures moved from -6.37°C for the period 1901-1930 to -5.58° in the period 1991-2020. According to all scenarios, minimum temperatures are expected to further increase in the future.

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. Niğde Province has a desertification risk above medium level. It is situated at an elevation of about 1300 m above sea level.

According to a study, 110 droughts lasting six months and more occurred between 1950 and 2015. It was determined that drought magnitude increases from 1-month time scale to 36-month timescale.[19]

Additionally, if droughts intensify, they will pose serious threats to food security, people’s main livelihood activity (agriculture), and water resources.

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)[20], severe storms including severe wind, heavy rain, large hail, damaging lightning is a recurring hazard in Niğde.

Therefore, this hazard has been scoped in for the climate change risks assessment and assessed as “HIGH”.

- **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.

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 Niğde 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, Niğde lost 79 ha overall from all loss factors between 2001 and 2022, including the loss of 23 ha of tree cover due to fires. In this time frame, the year 2021 had the greatest amount of tree cover loss due to fires, with 7 ha lost to fires accounting for 55% of all tree cover loss for that year. Fires were responsible for 23% of tree cover loss in Niğde between 2001 and 2022.

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

[19] https://www.researchgate.net/publication/322157691_INVESTIGATION_OF_TRENDS_IN_METEOROLOGICAL_DROUGHTS_IN_NIGDE_PROVINCE

[20] https://eswd.eu/

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 19: 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 “LOW”.

- According to the information provided by Smart, panel cleaning will be done with dry cleaning method which does not require water. Dry cleaning is the practice of using a soft brush or cloth to eliminate loose debris and dirt from solar panels' surfaces. This technique is commonly applied in areas where dust and dirt accumulation is minimal.
- Water need for dust suppression during dry periods is estimated to be 25 m3/day and water will be supplied from Kemerhisar 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.

<u>Sensitivity to Extreme precipitation</u>: 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.

<u>Sensitivity to Wildfires:</u> 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.
- Smart has an Environment and Climate Change Policy which was adopted and put into practice with the Board of Directors Decision dated 23/11/2022 and numbered 2022/46. The Policy is regularly reviewed and updated when deemed necessary. According to the policy Smart declares the following;
  - "While managing all our operations in compliance with relevant environmental legislation and national and international standards, we contribute to the low-carbon energy production of all our business stakeholders with our products and services.
  - We ensure that the technologies we use are environmentally sensitive, and in this context, we attach great importance to innovation and R&D activities.

  - We consider risks and opportunities related to the environment and climate change in our decision-making processes.
  - We protect natural resources, minimize waste generation with the goal of preventing and reducing pollution at its source, and ensure that resources are reused and recycled into the economy. With all these, we reflect the circular economy to our products and services.
  - We take care to develop the concept of social responsibility for the protection of the environment, climate change and raising environmental awareness, including all our stakeholders, subcontractors and suppliers, and ensure that our working environment is environmentally friendly.
  - We evaluate the impacts on biodiversity, environment and ecosystems during the project phase of all our planned investments, and we carry out activities to mitigate these impacts during construction/implementation, operation and post-operation.
  - Within the scope of preventing and combating climate change in the entire value chain, we attach importance to resource efficiency in all our processes, calculate our production-based greenhouse gas emissions in this direction, and develop targets and projects to reduce them.
  - We adopt the United Nations Sustainable Development Goals (SDGs) focused on combating climate change, and contribute to the fight against climate change in the national and international arena with our products and services focused on green technology and low-carbon energy production.
  - We lead the fight against climate change in Türkiye and around the world, and support projects in this field through collaborations and partnerships with national and international public institutions and organizations, private sector companies, academia and non-governmental organizations.”

- The project will have an active Emergency Preparedness & Response Plan, which will be prepared by WSP. It will include 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 “LOW”.

- There is no drainage system for rainwater and collection points. Procedures will be initiated if deemed necessary depending on the status of the project. No specific measures are in place according to available information to protect the plant.

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 is few Adaptive Capacity measures in place. Overall Adaptive Capacity has been assigned "MEDIUM".

- Project will use dry cleaning for panel cleaning.

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 11: 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 20 shows the details of Vulnerability assessment for all hazards.

Table 20: Vulnerability Assessment

Hazard	Sensitivity	Adaptive Capacity	Vulnerability
FLOODING	MEDIUM	LOW	HIGH
EXTREME HEAT	MEDIUM	MEDIUM	MEDIUM
EXTREME COLD	MEDIUM	MEDIUM	MEDIUM
DROUGHT	LOW	MEDIUM	LOW
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 12: Risk Matrix

A summary of the outcomes is presented in Table 21.

Table 21: Risk Assessment

Hazard	Vulnerability	Hazard Class	Risk
FLOODING	HIGH	HIGH	HIGH
EXTREME HEAT	MEDIUM	HIGH	HIGH
EXTREME COLD	MEDIUM	LOW	LOW
DROUGHT	LOW	HIGH	MEDIUM
SEVERE STORMS	HIGH	HIGH	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 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 Kemerhisar and Niğde 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 Niğde.
- Verify the adequacy of the maintenance program of all prevention and fire emergency systems.

Signature Page

Golder Associates (Turkey) Ltd. ŞTI

Irmak Özdemir
Environmental Engineer

Merve Acırlı
Project Manager

IO/MA

Registered in Türkiye Registration No. 53/3069

Vat No. 396 056 79 79

wsp.com