MURAT NEHRİ ENERJİ ÜRETİM A.Ş.

ENERGO-PRO

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## ALPASLAN II DAM AND HYDROELECTRIC POWER PLANT AUXILIARY SOURCE SOLAR ENERGY POWER PLANT PROJECT (41.9916 MWm-62.74 ha)

## MUŞ PROVINCE, CENTRAL DISTRICT, DUMLUSU VILLAGE MURAT MEVKİİ AND AKKONAK VILLAGE GÖLHAZAL MEVKİİ

☐ EIA Application File EIA
☐ Report
☐ Finalized EIA Report Final EIA Report
■ Final EIA Report

**OCTOBER-2023**

ÇINAR® MÜHENDİSLİK MÜŞAVİRLİK A.Ş.

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| **PROJECT NAME:** | ALPASLAN II DAM AND H Y D R O E L E C T R I C POWER PLANT ANCILLARY SOURCE SUN ENERGY POWER PLANT PROJECT (41.9916 MWm-62.74 ha) |
| **PROJECT COST (TL):** | TL 125.974.800,00 |
| **ADDRESS OF THE LOCATION SELECTED FOR THE PROJECT (PROVINCE, DISTRICT, LOCATION):** | Muş Province, Merkez District, Dumlusu Village Murat Mevkii and Akkonak Village Gölhazal Mevkii |
| **PROJECT'S EIA REGULATIONS LOCATION IN THE SCOPE (SECTOR, SUB-SECTOR):** | EIA Regulation published in the Official Gazette dated 29.07.2022 and numbered 31907;<br><br>**Annex-1 List;**<br>(List of Projects for Environmental Impact Assessment) "43- Solar power plants with a project area of 20 hectares or more or an installed capacity of 10 MWm or more**"** |
| **MAIN NACE CODE OF THE PROJECT:** | 35-Energy |
| **PROJECT RELEVANCE NACE CODES OF ACTIVITIES** | 35.11.19 Electric Power Generation |
| **NAME OF THE WORKING GROUP/ORGANIZATION PREPARING THE REPORT:** | Cinar Engineering Consultancy Inc.<br>Qualification Certificate No: 02<br>Qualification Certificate Issue Date: 30.12.2021 |
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## ABBREVIATIONS/ DEFINITIONS

| | |
|---|---|
| **ADNKS** | Address Based Population Registration System |
| **AFAD** | Disaster and Emergency Management Presidency |
| **A.S.** | Joint Stock Company |
| **BERN CONVENTION** | Convention for the Conservation of European Wildlife and Habitats |
| **See** | See also |
| **$cm^2$** | Square Centimeter |
| **EIA** | Environmental Impact Assessment |
| **EIA REGULATION** | Regulation on Environmental Impact Assessment published in the Official Gazette dated 29.07.2022 and numbered 31907 |
| **CGDG** | Environmental Noise Control Regulation published in the Official Gazette dated 30.11.2022 and numbered 32029 |
| **DEB** | Valuable Ecosystem Components |
| **DKMP** | Nature Conservation and National Parks |
| **EMRA** | Energy Market Regulatory Authority |
| **EIH** | Energy Transmission Line |
| **EİGM** | General Directorate of Energy Affairs |
| **Fider** | The equipment to which the line, transformer or cable is connected to transmit energy from a central busbar to a customer or group of customers |
| **G** | South |
| **GB** | Southwest |
| **GES** | Solar Power Plant |
| **GWh** | Gigawatt Hour |
| **ha** | Hectare |
| **IUCN** | International Union for Conservation of Nature (International Union for Conservation of Nature) |
| **K** | North |
| **KD** | Northeast |
| **km** | Kilometer |
| **$km^2$** | Square Kilometer |
| **KV** | kilowatt |
| **m** | Meter |
| **Max** | Maximum (Maximum) |
| **MGM** | General Directorate of Meteorology |
| **Müh.** | Engineering |
| **Muş.** | Consultancy |
| **MWac** | Megawatt Alternating Current |
| **MWdc** | Megawatt Linear Current |
| **MWe** | Megawatt (Electricity) |
| **MWm** | Megawatt (Mechanical) |
| **MWp** | Megawatt Peak |
| **center.** | Average |
| **PGA** | Peak Ground Acceleration |
| **R.G.** | Official Gazette |
| **SKKY** | Regulation on Water Pollution Control published in the Official Gazette dated 30.12.2004 and numbered 25687 |

| | |
|---|---|
| **SKHHKY** | 03.07.2009 dated and 27277 numbered Regulation on the Control of Industrial Air Pollution published in the Official Gazette |
| **T.C.** | Republic of Turkey |
| **TM** | Substation |
| **TUBIVES** | Plants of Turkey Data Service |
| **TUIK** | Turkish Statistical Institute |
| **UNEP** | United Nations Environment Program |
| **Investor Company** | Murat Nehri Enerji Üretim A.Ş. |
| **YEK/YEKA** | Renewable Energy Source |

**NON-TECHNICAL SUMMARY OF THE PROJECT**

(Explanation of all works planned to be carried out during the construction and operation phases of the project and all measures envisaged to be taken for environmental impacts, without technical terms and in understandable simplicity)

Murat Nehri Enerji Üretim A.Ş. plans to establish and operate the "Alpaslan II Dam and Hydroelectric Power Plant Auxiliary Source Solar Power Plant Project (41.9916 MWm-62.74 ha)" project in Murat Mevkii of Dumlusu Village and Gölhazal Mevkii of Akkonak Village in Muş province, Merkez district. The coordinates of the usage areas determined within the scope of the planned project are given in the annex of the report (See Annex-1).

The planned project is an auxiliary resource project planned by Murat Nehri Enerji Üretim A.Ş. as an addition to the hydroelectric power plant with a capacity of 280 MWe, which is currently operating within the borders of Murat Mevkii in Dumlusu Village and Gölhazal Mevkii in Akkonak Village in Muş province, Central district.

With the aforementioned auxiliary resource project, it is aimed to increase the total mechanical installed capacity from 283,520 MWm to 325,5116 MWm without any change in the electrical power of the currently operating 280 MWe hydroelectric power plant.

Alpaslan II Dam and Hydroelectric Power Plant, which is currently in operation, has a production license dated 05.01.2017 and numbered EÜ/6841-5/03642 by the Energy Market Regulatory Authority (See Annex-2.1).

Within the scope of the planned project, within the framework of the Energy Market Regulatory Authority's (EMRA) Decision No. 11234 dated 15.09.2022 (See Annex-2.2); a Solar Power Plant system with a total power of 41.9916 MWm will be added to a total area of 627,441.716 $m^2$ (62.74 ha) in the Murat Mevkii of Dumlusu Village and Gölhazal Mevkii of Akkonak Village in Muş province, Central district.

Approximately 10% of the electricity to be generated within the scope of the project will be used for the internal needs of the hydroelectric power plant, which is the main source, and the remaining 90% will be sold within the scope of the license. Within the scope of the project, at least 540 Wp
ELNSM72M-545-HC-HV Series with 20.1% efficiency, si-mono photovoltaic, etc.
76,440 panels will be used. Technical specifications of the solar panels to be used within the scope of the Project are given in the annex of the report (See Annex-2.3).

The energy to be produced in the Auxiliary Source Solar Power Plant will meet the internal needs of the hydroelectric power plant and will meet some of the increasing energy needs of our country. In addition, the region where the project is located will be positively affected by the increase in income, population mobility, education, health and other technical infrastructure services.

The SPP activity is expected to serve for approximately 25 years. However, with technological improvements, the operation period can be extended.

The investment cost of the project is determined as 125.974.800,00 TL. The entire investment and operating cost will be covered by the investor company. If necessary, credit utilization can be provided.

It is planned to employ 40 personnel during the construction phase of the project and 8 personnel during the operation phase. Within the scope of the project, unskilled personnel will be employed from the region as much as possible during the construction phase, contributing to the regional economy.

Within the scope of the planned project, local people will be prioritized as much as possible in the recruitment of personnel and it is planned to contribute to local employment.

The 1/25.000 Scale Land Asset Map showing the Project area and its surroundings i s given in Annex-5. According to the Project 1/25.000 Scale Land Asset Map, although the SPP Area is within irrigated agriculture (insufficient) areas, it is currently within the **"Solar Energy Area qualified"** areas **with non-agricultural use permits**.

The planned project area is located in "Treeless Forest Areas" according to the stand map. In this context, there is no forest area utilization and tree felling specific to the activity (See Annex-6 1/50.000 Scale Stand Map of the Project Area and Surroundings).

The approved Environmental Plan, Legends and Relevant Plan Provisions for the Muş-Bitlis-Van Planning Region with a scale of 1/100.000, where the Project area is located, are given in Annex-3 and the EIA Area and SPP Area are defined as "Dam" in the Environmental Plan with a scale of 1/100.000. However, although the project area appears as "Dam" in the Environmental Plan, it is currently within the **"Solar Energy Area qualified"** areas **that have been granted non-agricultural use permits**.

In addition, part of the project area was previously used as "Construction Site" for the construction of Alpaslan II Dam and Hydroelectric Power Plant.

For the agricultural lands in the project area; within the scope of the Soil Conservation and Land Use Law No. 5403, with the letter dated 20.02.2003 and numbered 2844-002375 of the General Directorate of Agricultural Production and Development of the Ministry of Agriculture and Rural Affairs, a total area of 5469 hectares including the Alparslan II Dam and HEPP project area was given permission for non-agricultural use within the scope of the Regulation on the Protection and Use of Agricultural Lands in force at that time.

The "Non-Agricultural Use Permit Opinion" received by Muş Provincial Directorate of Agriculture and Forestry from the Ministry of Agriculture and Forestry, General Directorate of Agricultural Reform, regarding whether this permit is valid for the planned SPP project is given in Annex-2.4. In the opinion of the General Directorate of Agricultural Reform given in Annex-2.4, it is stated that *"5469 hectares of land with a surface area of 5469 hectares, which was granted permission for non-agricultural use with the letter dated 20.02.2003 and numbered 2844-002375 of the abrogated Ministry of Agriculture and Rural Affairs General Directorate of Agricultural Production and Development, is outside the scope of Law No. 5403, and it is considered that no action can be taken within the scope of Articles 13, 14, 20 and 21 of Law No. 5403 within this area."* In this context, no additional permission, etc. will be obtained for land use.

Muş-Bitlis-Van Planning Region 1/100.000 Scale Environmental Plan Provisions;

**Given under the heading "7.23. Energy Generation Areas and Energy Transmission Facilities";**

*7.23.1. In renewable energy (wind, solar, geothermal, hydroelectric) production areas, within the scope of the permits obtained from the relevant institutions and organizations and the license to be issued by the Energy Market Regulatory and Supervisory Board, provided that the Ministry of Environment and Urbanization's approval is obtained, the master and implementation zoning plans prepared in line with the opinions of the relevant institutions and organizations are approved by the relevant administration without the need for a 1/100.000 scale environmental layout plan amendment, and the plans are sent to the Ministry for information.*

The provisions given under the heading "7.23. Energy Generation Areas and Energy Transmission Facilities" shall be complied with.

In the planned "Alpaslan II Dam and Hydroelectric Power Plant Auxiliary Source Solar Power Plant Project (41,9916 MWm-62,74 ha)", location alternative evaluations have been made while determining the area where SPP panels will be installed and while making these evaluations;

- Distance of SPP areas from settlements,
- Not being on a bird migration route,
- Not being within the areas covered by the Circular dated 03/03/2014 and numbered 2014/1,

- Distance to the existing hydroelectric power plant and infrastructure connections,
- Areas deemed appropriate and/or planned to be deemed appropriate by EMRA,
- The high solar potential of the province,
- The distances to and/or overlaps with mining sites, geothermal water sources, surface water, etc. have been taken into consideration.

Within the scope of the project, in accordance with Article 8- 9 of the "Communiqué on Environmental Impact Assessment Qualification Certificate" published in the Official Gazette dated 29.11.2019 and numbered 30963, Çınar Mühendislik Müş. A.Ş. dated 06.09.2022 and numbered 1038, an information petition was submitted to the Provincial Directorate of Environment, Urbanization and Climate Change of the Governorship of Muş, and land survey studies were carried out in and around the project area on 15.09.2022.

The said Land Survey Petition and Site Investigation Form are given in Annex-2.5.

The location of the Project area in relation to the nearby settlements is shown in the satellite image in Figure I.4.1 and the distances of the settlements to the Project area are given in Table I.4.1. The Project area will be accessible via Erzurum-Muş (D955) highway.

All social and administrative needs of the personnel who will work during the land preparation and construction phase of the Project will be met from the mobile prefabricated construction site, while all needs of the personnel who will work during the operation phase will be met from the existing administrative building of Alpaslan II Dam and HEPP production facility.

During the land preparation-construction phase and operation phase of the Project, the drinking water needs of the personnel will be met by purchasing from the market with carboys. The domestic water needs of the personnel will be met by tanker truck from Dumlusu Neighborhood in accordance with the protocol given in Annex-2.6 during the land preparation and construction phase and from the administrative building of Alpaslan II Dam and HEPP production facility during the operation phase.

Land preparation and construction works are planned to take approximately 18 months. Engineering and preliminary works are planned for 2024-2025, material procurement and construction works are planned to start in 2025, and the planned project is planned to be commissioned in 2026 with assembly and commissioning works. It is envisaged that the planned activity will be commissioned within 1 month after the equipment procurement and construction works are completed, followed by test production and then provisional acceptance.

Currently, the Zoning Plans of the project area have been approved, land purchases have been completed, the unification file has been approved, cadastral and expropriation processes are about to be completed. It is planned to start construction by obtaining a construction license after the EIA Decision.

An infirmary will not be established within the project area and in case medical intervention is required for the personnel, they will be referred to the nearest health institution.

Within the scope of the project, the GES panels will need to be cleaned of dust that will form on them in certain periods in order to make the best use of solar energy. Panel cleaning will be done with pure water and no chemicals will be used. Since the panels will be left to dry after the washing process, the washing water will evaporate. In this context, no wastewater generation from panel washing processes is foreseen.

Regarding the wastes that may arise from both personnel and activities during the land preparation, construction and operation phases of the Project, detailed assessments have been made in Section III.1.9 regarding waste sources, estimated annual quantities and disposal methods.

Domestic solid wastes that will be generated during the land preparation, construction and operation phases of the facility will be collected in sealed containers to be placed within the project site as recyclable wastes (metal, cardboard, plastic, etc.) and non-recyclable wastes (organic wastes, etc.).

The wastes that can be recovered will be given to licensed recovery companies, and the wastes that cannot be recovered will be disposed of by the solid waste collection system of the relevant administration (Special Provincial Administration and/or licensed companies).

For all kinds of wastes that may be generated at all stages of the planned project, the provisions of the "Waste Management Regulation" published in the Official Gazette dated 02.04.2015 and numbered 29314, the "Regulation on Landfilling of Wastes" published in the Official Gazette dated 26.03.2010 and numbered 27533, and the "Zero Waste Regulation" published in the Official Gazette dated 12.07.2019 and numbered 30829 will be followed.

The activity subject to the project has been evaluated within the scope of Article-43 *"Solar power plants with a project area of 20 hectares or more or an installed capacity of 10 MWm or more" of* the Annex-1 list of the "Environmental Impact Assessment Regulation" published in the Official Gazette dated 29.07.2022 and numbered 31907 and this EIA Report has been prepared.

During the preparation of the EIA Report, evaluations were made by taking into consideration the positive o r negative impacts of the planned project on the environment, the measures to be taken to prevent or minimize the negative impacts to the extent that they do not harm the environment, and the selected location and technology alternatives.

## SECTION I. DESCRIPTION, LOCATION AND CHARACTERISTICS OF THE PROJECT

### I.1. Definition, characteristics, lifetime, service purposes, importance and necessity of the investment subject to the project.

**Project Description, Lifetime and Service Purposes**

"Alpaslan II Dam and Hydroelectric Power Plant Auxiliary Source Solar Power Plant Project (41.9916 MWm-62.74 ha)" project is planned to be established and operated by Murat Nehri Enerji Üretim A.Ş. in Murat Mevkii of Dumlusu Village and Gölhazal Mevkii of Akkonak Village in Muş province, Merkez district.

The planned project is an auxiliary resource project planned by Murat Nehri Enerji Üretim A.Ş. as an addition to the hydroelectric power plant with a capacity of 280 MWe, which is currently operating within the borders of Murat Mevkii in Dumlusu Village and Gölhazal Mevkii in Akkonak Village in Muş province, Central district.

With the aforementioned auxiliary resource project, it is aimed to increase the total mechanical installed capacity from 283,520 MWm to 325,5116 MWm without any change in the electrical power of the currently operating 280 MWe hydroelectric power plant.

Alpaslan II Dam and Hydroelectric Power Plant, which is currently in operation, has a production license dated 05.01.2017 and numbered EÜ/6841-5/03642 by the Energy Market Regulatory Authority (See Annex-2.1).

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Approximately 10% of the electricity to be generated within the scope of the project will be used for the internal needs of the hydroelectric power plant, which is the main source, and the remaining 90% will be sold within the scope of the license. Within the scope of the project, at least 540 Wp
ELNSM72M-545-HC-HV Series with 20.1% efficiency, si-mono photovoltaic, etc.
76,440 panels will be used. Technical specifications of the solar panels to be used within the scope of the Project are given in the annex of the report (See Annex-2.3).

The energy to be produced in the Auxiliary Source Solar Power Plant will meet the internal needs of the hydroelectric power plant and will meet some of the increasing energy needs of our country. In addition, the region where the project is located will be positively affected by the increase in income, population mobility, education, health and other technical infrastructure services.

The SPP activity is expected to serve for approximately 25 years. However, with technological improvements, the operation period can be extended.

The investment cost of the project is determined as 125.974.800,00 TL. The entire investment and operating cost will be covered by the investor company. If necessary, credit utilization can be provided.

It is planned to employ 40 personnel during the construction phase of the project and 8 personnel during the operation phase. Within the scope of the project, unskilled personnel will be employed from the region as much as possible during the construction phase, contributing to the regional economy.

Within the scope of the planned project, local people will be prioritized as much as possible in the recruitment of personnel and it is planned to contribute to local employment.

In addition, local procurement, where possible from local supply sources, can also indirectly provide opportunities for the economic activities and employment opportunities of the enterprises in the supply chain.

All social and administrative needs of the personnel who will work during the land preparation and construction phase of the Project will be met from the mobile prefabricated construction site, while all needs of the personnel who will work during the operation phase will be met from the administrative building of Alpaslan II Dam and HEPP production facility.

**Importance and Necessity of the Project**

Electric energy consumption is one of the most important indicators of economic development and social welfare. Electric energy production and/or consumption per capita in a country is of great importance in terms of reflecting the standard of living in that country. As a rapidly developing and industrializing country, Turkey is in need of uninterrupted, high quality, reliable and economic energy.

Considering the distribution of electrical energy across countries in the world, China is the leader with an installed capacity of more than 78 GW. The People's Republic of China is followed by Japan, Germany, the USA, Italy, the United Kingdom (UK and other countries affiliated to the UK) and India[1]. According to these data, the consumption values of some countries and Turkey's place in the ranking are given in Table I.1.1.

**Table I.1.1** Electricity Consumption Per Capita in World Countries in 2020

| ROW | COUNTRY | Update | Installed Power (MW) | Per Capita Installed Power (Watt) |
|---|---|---|---|---|
| 1 | China | December 2020 | 254.355 | 180 |
| 2 | USA | December 2020 | 75.572 | 232 |
| 3 | Japan | December 2020 | 67.000 | 529 |
| 4 | Germany | December 2020 | 53.783 | 650 |
| 5 | India | December 2020 | 39.211 | 29 |
| 6 | Italy | December 2020 | 21.600 | 357 |
| 11 | United Kingdom | December 2020 | 13.563 | 207 |
| **14** | **Turkey** | **June 2022** | **8.275** | **98** |
| 34 | Russia | December 2020 | 1.428 | 10 |
| 49 | Iran | December 2020 | 414 | 5 |
| 62 | Latvia | December 2016 | 2 | 1 |

**Source:** International Energy Agency (IEA)

Considering the data in the table, it is observed that the per capita consumption of electrical energy in Turkey is quite low. Our country ranks 65th among the world countries in terms of electrical energy consumption. Considering that electrical energy is the most important tool for industrialization, it is necessary to increase the supply of electrical energy.

In this context, within the framework of the Eleventh Development Plan (2019-2023) prepared by the Presidency of the Republic of Turkey, Strategy and Budget Directorate, the main objective in terms of energy is stated as "***Ensuring continuous, high quality, sustainable, secure and bearable costs of energy supply***". In addition, the policy of "***increasing electricity generation from renewable energy sources and realizing the necessary planning and investments to ensure the safe integration of renewable energy generation into the grid***" is supported.

Targets for 2023 in energy sectors are given in Table I.1.2.

**Table I.1.2** Energy Sector Targets for 2023

| Sector/Demand | 2023 |
|---|---|
| Primary Energy Demand (BTEP) | 174.279 |
| Electric Energy Demand (TWh) | 375,8 |
| Primary Energy Consumption per Capita (TOE/capita) | 2,01 |
| Electricity Consumption per Capita (kWh/person) | 4.324 |
| Share of Natural Gas in Electricity Generation (%) | 20,7 |
| Share of Renewable Resources in Electricity Generation (%) | 38,8 |
| Amount of Electricity Generated from Domestic Sources (TWh) | 219,5 |
| Electricity Installed Capacity (MW) | 109.474 |

**Source:** 2018 data by Ministry of Energy and Natural Resources and TEİAŞ, 2023 data by Eleventh Development Plan forecasts

[1] **Source:** https://www.enerjiatlasi.com

The utilization of renewable energy resources such as hydraulic, wind, solar, geothermal, biomass, wave and current in our country has strategic importance in terms of ensuring resource diversity. For this reason, it is aimed to increase the share of renewable energy in electricity generation and also to ensure its use as a heat energy source.

Turkey's long-term electricity demand forecast is given in Table I.1.3.

**Table I.1.3** Turkey's Long-Term Electricity Demand Forecast

| Year | Puant Demand | | Electricity Consumption Forecast | |
|---|---|---|---|---|
| | MW | Increase (%) | GWh | Increase (%) |
| 2022 | 55.473 | 4,4 | 359.600 | 4,4 |
| 2023 | 57.972 | 4,5 | 375.800 | 4,5 |
| 2024 | 60.487 | 4,3 | 392.100 | 4,3 |
| 2025 | 62.770 | 3,8 | 406.900 | 3,8 |
| 2026 | 65.068 | 3,7 | 421.800 | 3,7 |
| 2027 | 67.352 | 3,5 | 436.600 | 3,5 |
| 2028 | 69.681 | 3,5 | 451.700 | 3,5 |
| 2029 | 72.010 | 3,3 | 466.800 | 3,3 |

**Source:** Generation Capacity Projection (2020-2024), TEİAŞ General Directorate

In order to meet increasing energy demands, it is necessary to ensure resource diversity as well as emphasizing domestic resources. As a matter of fact, with the decision of the High Planning Council dated 18.05.2009, these issues are also stated in the strategy document on the electricity energy market and supply security. In addition, the Strategic Plan of the Ministry of Energy and Natural Resources (2015-2019) aims to bring all our renewable energy potential to our economy.

The mission of this plan is defined as *"We have adopted the mission of reducing external dependency and providing the highest contribution to national welfare by utilizing energy and mineral resources **in an** efficient, effective, safe, timely and **environmentally sensitive manner**".*

The legal regulation on the generation of electricity from renewable energy sources is provided by the "***Law on the Utilization of Renewable Energy Resources for Electricity Generation***" numbered 5346.

According to data from TEİAŞ, Turkey's total installed c a p a c i t y reached 103,809.3 MW as of December-2022, with 9,353 solar power plants and an installed capacity of 9,425.4 MW (approximately 11% of the total capacity) (See Table I.1.4).

**Table I.1.4** Installed Capacity of Power Plants by Fuel Types in Turkey

| Number of Power Plants, Installed Capacity and Percentage Distribution by Primary Sources | | |
|---|---|---|
| **Primary Source** | **Number of Switchboards** | **Installed Power (MW)** |
| Stream | 610 | 8.296,3 |
| Asphaltite Coal | 1 | 405,0 |
| Waste Heat | 94 | 387,5 |
| Dammed | 141 | 23.275,2 |
| Biomass | 384 | 1.921,3 |
| Natural Gas | 345 | 25.345,3 |
| Fuel Oil | 9 | 251,9 |
| **Sun** | **9.353** | **9.425,4** |
| Imported Coal | 16 | 10.373,8 |
| Geothermal | 63 | 1.691,3 |
| Lignite | 46 | 10.191,5 |
| LNG | 1 | 2,0 |
| Diesel | 1 | 1,0 |
| Nafta | 1 | 4,7 |
| Wind | 358 | 11.396,2 |
| Hard Coal | 4 | 840,8 |
| **TOTAL** | **11.427** | **103.809,3** |

**Source:** Turkish Electricity Transmission Company (TEİAŞ) General Directorate, Turkish Electricity System Installed Capacity Report by Organization and Resources, December 2022

Solar energy is the radiant energy released by the fusion process (the conversion of hydrogen gas into helium) in the sun's core. The intensity of solar energy outside the Earth's atmosphere is approximately 1370 W/m². However, the amount reaching the earth varies between 0 and 1100 W/m2 due to the atmosphere[2]. Even a small portion of this energy reaching the earth is many times more than the current energy consumption of humanity. Solar energy is a renewable energy source with advantages such as not polluting the environment and not creating harmful waste, as well as being preferred mostly due to its ease of installation and use.

Turkey has a high solar energy potential due to its geographical location. According to the GEPA prepared by the Ministry of Energy and Natural Resources, the average annual total sunshine duration is 2,741.07 hours and the average annual total radiation value is calculated as 1,527.46 kWh/m2 (See Figure I.1.1).

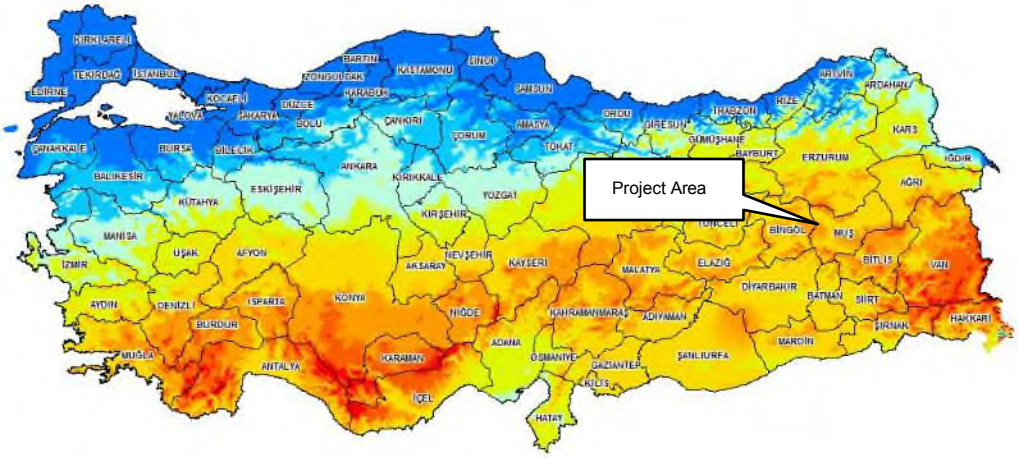



**Figure I.1.1.** Turkey Solar Energy Potential Atlas
**Source:** Republic of Turkey Ministry of Energy and Natural Resources, www.gepa.enerji.gov.tr

According to the Solar Energy Potential Atlas of Turkey (GEPA), the Central district of Ü
value of 1600-1650 kWh/m2 (See Figure I.a.2). "Global
district where the project area is located are given

[2]**Source:** www.enerji.gov.tr

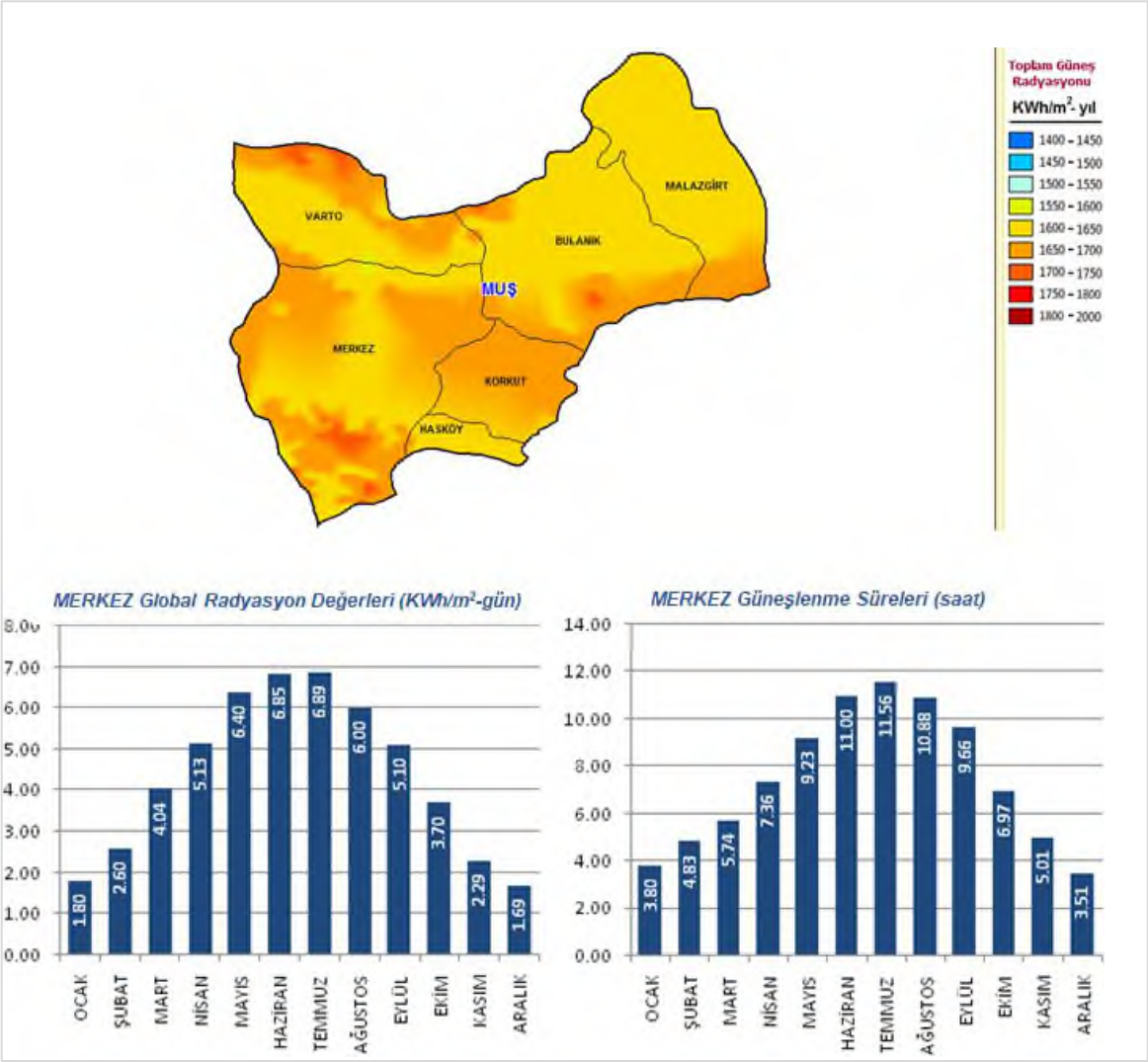



**Figure I.1.2** Province Solar Energy Potential Atlas, Central District Global Radiation Values and Insolation Periods (GEPA)
**Source:** Republic of Turkey Ministry of Energy and Natural Resources, https://gepa.enerji.gov.tr/MyCalculator/

Solar energy technologies vary widely in terms of method, material and technological level, but are divided into two main groups (See Figure I.1.3).

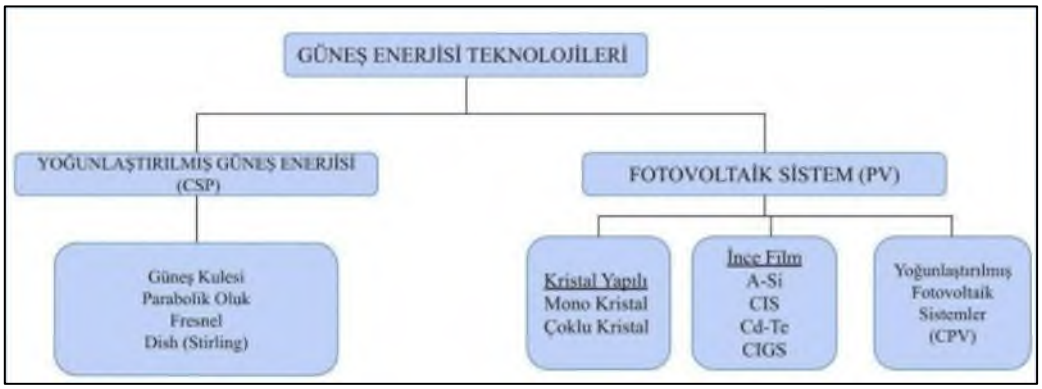



**Figure I.1.3** Solar Energy Technologies
**Source:** Ankara University Renewable Energy Sources Course Document

**Photovoltaic Solar Technology:** Semiconductor materials called photovoltaic cells convert sunlight directly into electricity. Photovoltaic systems include many different types with the use of different materials in the panels.

**Thermal Solar Technologies (Concentrated Solar Energy):** In these systems, heat is first obtained from solar energy. This heat can be used directly or it can also be used in electricity generation.

Solar cells (photovoltaic cells) are semiconductor materials that convert sunlight directly into electrical energy. Solar cells, whose surfaces are shaped as squares, rectangles or circles, are usually around 100 cm² in area and 0.1 - 0.4 mm in thickness.

Solar cells work based on the photovoltaic principle. In other words, when light falls on them, an electrical voltage is generated at their ends. The source of the electrical energy given by the cell is the solar energy coming to its surface.

Solar energy can be converted into electrical energy with an efficiency between 5% and 30% depending on the structure of the solar cell. For ease of installation, to increase power output, to increase resistance to external factors and to reduce production costs, a large number of solar cells are connected in parallel or in series and mounted on a surface, this structure is called a solar cell module or photovoltaic module (See Figure I.1.4).

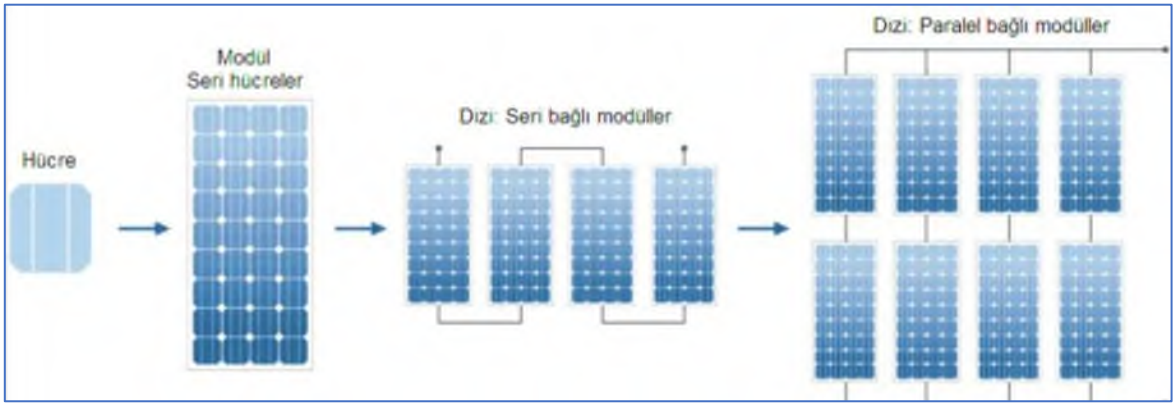



**Figure I.1.4** Photovoltaic System Elements
**Source:** ÖZTÜRK, H. H., "Power Conversion Efficiency and Effective Factors in Solar Photovoltaic Electricity Generation", 2019

Solar power plants are modular structures that convert the sunlight falling on them directly into electrical energy thanks to the silicon cells they contain. A schematic view of the system layers is given in Figure I.1.5.

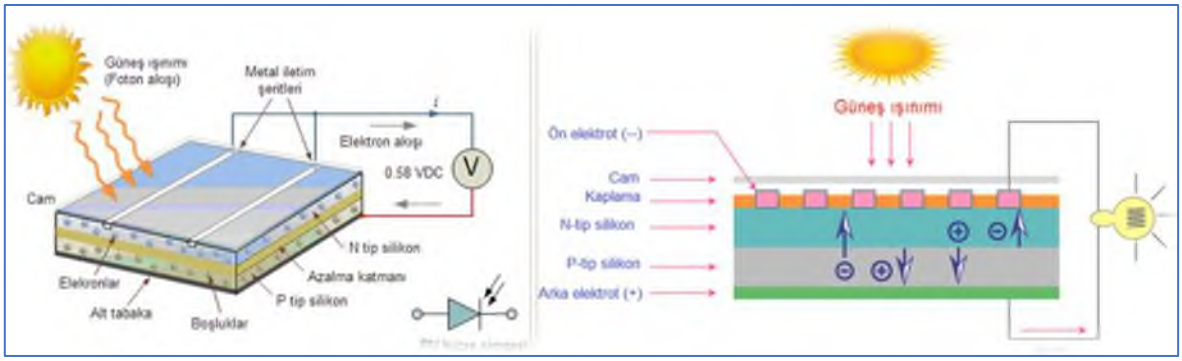



**Figure I.1.5** Photovoltaic System Layers
**Source:** ÖZTÜRK, H. H., "Power Conversion Efficiency and Effective Factors in Solar Photovoltaic Electricity Generation", 2019

Like transistors and rectifier diodes used in today's electronic products, photovoltaic cells are also made of semiconductor materials. Among the many materials with semiconductor properties, the most suitable ones for making photovoltaic cells are silicon, gallium arsenide and cadmium telluride. A solar cell, a semiconductor diode, is a device that converts light directly into electric current.

Semiconductor materials such as silicon, gallium arsenide and cadmium telluride are used to make solar cells. Their structure simply consists of a P and N junction. Based on the principle of the "photovoltaic event", electrons plucked by photons move across the junction and an electric current is generated.

Photovoltaic modules are mounted on a metal carrier (construction) consisting of steel or aluminum and a representative view is given in Figure I.1.6.

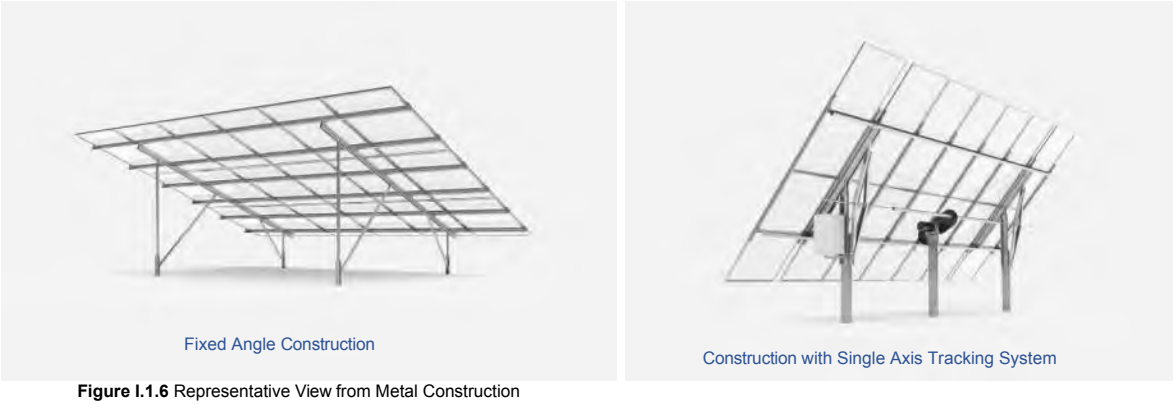



**Figure I.1.6** Representative View from Metal Construction
**Source:** Solar Energy Systems in Turkey, 14th RLC Energy Days, 2018

The project will utilize a structural system consisting of steel piers, beams and purlins to be procured on turnkey basis from Turkey and/or abroad. The legs of this carrier system will be fixed to the ground with concrete foundations. The steel parts of the load-bearing system will be hot-dip galvanized, while the purlins that contact the panels will be made of steel or aluminum material according to the application method to be selected. The carrier system to be used within the scope of the project can have two different application methods. The first one is fixed angle construction and the second one is single axis tracking construction. In fixed angle construction systems, a fixed table is designed to face south. In single axis construction systems, the panel is placed on the north-south line and its movement is made on the east-west axis. The carrier system is guaranteed by the manufacturers to have a lifetime of 25 years.

There are DC/AC cables used for series and parallel connections of each photovoltaic module (See Figure I.1.7). These cables are electronic devices that enable DC current to be converted into AC (Grid) current.

**Figure I.1.7** Representative View of DC/AC Cable
**Source:** Solar Energy Systems in Turkey, 14th RLC Energy Days, 2018

Semiconductor materials need to be doped with N- or P-type dopants in order to be used as photovoltaic cells. Whether the resulting semiconductor is N or P type depends on the dopant. To obtain n-type silicon from silicon, the most common solar cell material, an element from Group 5 of the periodic table, for example phosphorus, is added to the silicon melt. Since there are 4 electrons in the outer orbit of silicon and 5 electrons in the outer orbit of phosphorus, the excess one electron of phosphorus gives one electron to the crystal structure. This is why group V elements are called 'donor' or 'n-type' dopants.

To obtain P-type silicon, an element from Group 3 (such as aluminum, indium, boron) is added to the melt. Since these elements have 3 electrons in the last orbital, the crystal lacks an electron, which is called a hole or a vacancy and is assumed to carry a positive charge. Such substances are called 'p-type' or 'acceptor' dopants.

When p- and n-type doped materials are brought together, semiconductor junctions are formed. Electrons are the majority carriers in the N-type semiconductor and holons in the P-type semiconductor. Before the P- and N-type semiconductors come together, both materials are electrically neutral. In other words, in type P the negative energy levels and the number of holons are equal, in type N the positive energy levels and the number of electrons are equal. When the P-N junction is formed, the electrons, which are the majority carriers in the N type, create a current towards the P type. This continues until a charge balance is established on both sides. At the interface of the P-N type substance, i.e. in the joint region, negative charge accumulates on the P side and positive charge accumulates on the N side. This joint region is called the 'transition region' or the 'charge-free region'. The electric field generated in this region is called the 'structural electric field (Ey)'. The formation of the P-N joint is given in Figure I.1.8.

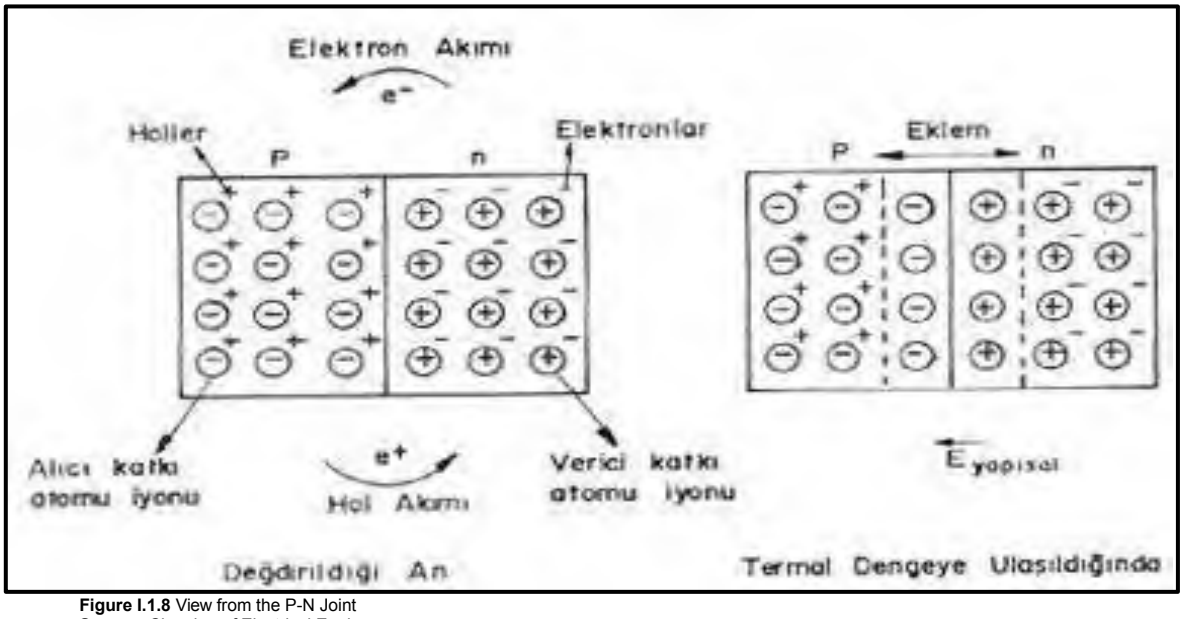



**Figure I.1.8** View from the P-N Joint
**Source:** Chamber of Electrical Engineers

When sunlight falls on solar panels operating according to the photovoltaic principle, direct current (DC) is generated at the panel ends. The generated DC current is converted to alternating current (AC), which is the grid current, by means of inverters. A representative view of central inverters is given in Figure I.1.9.

**Figure I.1.9** Inverter Representative View
**Source:** https://rudgeenergy.co.uk

In the project, 12 units of Sungrow brand SG3300UD-MV model etc. central type inverters or 132 units of Huawei brand SUN2000-330 KTL model etc. string inverters are planned to be used. Type and brand will be selected according to the conditions. Inverters have a voltage level of 1500Vdc and due to this feature, more panels can be connected in series in a single array. The inverters, which can also fulfill the Grid Regulation Annex-18 compliance criteria, can be loaded up to 1.56 times DC/AC ratio. The specifications of the inventor to be used within the scope of the project are given in visual Figure I.1.10.

**From Inverter (Inventor)**
**Source:** https://solar.huawei.com

**Transformer**
**Source:** Solar Energy Systems in Turkey, 14th RLC Energy Days, 2018

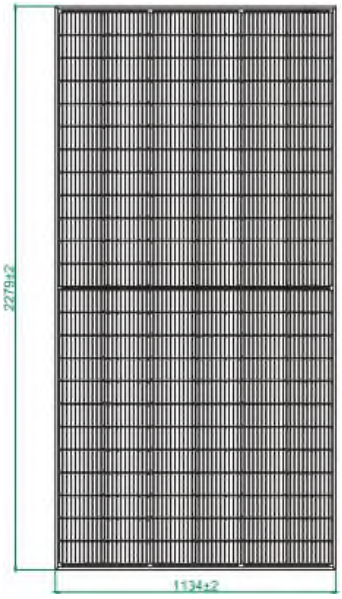
**Figure I.1.10.** Representative Views from Inverter (Inventor) and Transformer

Transformers are used to boost the mains voltage (400 V etc.) at the inverter outputs. This enables transportation at medium voltage level. The AC electrical energy is raised to the grid distribution voltage (31.5 kV etc.) by means of the transformer and transferred to the existing electricity grid and electrical energy is obtained.

Technical details of a sample panel to be used within the scope of the Project are given in Table I.1.5 and the technical introduction document is given in the appendices (See Annex-2.3).

**Table I.1.5.** Sample Panel Characteristics

| **Mechanical Properties** | | |
|---|---|---|
| Solar Cells | Monocrystalline 158.75 x 158.75 mm | |
| Cell Number | PERC Mono Crystal 144 (6x24) | |
| External Dimensions | 2279 mm x 1134 mm x 35 mm | |
| Weight | 27 kg | |
| Windshield | 3.2 mm AR Coated Tampered Glass | |
| Frame | Anodized Aluminum Alloy | |
| Connection Box | IP68, 3 diodes | |
| Output Cables | 4 mm(2) (UL/IEC) 250 mm (+)/350 mm (-) | |
| Mechanical Strength | Front side 5400 Pa / Rear side 2400 Pa | |
| **Electrical Properties** | | |
| **Feature** | **STC** | **NMOT** |
| Maximum Power at STC (Pmax) | 540 | 412 |
| Open Circuit Voltage (Voc) | 49,75 | 46,55 |
| Short Circuit Current (Isc) | 13,93 | 11,13 |
| Maximum Power Voltage (Vmp) | 41,80 | 39,20 |
| Maximum Power Current (Imp) | 13,04 | 10,51 |
| STC Module Efficiency (m) | 21,1 | |
| Power Tolerance (W) | (0, +4,99 W) | |
| Maximum System Voltage | 1500V DC | |
| Maximum Series Fuse Value | 25 A | |
| Operating Temperature | -40~ +85 C | |




Measurement Tolerance +/-3%
STC: Irradiance 1000W/m², Cell Temperature 25 C, AM=1.5
NOCT: Irradiance 800W/m², Ambient Temperature 20 C, AM=1.5, Wind Speed 1m/s

**I.2. The location of the location selected for the project (Attaching the original size copies of the relevant plan sheets, legends and plan provisions of the current "Relevant Planning Region 1/100.000 Scale Environmental Plan" to the report with the stamp "Like Original" indicating the scope of work for which the relevant plan sheets, legends and plan provisions are taken, and also preparing a separate A4 / A3 document showing the project area on the approved environmental layout plan and attaching it to the report; Attaching the relevant plan sheet of the approved zoning plan (1/5.000 and 1/1.000 scale) of the approved zoning plan (1/5.000 and 1/1.000 scale) of the project area or the region where the project area is located (if any), together with the relevant plan sheet, legend sheet and plan provisions, and attaching it to the report with the official institution stamped "as original" by the relevant administration and showing the activity area on these plans, stating in the report the approval dates of the zoning plan and by which institution it was approved, or if there is no approved zoning plan, obtaining a letter from the relevant administration stating that there is no approved zoning plan and attaching it to the report); explaining the current land use and indicating which use(s) it remains in the landscaping plan;**

"Alpaslan II Dam and Hydroelectric Power Plant Auxiliary Source Solar Power Plant Project (41.9916 MWm-62.74 ha)" project is planned by Murat Nehri Enerji Üretim A.Ş. in Muş province, Merkez district, Dumlusu Village Murat Mevkii and Akkonak Village Gölhazal Mevkii.

The 1/25.000 Scale Land Asset Map showing the Project area and its surroundings i s given in Annex-5. According to the Project 1/25.000 Scale Land Asset Map, although the SPP Area is within irrigated agriculture (insufficient) areas, it is currently within the **"Solar Energy Area qualified"** areas **with non-agricultural use permits**.

The planned project area is located in "Treeless Forest Areas" according to the stand map. In this context, there is no use of any forest area and tree felling specific to the activity (See Annex-6 1/50.000 Scale Stand Map of the Project Area and Surroundings).

The approved Environmental Plan, Legends and Relevant Plan Provisions for the Muş-Bitlis-Van Planning Region with a scale of 1/100.000, where the Project area is located, are given in Annex-3 and the EIA Area and SPP Area are defined as "Dam" in the Environmental Plan with a scale of 1/100.000. However, although the project area appears as "Dam" in the Environmental Plan, it is currently within the **"Solar Energy Area"** areas **that have been granted non-agricultural use permits**.

In addition, part of the project area was previously used as a "Construction Site" for the construction of Alpaslan II Dam and Hydroelectric Power Plant.

For the agricultural lands in the project area; within the scope of the Soil Conservation and Land Use Law No. 5403, with the letter dated 20.02.2003 and numbered 2844-002375 of the General Directorate of Agricultural Production and Development of the Ministry of Agriculture and Rural Affairs, a total area of 5469 hectares including the Alparslan II Dam and HEPP project area was given permission for non-agricultural use within the scope of the Regulation on the Protection and Use of Agricultural Lands in force at that time.

The "Non-Agricultural Use Permit Opinion" received by Muş Provincial Directorate of Agriculture and Forestry from the Ministry of Agriculture and Forestry, General Directorate of Agricultural Reform, regarding whether this permit is valid for the planned SPP project is given in Annex-2.4. In the opinion of the General Directorate of Agricultural Reform given in Annex-2.4, it is stated that *"5469 hectares of land with a surface area of 5469 hectares, which was granted permission for non-agricultural use with the letter dated 20.02.2003 and numbered 2844-002375 of the abrogated Ministry of Agriculture and Rural Affairs General Directorate of Agricultural Production and Development, is outside the scope of Law No. 5403, and it is considered that no action can be taken within the scope of Articles 13, 14, 20 and 21 of Law No. 5403 within this area."* In this context, no additional permission, etc. will be obtained for land use.

Muş-Bitlis-Van Planning Region 1/100.000 Scale Environmental Plan Provisions;

**Given under the heading "7.23. Energy Generation Areas and Energy Transmission Facilities";**

*7.23.1. In renewable energy (wind, solar, geothermal, hydroelectric) production areas, obtaining the appropriate opinion of the Ministry of Environment and Urbanization within the scope of the permits obtained from the relevant institutions and organizations and the license to be issued by the Energy Market Regulatory and Supervisory Board*

The provisions given under the heading "7.23. Energy Generation Areas and Energy Transmission Facilities" shall be complied with.

Before the start of the activity, the Zoning Law No. 3194 and Regulations, the provisions of the Environmental Plan, the opinions to be obtained from public institutions and organizations will be complied with, and all necessary measures for human and environmental health will be taken by the investor company.

## I.3. Location and technology alternatives of the project (comparison and ranking of location and technology alternatives and indication of inertia alternative), tabulation of previous EIA decisions/opinions for the SPP project (if any), indication of national and international standards to be used in the project (if any),

**Location Alternatives and Reasons for Preference**

The planned project is an auxiliary resource project planned by Murat Nehri Enerji Üretim as an addition to the hydroelectric power plant with a capacity of 280 MWe, which is currently operating within the borders of Murat Mevkii in Dumlusu Village and Gölhazal Mevkii in Akkonak Village in province, Central district.

Within the scope of the planned project, within the framework of the Energy Market Regulatory Authority's (EMRA) Decision No. 11234 dated 15.09.2022 (See Annex-2.2); a Solar Power Plant system with a total power of 41.9916 MWm will be added to a total area of 627,441.716 $m^2$ ( 62.74 ha) in the Murat Mevkii of Dumlusu Village and Gölhazal Mevkii of Akkonak Village in province, Central district.

With the aforementioned auxiliary resource project, it is aimed to increase the total mechanical installed capacity from 283,520 MWm to 325,5116 MWm without any change in the electrical power of the currently operating 280 MWe hydroelectric power plant.

In the planned "Alpaslan II Dam and Hydroelectric Power Plant Auxiliary Source Solar Power Plant Project (41,9916 MWm-62,74 ha)", location alternative evaluations have been made while determining the area where SPP panels will be installed and while making these evaluations;

- Distance of SPP areas from settlements,
- Not being on a bird migration route,
- Not being within the areas covered by the Circular dated 03/03/2014 and numbered 2014/1,
- Distance to the existing hydroelectric power plant and infrastructure connections,
- Areas deemed appropriate and/or planned to be deemed appropriate by EMRA,
- The high solar potential of the province,
- The distances to and/or overlaps with mining sites, geothermal water resources, surface water, etc. have been taken into consideration.

Within the scope of the project, in accordance with Article 8- 9 of the "Communiqué on Environmental Impact Assessment Qualification Certificate" published in the Official Gazette dated 29.11.2019 and numbered 30963, Mühendislik dated 06.09.2022 and numbered 1038, an information petition was submitted to the Provincial Directorate of Environment, Urbanization and Climate Change of the Governorship of and land survey studies were carried out in and around the project area on 15.09.2022.

The said Land Survey Petition and Site Investigation Form are given in Annex-2.5. Photographs taken from the Project area and its surroundings are given in Figure I.3.1-Figure I.3.5.

**Figure I.3.1** Views of the Project Area and its Near Environment-I

**Figure I.3.2** Views of the Project Area and its Near Environment-II

**Figure I.3.3** Views of the Project Area and its Near Environment-III

**Figure I.3.4** Views of the Project Area and its Near Environment-IV

**Figure I.3.5** Views of the Project Area and its Near Environment-V

**Project's Technology Alternatives and Reasons for Preference**

Within the scope of the planned project, photovoltaic solar technology, which is an advanced technology product, will be used, and this technology is more efficient and more environmentally friendly than thermal solar technologies.

In SPP projects, factors such as annual sunshine duration, meteorological (humidity, temperature, wind, etc.), topographical, geographical (no hills or mountains that can block the sun, no facilities that will block the sun by releasing gas, etc.) and proximity to the electricity grid if the consumption of electricity is intended to be done elsewhere are taken into consideration.

The project technology has been selected based on all these considerations and no alternative to the project technology has been considered.

**I.4. The location of technical infrastructure units, administrative and social units, and other units, if any, within the scope of the Project; together with the existing roads and the roads to be opened, the distances of the nearest settlements and sensitive areas to the SPP area are given separately and shown on the map together with their distances,**

The location of the Project area in relation to the nearby settlements is shown in the satellite image in Figure I.4.1 and the distances of the settlements to the Project area are given in Table I.4.1. The Project area will be accessible via Erzurum-Muş (D955) highway.

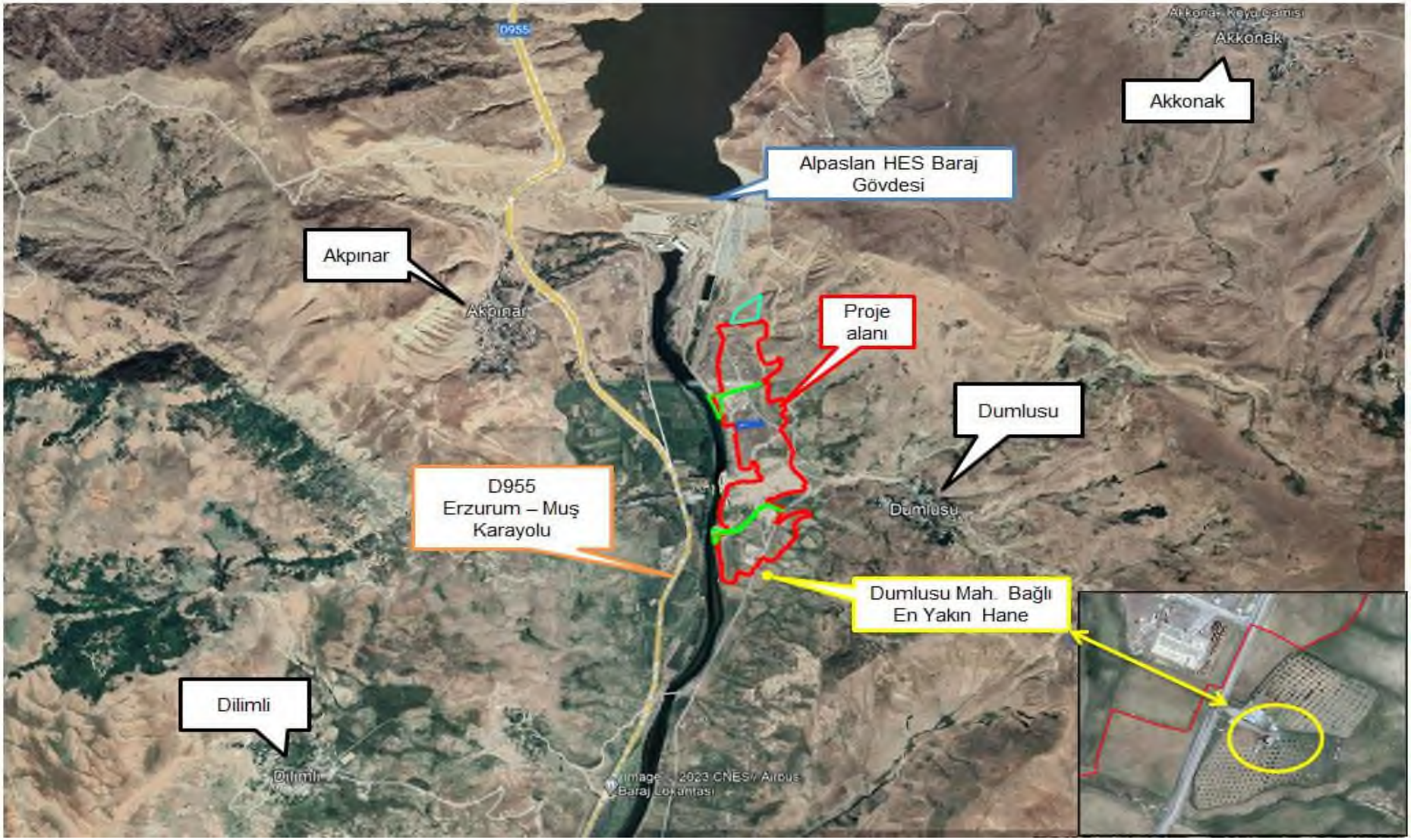



**Figure I.4.1** Satellite Image Showing Settlements Surrounding the Project Area
**Source:** Google Earth

**Table I.4.1** Settlements in the vicinity of the Project Area and Approximate Bird's Flight Distances of Settlements to Project Units

| Settlement Location | Location According to the Project Area | Nearest Household to the Project Area Bird's Flight Distance (m) |
|---|---|---|
| Dumlusu Mah. Nearest Household | South | 75 |
| Dumlusu Mah. | Southeast | 420 |
| Akpinar Mah. | Northwest | 1.200 |
| Dilimli Mah. | Southwest | 2.600 |
| Akkonak Mah. | Northeast | 3.150 |
| Central District Center | South | 30.323 |
| Muş City Center | South | 30.323 |

All social and administrative needs of the personnel who will work during the land preparation and construction phase of the Project will be met from the mobile prefabricated construction site, while all needs of the personnel who will work during the operation phase will be met from the existing administrative building of Alpaslan II Dam and HEPP production facility.

During the land preparation-construction phase and operation phase of the Project, the drinking water needs of the personnel will be met by purchasing from the market with carboys. The domestic water needs of the personnel will be met by tanker truck from Dumlusu Neighborhood in accordance with the protocol given in Annex-2.6 during the land preparation and construction phase and from the administrative building of Alpaslan II Dam and HEPP production facility during the operation phase.

For all of the water to be used within the scope of the activity, the provisions of the "Regulation on Water Intended for Human Consumption", which entered into force after being published in the Official Gazette dated 17.02.2005 and numbered 25730, will be complied with.

Domestic wastewater that will be generated from the use of personnel will be collected in a sealed septic tank and when it reaches 80-90% fullness without any transportation, it will be extracted by a vacuum truck and disposed of by a vacuum truck to be supplied from the relevant Municipality in accordance with the provisions of the Water Pollution Control Regulation and Waste Management Regulation, which entered into force after being published in the Official Gazette dated 31.12.2004 and numbered 25687 *(Amendment: 17.12.2022 dated and numbered 32046).*

## I.5. Economic characteristics of the project (relevant investment program, financial resources, where these resources will be obtained, work flow chart, timing table, cost-benefit analysis; permits to be obtained after the EIA process),

**Life of the Project, Work Flow Chart, Financial Resources and Expense Items**

The direct current (DC) electricity to be generated by the photovoltaic panels to be installed within the solar power plant will be collected in the combiner box and converted to alternating current (AC) by the inverter. The electrical energy to be generated will be transferred first to the transformer, then to the existing switchyard or the power plant building MV busbar, and then to the interconnected system via a step-up transformer. The draft Single Line Diagram prepared within the scope of the project is given in Annex-2.7. The work flow of the project is given in Figure I.5.1.

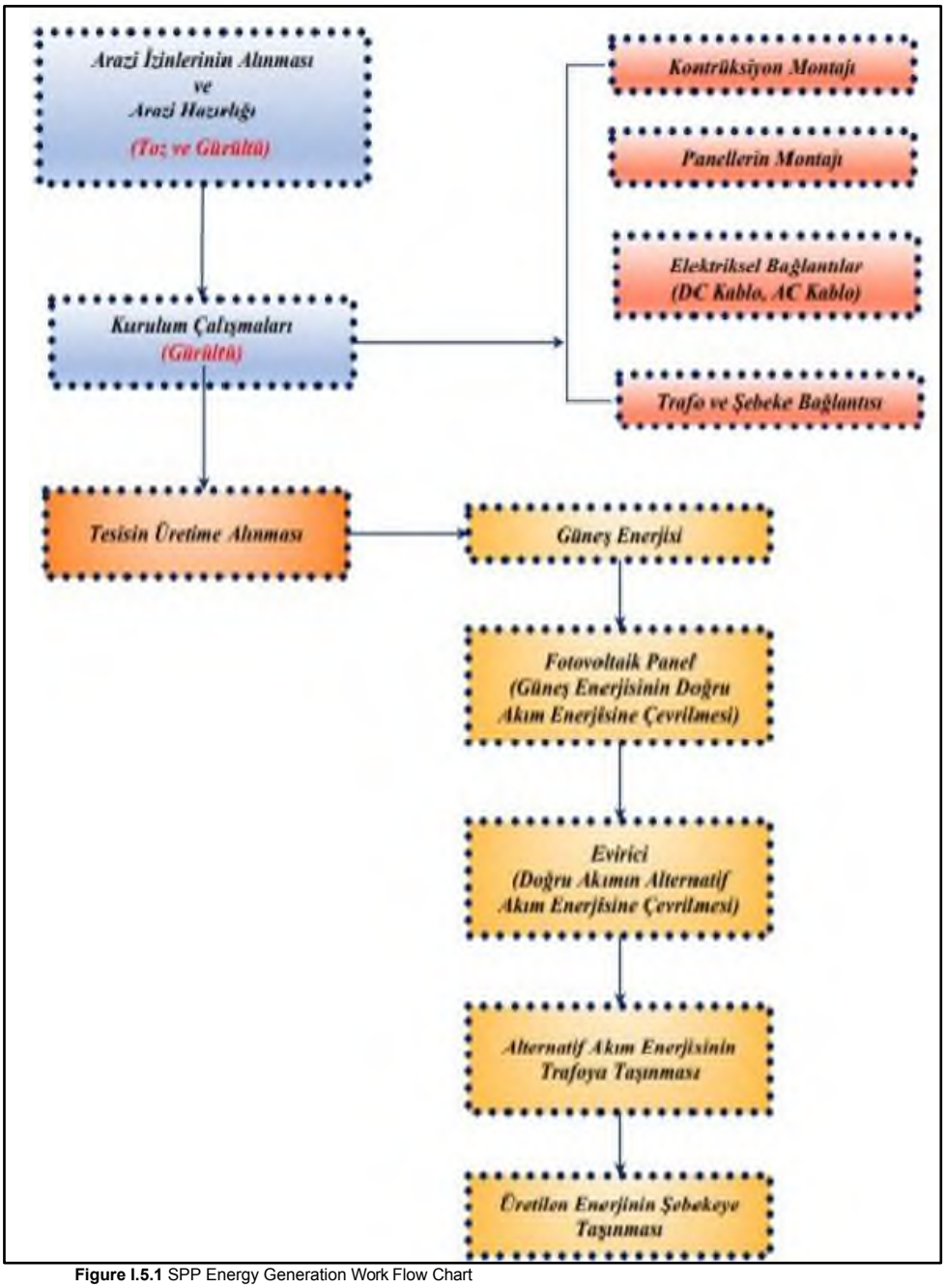



**Figure I.5.1** SPP Energy Generation Work Flow Chart

The economic life of the project is estimated to be 25 years and the investment cost of the project is determined as 125,974,800 TL. Expense items related to the investment are given in Table I.5.1.

**Table I.5.1** Expense Items Related to the Project

| Expense Item | Amount (TL) |
|---|---|
| Land Acquisition | 55.727 |
| Engineering | 1.114.537 |
| PV Module | 65.597.162 |
| Inverter | 4.413.565 |
| Mechanical Carrier Assembly | 12.494.697 |
| Transformers and MV Equipment | 16.294.524 |
| Cables (DC/AC Cables) | 10.932.860 |
| Electrical and Mechanical Labor | 9.605.299 |

| Expense Item | Amount (TL) |
|---|---|
| Earthworks and Construction Works | 2.030.388 |
| Other Expenses (Grounding, SCADA, Wire Fence, CCTV, Lighting, Labeling etc.) | 3.436.041 |
| **TOTAL** | 125.974.800 TL |

**Timing Table**

Land preparation and construction works are planned to take approximately 18 months. Engineering and preliminary works are planned for 2024-2025, material procurement and construction works are planned to start in 2025, and the planned project is planned to be commissioned in 2026 with assembly and commissioning works. It is envisaged that the planned activity will be commissioned within 1 month after the equipment procurement and construction works are completed, followed by test production and then provisional acceptance.

The work schedule of the planned project from preparation, construction phase to operation phase is given in Table I.5.2.

**Table I.5.2.** Timing Table

| Work Items | 2023 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | January | February | Mart | April | May | June | July | August | September | October | Kassimn | December |
| **EIA Process*** | | | | | | | | | | | | |
| **Obtaining Building Permits, etc.** | | | | | | | | | | | | |

| Work Items | 2023 | 2024 | | | 2025 | | | 2026 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | October November December | January February March | May June July August | September October November | January February | May June July August | September October November | January February March April | May June June July July August | September October October November |
| **. Engineering and preliminary work** | | | | | | | | | | |
| **Site Setup/Commencement of Construction** | | | | | | | | | | |
| **Carrier System Bottom and Top Assembly** | | | | | | | | | | |
| **Delivery of SPP Equipment (Panel, inverter, transformer, collection boxes, cables, etc.) to the Project Area** | | | | | | | | | | |
| **Installation of SPP Equipment** | | | | | | | | | | |
| **Electricity Connections of SPP and HEPP** | | | | | | | | | | |
| **Test Production** | | | | | | | | | | |
| **MENR Provisional Acceptance** | | | | | | | | | | |
| **Business** | | | | | | | | | | |

***Studies Conducted So Far in the EIA Process;**

- Çınar Mühendislik Müş A.Ş. has been authorized by the investor with a Notarized Power of Attorney dated 06.09.2022.
- 15.09.2022 A site visit activity was carried out by Çınar Mühendislik Müş A.Ş. officials on the date of the project.
- 26.10.2022 The EIA Application File was submitted to the Ministry of Environment, Urbanization and Climate Change via the e-ED system.
- 18.10.2022 Public Participation Meeting was held on
- 30.12.2022 EIA Report Special Format has been received.
- 24.07.2023 The EIA Report was submitted to the Ministry of Environment, Urbanization and Climate Change.
- 21.08.2023 The 1st IDB Meeting was held on the same date.
- 31.08.2023 The Finalized EIA Report was submitted to the Ministry of Environment, Urbanization and Climate Change.

Capacity information of existing HEPP and planned Auxiliary Source SPP project Section Detailed in III.2.1.

**Cost-Benefit Analysis of the Project**

While direct and indirect costs are evaluated during the environmental benefit-cost analysis of the project, the expected benefit of the project is mainly to increase the amount of energy production and contribute to the national economy by creating employment in the region.

It is planned to employ 40 people during the land preparation and construction phase of the project and 8 people during the operation phase. Within the project, unskilled personnel will be employed from the region as much as possible during the construction phase, contributing to the regional economy.

Considering that each person to be employed will affect 4 people (average household population), it can be said that approximately 160 people will indirectly benefit from the project during the land preparation and construction phase and approximately 32 people during the operation phase.

In addition, local procurement, where possible from local supply sources, can also indirectly provide opportunities for the economic activities and employment opportunities of the enterprises in the supply chain.

The interactions and environmental impact process of the planned project and the cost-benefit analysis assessment are given in Table I.5.3.

**Table I.5.3** Environmental Benefit-Cost Analysis of the Planned Project

| Elements of Evaluation | Impact<br>O Positive<br>X Negative<br>Ineffective | Description | Cost |
|---|---|---|---|
| Selection of the Project Location | X | The main reasons for selecting the project area are summarized below.<br>• The topography of the region is suitable for the units to be established,<br>• Being within the area licensed by EMRA,<br>• Existence of an already operating HEPP facility belonging to the investor company,<br>• The high solar potential of the region,<br>• Distance from areas where daily routine activities are carried out (traffic, animal husbandry, etc.).<br>The entire project area generally consists of agricultural and pasture areas. In this context, the amount of area to be used can be taken into consideration as the only negative aspect in terms of site selection. | It is calculated that the investment cost will be lower due to the presence of the already operating facility of the investor company in the area in question, the suitability of the area in terms of land structure and the utilization of solar energy, which is a renewable energy source within the scope of the planned project. |
| Noise | ■ | During the construction period, noise generation may occur due to vehicle traffic during the transportation of the panels and due to excavation operations during assembly. | Since there will be no noise generation from the operation of the solar power plant, it is necessary to take measures will be limited to the Legislation. Therefore, no extra cost will be incurred as no additional noise preventive measures will be required. |
| Emission | ■ | During the construction phase, dust emission may occur due to vehicle traffic during the transportation of the panels and due to excavation operations during the construction phase. | Since there will be no dust emission from the solar power plant operation, the measures to be taken will be limited to the Legislation. Therefore, no additional emission preventive measures will be required and no extra cost will be incurred. will not occur. |
| Water Use and Wastewater | X | The planned auxiliary source SPP project is expected to employ 40 people during the construction phase and 8 people during the operation phase. | Increase in the amount of water needed and consequently increase in the amount of wastewater to be disposed and pollution load as a result, extra costs may be incurred. |
| Waste | X | Considering the waste hierarchy, the priority is to prevent waste generation, It is aimed to reduce and reuse waste. There will be waste generation from personnel and construction/operation activities. | Disposal cost may increase with the increase in other wastes from personnel and construction/operation activities. |
| Socio-Economic Status | O | Improving the economic life in the region, increasing the incomes and livelihoods of local people levels increase, new jobs will be created during the construction and operation phases of the enterprise. opportunities will arise. | Positive impact on the socio-economic situation by increasing employment will have an impact in this way. |
| Transportation Route and Traffic Load | ■ | There are existing roads for Alpaslan II Dam and HEPP, which are currently being operated in the site. In this context, there will be no need to open a new road. During the transportation of panels to the site during the construction period, there may be an increase in traffic load, albeit for a short period of time. | Since the increase in traffic load will be very low and no additional road will be constructed, no extra increase in cost is expected. |
| Technology | O | The photovoltaic system, which is planned to be preferred within the scope of the project's technology, will enable direct conversion of sunlight into electricity. | There will be an investment cost with the selected technology. However, the most technologically and environmentally appropriate system was preferred. In addition, the fact that the panels to be installed can be controlled from the existing control and switchyard so there will be no extra cost at this stage. |

**Permits to be obtained after the EIA Process**

Within the scope of the project, auxiliary source SPP units will be installed on a total area of 627,441,716 $m^2$ (62.74 ha) hectares. The parcels where the SPP units will be placed are owned by the investor company. No expropriation will be made within the scope of the project.

In the current situation, it is within the "Solar Energy Area" areas **with non-agricultural use permit.**

In addition, part of the project area was previously used as "Construction Site" for the construction of Alpaslan II Dam and Hydroelectric Power Plant.

For the agricultural lands in the project area; within the scope of the Soil Conservation and Land Use Law No. 5403, with the letter dated 20.02.2003 and numbered 2844-002375 of the General Directorate of Agricultural Production and Development of the Ministry of Agriculture and Rural Affairs, a total area of 5469 hectares including the Alparslan II Dam and HEPP project area was given permission for non-agricultural use within the scope of the Regulation on the Protection and Use of Agricultural Lands in force at that time.

The "Non-Agricultural Use Permit Opinion" received by Muş Provincial Directorate of Agriculture and Forestry from the Ministry of Agriculture and Forestry, General Directorate of Agricultural Reform, regarding whether this permit is valid for the planned SPP project is given in Annex-2.4. In the opinion of the General Directorate of Agricultural Reform given in Annex-2.4, it is stated that *"5469 hectares of land with a surface area of 5469 hectares, which was granted permission for non-agricultural use with the letter dated 20.02.2003 and numbered 2844-002375 of the abrogated Ministry of Agriculture and Rural Affairs General Directorate of Agricultural Production and Development, is outside the scope of Law No. 5403, and it is considered that no action can be taken within the scope of Articles 13, 14, 20 and 21 of Law No. 5403 within this area."* In this context, no additional permission, etc. will be obtained for land use.

Currently, the Zoning Plans of the project area have been approved, land purchases have been completed, the unification file has been approved, cadastral and expropriation processes are about to be completed. It is planned to start construction by obtaining a construction license after the EIA Decision.

**I.6. Other issues (other economic, social and infrastructure activities that are not within the scope of the project but are essential for the realization of the project or are intended to be realized by the investor company or other companies depending on the realization of the project)**

There are no issues to be evaluated under this heading.

## SECTION II. EXISTING ENVIRONMENTAL CHARACTERISTICS OF THE PROJECT LOCATION AND IMPACT AREA (*)

### II.1. Determination of the Area to be Affected by the Project

During the determination of the area to be affected by the planned project, short and long term impacts that may occur have been taken into consideration. Within the scope of the project, environmental impacts will be caused by the activities during the land preparation, construction and operation phases of the project and social impacts on the economy of the region will be observed.

The environmental impacts of the Project are emissions, fuel emissions from the operation of construction machinery, noise, waste generation, etc. that may occur during the ground preparation and assembly activities planned to be carried out during the land preparation and construction phase. These environmental impacts can be considered as short-term impacts as they will end with the completion of the land preparation and construction phase.

During the operation phase of the project, there will be no dust emission or noise generation during the operation of the panels.

Domestic solid waste from personnel, wastewater generation and wastes that may occur during maintenance and repair operations of the units, exhaust gas emissions from fuel due to the operation of machinery and equipment are the impacts that may be seen during the operation phase of the project.

The environmental impacts identified in the
" prepared within the scope of the Technical Assistance Project for Strengthening the
Capacity of the Republic of Turkey Ministry of Environment, Urbanization and Climate Change in the Field of Environmental Impact Assessment (EIA) have been taken into consideration in assessing the environmental impacts that may be encountered during the land preparation, construction and operation phases of the Project.

The distances of other buildings and residences in the vicinity of the project area to the project area are given in Section I.4 Table I.4.1.

Annex-2.1.f.2. of the Regulation on the Control of Industrial Air Pollution in force states that

The
However, taking into account the
project area and the nearest sensitive areas around the project area, a square area with a side length of 4 km has been determined so that the impact area will be larger than the side length of 2 km defined in the legislation. In this context, the project impact area covers an area of 16 km² (See Figure II.1.1).

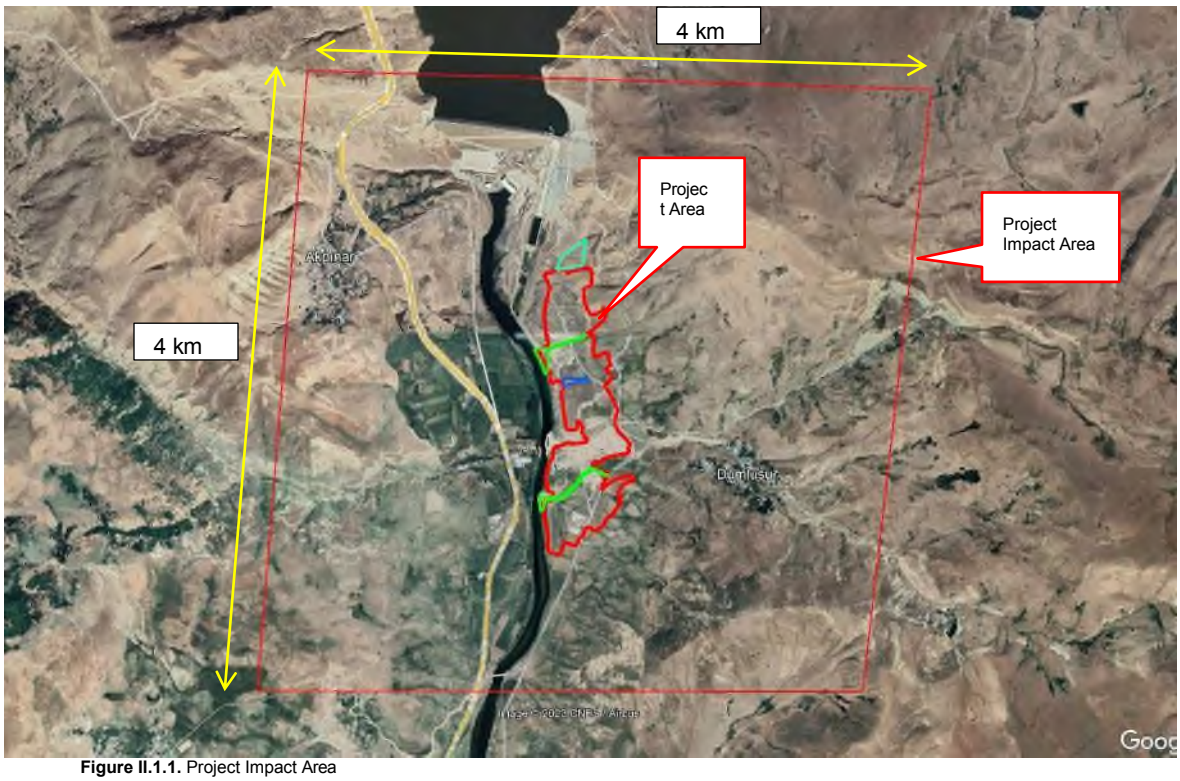



**Figure II.1.1.** Project Impact Area

A 1/25.000 Scale Topographic Map showing the project area, settlements around the project area and its immediate surroundings is provided in the appendices (See Annex-4).

### II.1.1. Identification of the project area and the environment likely to be affected by the proposed project (explaining how and on what basis the EIA study area and impact area were determined and showing these areas on a map),

The environmental impacts identified in the
" prepared within the scope of the Technical Assistance Project for Strengthening the
Capacity of the Republic of Turkey Ministry of Environment, Urbanization and Climate Change in the Field of Environmental Impact Assessment (EIA) have been taken into consideration in assessing the environmental impacts that may be encountered during the land preparation, construction and operation phases of the Project.

Annex-2.1.f.2. of the Regulation on the Control of Industrial Air Pollution in force states that

The
However, taking into account the
project area and the nearest sensitive areas around the project area, a square area with a side length of 4 km has been determined so that the impact area will be larger than the side length of 2 km defined in the legislation. In this context, the project impact area covers an area of 16 km² (See Figure II.1.1).

The Project impact area is also shown on the 1/25.000 Scale Topographic Map presented in Annex-4.

### II.1.2. Ownership status, land use status, expropriation plan of the EIA study area and impact area,

The 1/25.000 Scale Land Asset Map showing the Project area and its surroundings i s included in Annex-5. According to the Project 1/25.000 Scale Land Asset Map, although the SPP Area is within irrigated agriculture (insufficient) areas, it is currently within the **"Solar Energy Area qualified"** areas **with non-agricultural use permits**.

The Land Asset Map showing the project area and its surroundings is given in Figure II.1.2.1.

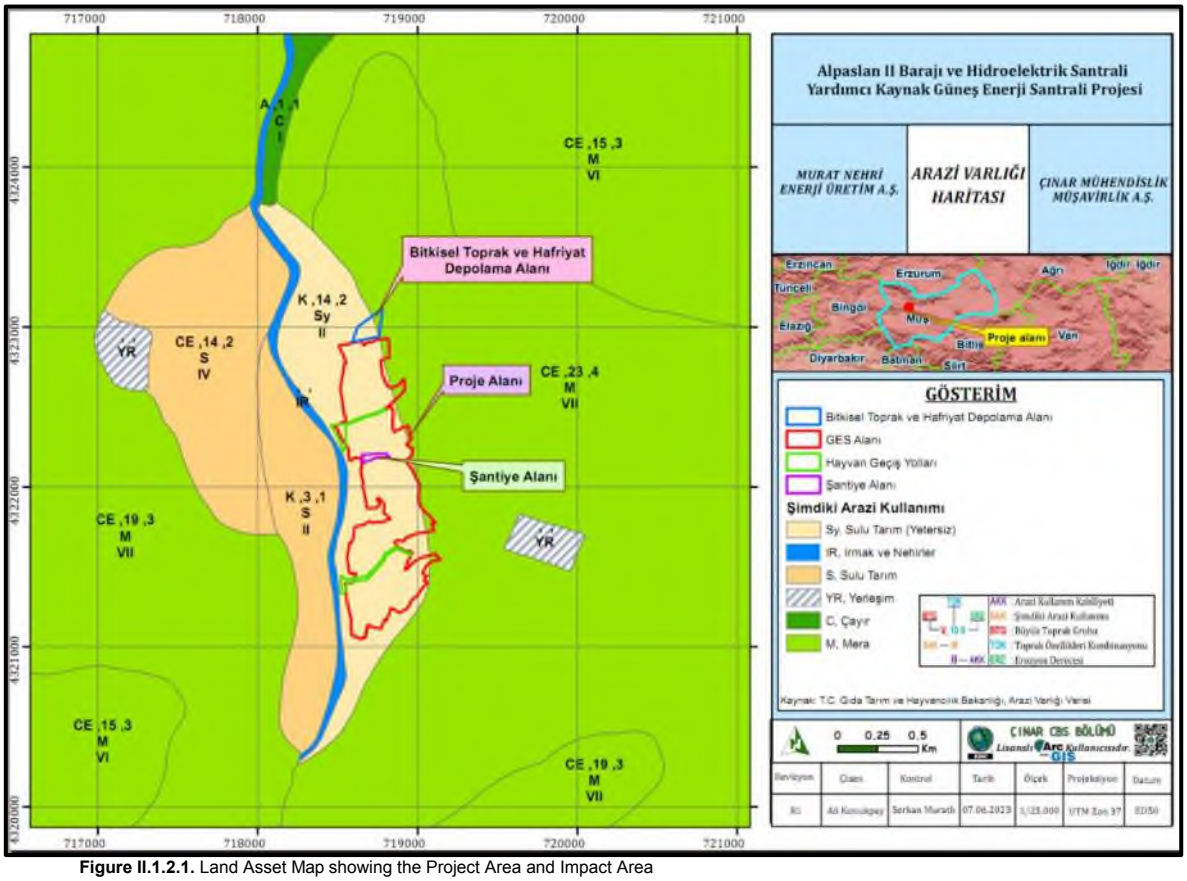



**Figure II.1.2.1.** Land Asset Map showing the Project Area and Impact Area

For the agricultural lands in the project area; within the scope of the Soil Conservation and Land Use Law No. 5403, with the letter dated 20.02.2003 and numbered 2844-002375 of the General Directorate of Agricultural Production and Development of the Ministry of Agriculture and Rural Affairs, a total area of 5469 hectares including the Alparslan II Dam and HEPP project area was given permission for non-agricultural use within the scope of the Regulation on the Protection and Use of Agricultural Lands in force at that time.

The "Non-Agricultural Use Permit Opinion" received by Provincial Directorate of Agriculture and Forestry from the Ministry of Agriculture and Forestry, General Directorate of Agricultural Reform, regarding whether this permit is valid for the planned SPP project is given in Annex-2.4. In the opinion of the General Directorate of Agricultural Reform given in Annex-2.4, it is stated that

In this context, no additional permission, etc.
will be obtained for land use.

The project area belongs to the investor as shown in the ownership documents provided in Annex-2.8.

Part of the Project area was previously used as "Construction Site" for the construction of Alpaslan II Dam and Hydroelectric Power Plant.

The parcels within the Project area are not forest, agricultural or pasture land and are owned by the investor. Therefore, following the completion of the EIA process, no expropriation etc. land acquisition will be made.

### II.1.3. Distances to other solar power plant projects and other activities (such as energy, mining, industry, tourism, animal husbandry...) in the EIA review area and impact area, which have EIA decisions and are currently installed or planned to be installed, and general information about these projects,

The coordinates of the project area and the area where SPP panels will be installed are given in the annexes (See Annex-1).

The distance of the SPP area to be established in the planned project area is approximately 700 meters from the hydroelectric power plant facility currently being operated by the investor company.

In the institutional opinion dated 09.12.2022 and numbered 2022487990 of the General Directorate of Mining and Petroleum Affairs of the Ministry of Energy and Natural Resources of the Republic of Turkey dated 09.12.2022 and numbered 2022487990, it is stated that *"...in the area inquiry made in the system records on 09.12.2022, it has been determined that there is no mining license in force interfering with the project area of 62.74 hectares, and it has been decided by our General Directorate that there is no objection to the construction of the Alpaslan II Dam and Hydroelectric Power Plant Auxiliary Source Solar Power Plant project on a total area of 62.74 hectares within the attached coordinates."* (See Annex-2.14).

The project area does not overlap with a n y current mining area of the General Directorate of Mining and Petroleum Affairs.

In the opinion of Muş Special Provincial Special Administration dated 06.12.2022 and numbered E.10542 and given in Annex-2.15, separate opinions of the Directorate of Culture and Social Affairs, Directorate of Environmental Protection and Control, Directorate of Agricultural Services, Directorate of Road and Transportation Services and Directorate of Zoning and Urban Improvement were taken and as a result, it was found appropriate to realize the SPP investment in the project area.

There are no facilities or planned projects other than Allpaslan II HEPP in the Project area and its immediate vicinity.

## II.2. Characteristics of the Physical and Biological Environment and Utilization of Natural Resources within the EIA Study Area and Impact Area

The physical, biological and environmental characteristics of the areas in the impact area of the planned project, the use of natural resources and the measures to be taken are explained in the sub-headings.

**II.2.1. Atmospheric conditions, climatic factors (general climatic conditions - pressure, temperature, precipitation, relative humidity, number of days, snow depth, evaporation, effective wind direction; table, graphical and written expression of the distribution of meteorological parameters; information about the modeling study, if any, information about the modeling study, evaluation of the results by using the hourly meteorological data of the representative year compatible with the long-term data of the meteorological station or stations that can represent the activity area in the modeling studies, updated and long-term values of meteorological data;**

**General Climatic Features**

/ C province has a harsh continental climate. The temperature fluctuates between -29°C and +37°C. On 120 days of the year, the temperature is above +30°C and 120 days below O°C. It snows a lot in winter. Annual precipitation is between 1000 mm and 350 mm. Winters are very cold and long, summers are short, hot and dry[3].

**Meteorological Bulletin Used to Determine Meteorological and Climatic Features**

In the preparation of the sections related to meteorological data within the scope of the Project, in accordance with the opinion of the Republic of Turkey Ministry of Environment, Urbanization and Climate Change, General Directorate of Meteorology given in Annex-2.10, Varto Meteorological Station Long Term Data (1977- 2021) with station number 17778 was used. These meteorological data are given in Annex-2.10.

In order to evaluate the meteorological conditions in the Project site and surrounding areas, the results of meteorological continuous measurements carried out by the General Directorate of Meteorology (MGM) were analyzed and the results are presented below with the help of tables and graphs.

**Meteorological Features**

*Pressure Distribution (Average, Maximum, Minimum Pressure)*

According to the observation records of Varto Meteorological Station, the annual average pressure was measured as 852.0 hPa. The maximum pressure was observed in January with 869.0 hPa and the minimum pressure was observed in March with 831.2 hPa. The pressure data are given in Table II.2.1.1 and the graphical representation of the data is given in Figure II.2.1.1.

**Table II.2.1.1.** Long Years Pressure Data

| Meteorological Parameters | Months | | | | | | | | | | | | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | January | February | Mart | April | May | June | July | August | September | October | November | December | |
| Average Pressure (hPa) | 854,1 | 853,0 | 851,1 | 851.0 | 851,2 | 849,3 | 847,6 | 848,9 | 851,8 | 855,1 | 855,7 | 855,3 | 852,0 |
| Maximum Pressure (hPa) | 869,0 | 866,9 | 867,4 | 862.8 | 861,4 | 860,0 | 857,2 | 858,5 | 862,4 | 865.7 | 868,3 | 866,9 | 869,0 |
| Minimum Pressure (hPa) | 833,1 | 833,4 | 831,2 | 836,0 | 839,1 | 839,2 | 837,8 | 839,9 | 842,8 | 841.8 | 838,9 | 835,8 | 831,2 |

**Source:** Varto Meteorological Station, 1977-2021 Data

[3]**Source:** https://www.cografya.gen.tr/tr/mus/iklim.html

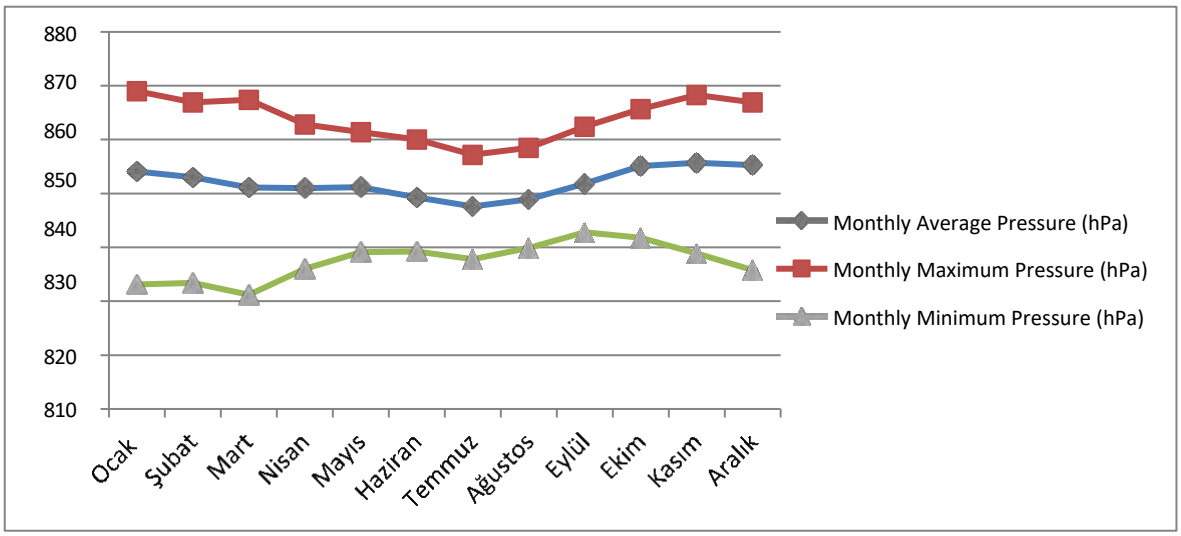



**Figure II.2.1.1.** Graph of Monthly Pressure Distributions
**Source:** Varto Meteorological Station, 1977-2021 Data

According to the observation records of Varto Meteorological Station; the average annual temperature is 7.9 $^{0C}$. The lowest temperature was recorded in February with -33.4 $^{0C}$ and the highest temperature was recorded in July with 40.5 $^{0C}$. The temperature data are given in Table II.2.1.2 and the graphical representation of the data is given in Figure II.2.1.2.

**Table II.2.1.2.** Long Years Temperature Data

| Meteorological Parameters | Months | | | | | | | | | | | | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | January | February | Mart | April | May | June | July | August | September | October | November | December | |
| Average Temperature ($^{(0)C}$) | -7,9 | -6,2 | -0,1 | 7,4 | 12,6 | 17,5 | 22,2 | 22,3 | 17,4 | 10,7 | 3 | -3,7 | 7,9 |
| Maximum Temperature ($^{(0)C}$) | 8,7 | 11,4 | 21,4 | 27 | 32,2 | 35 | 40,5 | 38,5 | 36,9 | 29,8 | 20,4 | 17,7 | 40,5 |
| Minimum Temperature | -31,1 | -33,4 | -29,4 | -11,3 | -3,3 | 1 | 4,5 | 4,7 | -1 | -7,5 | -21,4 | -31 | -33,4 |

**Source:** Varto Meteorological Station, 1977-2021 Data

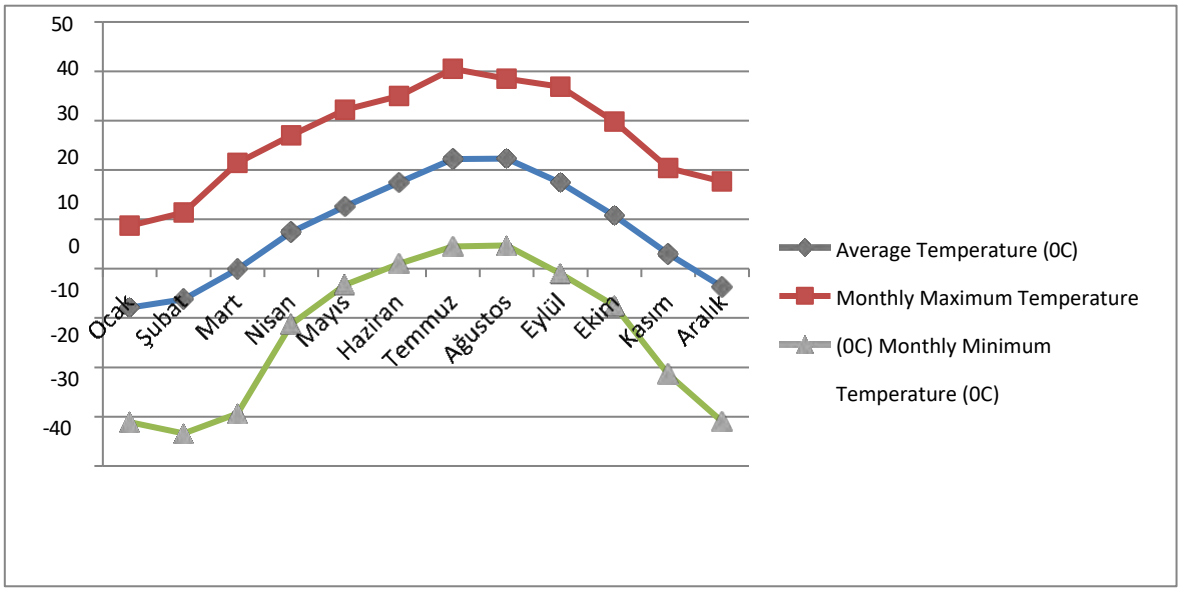



**Figure II.2.1.2.** Monthly Temperature Distribution Graph
**Source:** Varto Meteorological Station, 1977-2021 Data

According to the observation records of Varto Meteorological Station, the average annual total precipitation was recorded as 636.2 mm. The maximum monthly precipitation observed so far was 93 mm in October. Precipitation data are given in Table II.2.1.3 and the graphical representation of the data is given in Figure II.2.1.3.

**Table II.2.1.3.** Long Years Precipitation Data

| Meteorological Parameters | Months | | | | | | | | | | | | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | January | February | Mart | April | May | June | July | August | September | October | November | December | |
| Average Total Rainfall (mm) | 53,1 | 66 | 85,8 | 96 | 70,1 | 28,8 | 12,1 | 10,5 | 14,3 | 63,8 | 66,1 | 69,6 | 636,2 |
| Monthly Maximum Rainfall (mm) | 32,8 | 35 | 57 | 47,7 | 58,2 | 33 | 26,2 | 44,4 | 22,1 | 93 | 59,6 | 30,8 | 93 |

**Source:** Varto Meteorological Station, 1977-2021 Data

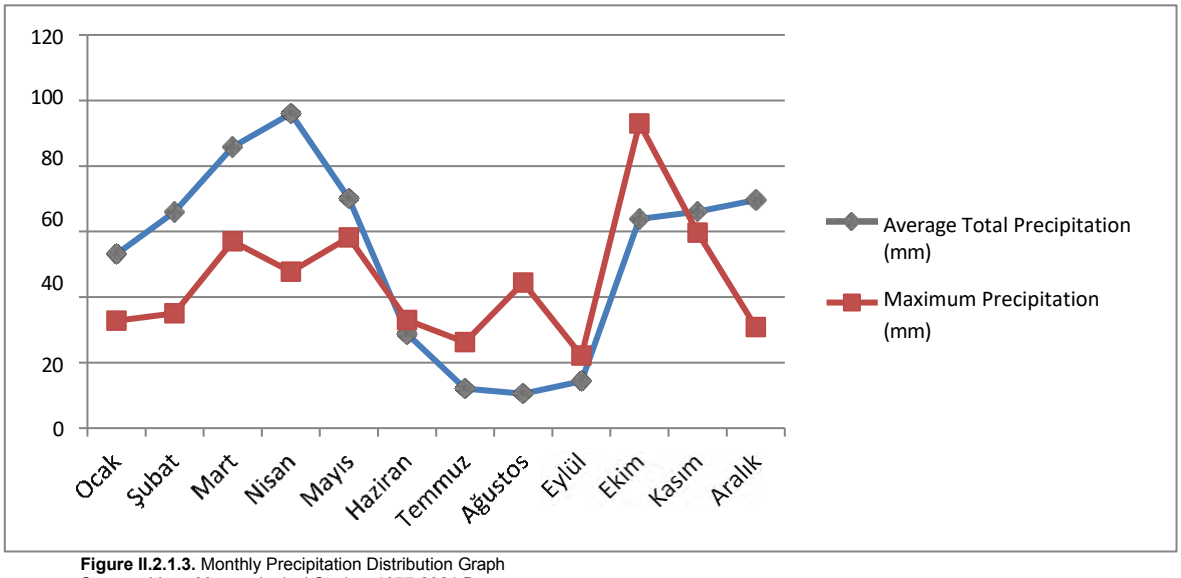



**Figure II.2.1.3.** Monthly Precipitation Distribution Graph
**Source:** Varto Meteorological Station, 1977-2021 Data

Moreover, the Recurrence Graph of the region is given in Figure II.2.1.4.

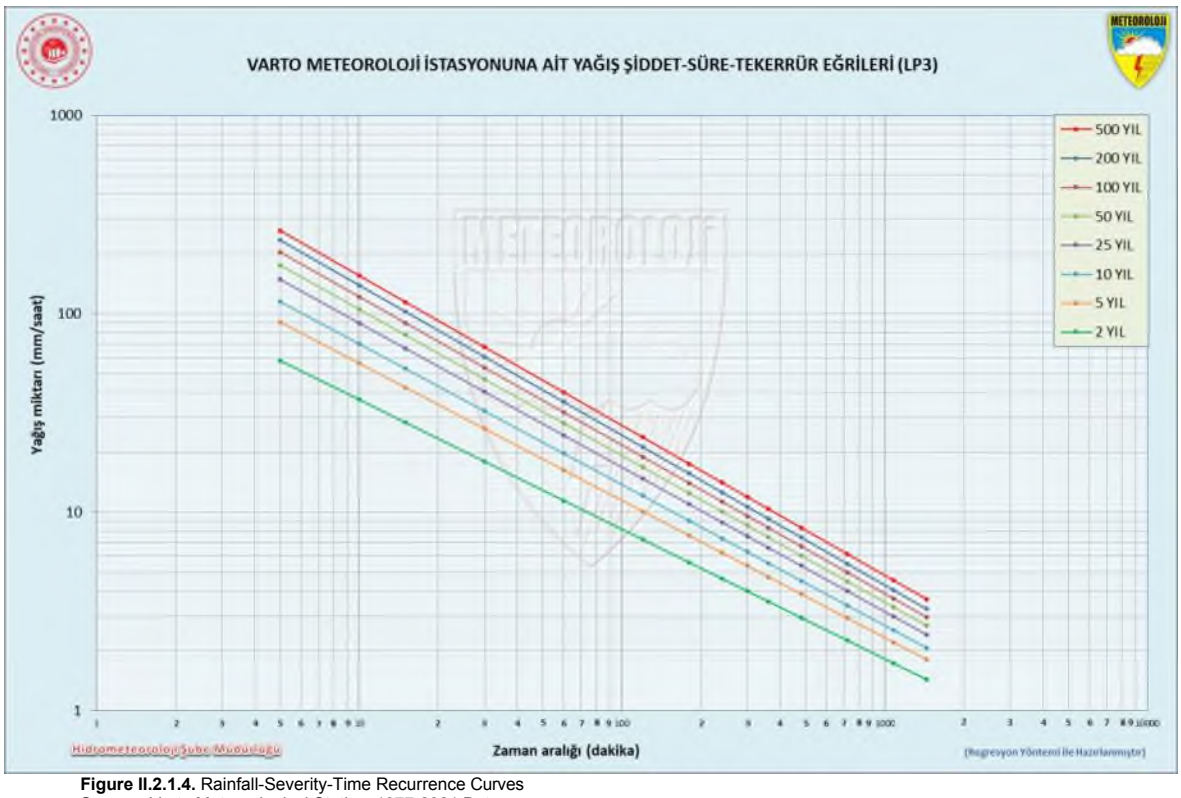



**Figure II.2.1.4.** Rainfall-Severity-Time Recurrence Curves
**Source:** Varto Meteorological Station, 1977-2021 Data

According to the relative humidity values obtained from Varto Meteorological Station, annual average humidity 62.9%. The humidity values obtained from Varto Meteorological Station are given in Table II.2.1.4 and the graphical representation of the data is given in Figure II.2.1.5.

**Table II.2.1.4.** Average Humidity Data

| Meteorological Parameters | Months | | | | | | | | | | | | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | January | February | Mart | April | May | June | July | August | September | October | November | December | |
| Average Humidity (%) | 76,7 | 76,2 | 73,7 | 65,4 | 60,9 | 53 | 45,3 | 44,2 | 48,5 | 61,8 | 71,4 | 77,9 | 62,9 |
| Average Minimum Relative Moisture (%) | 34,9 | 36,5 | 30,1 | 19 | 18,3 | 15,7 | 12,2 | 12,2 | 12 | 14,9 | 22,2 | 31,7 | 21,6 |

**Source:** Varto Meteorological Station, 1977-2021 Data

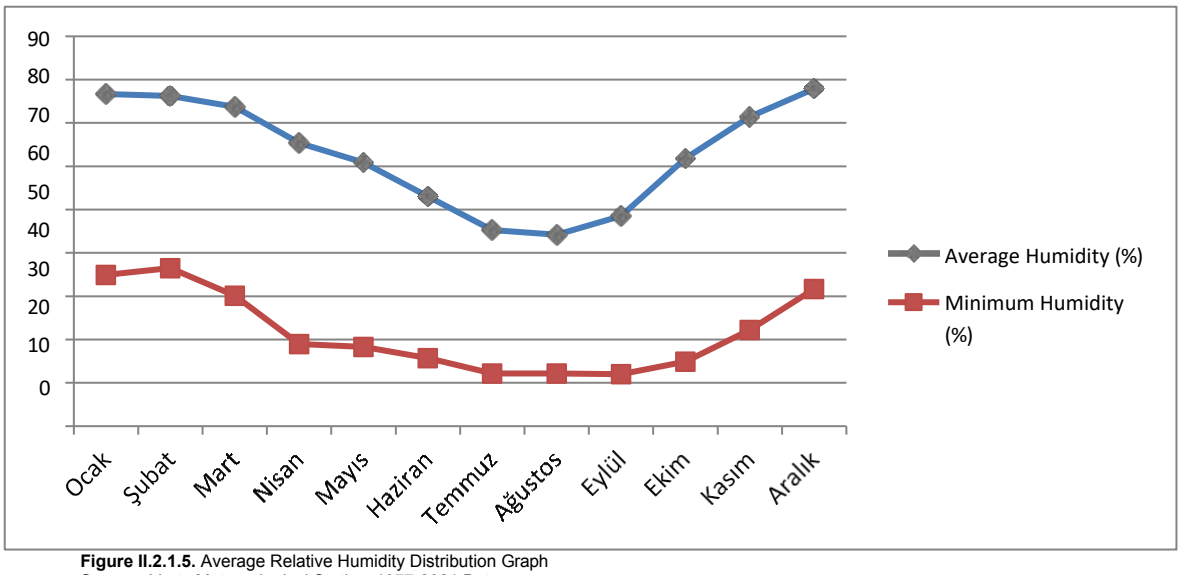



**Figure II.2.1.5.** Average Relative Humidity Distribution Graph
**Source:** Varto Meteorological Station, 1977-2021 Data

According to the observation records of Varto Meteorological Station, the total number of days with annual snowfall is 46.06, the total number of days with annual snow cover is 112.78, the total number of days with annual fog is 6.08, the total number of days with annual fog is 6.08, the total number of days with annual hail is 1.09, the total number of days with annual hoarfrost is 5.43, and the total number of days with annual orage is 0.63. The data on numbered days are given in Table II.2.1.5 and the graphical representation of the data are given in Figure II.2.1.6 and Figure II.2.1.7.

**Table II.2.1.5.** Numbered Days Data

| Meteorological Parameters | Months | | | | | | | | | | | | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | January | February | Mart | April | May | June | July | August | September | October | November | December | |
| Average Number of Days with Snowfall | 11,83 | 11,1 | 9,07 | 1,62 | 0,1 | - | - | - | - | 0,24 | 2,76 | 9,34 | 46,06 |
| Average Number of Days with Snow Cover | 27,61 | 27,25 | 22 | 6,28 | 2 | - | - | - | - | 2 | 7,5 | 18,14 | 112,78 |
| Average Number of Foggy Days | 1,82 | 1,36 | 0,77 | 0,07 | - | - | - | - | - | 0,02 | 0,61 | 1,43 | 6,08 |
| Average Number of Occupied Days | - | - | 0,07 | 0,27 | 0,34 | 0,2 | 0,05 | 0,07 | 0,02 | 0,02 | 0,05 | - | 1,09 |
| Average Number of Frosty Days | 0,59 | - | 0,41 | 0,45 | 0,05 | - | - | - | | 0,5 | 2 | 1,43 | 5,43 |
| Average Number of Days with Oraj | - | - | - | 0,11 | 0,18 | 0,18 | 0,09 | 0,07 | - | - | - | - | 0,63 |

**Source:** Varto Meteorological Station, 1977-2021 Data

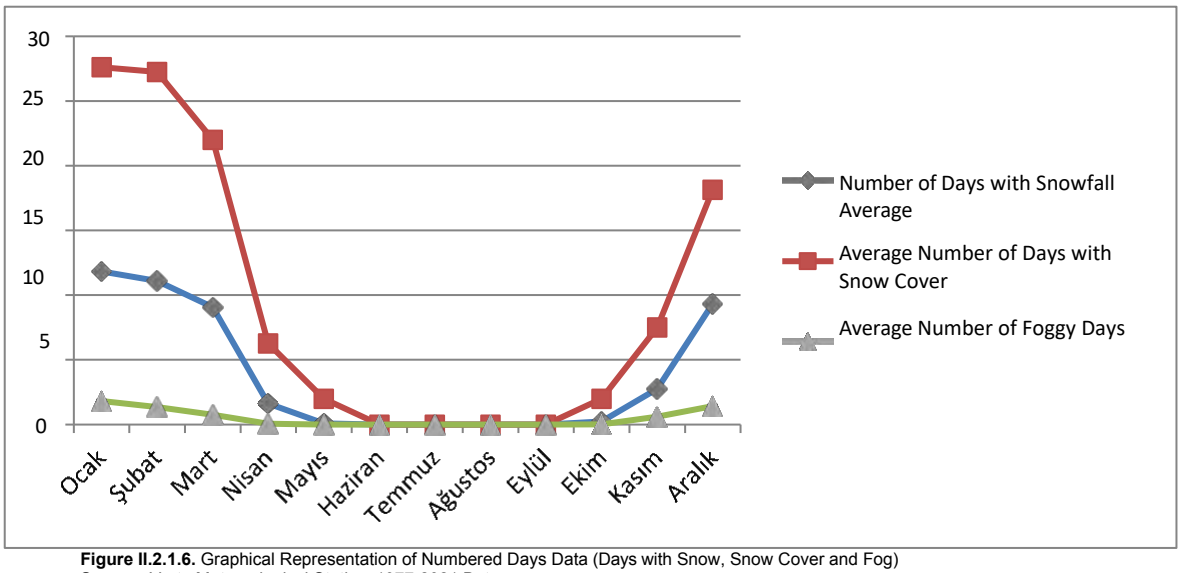



**Figure II.2.1.6.** Graphical Representation of Numbered Days Data (Days with Snow, Snow Cover and Fog)
**Source:** Varto Meteorological Station, 1977-2021 Data

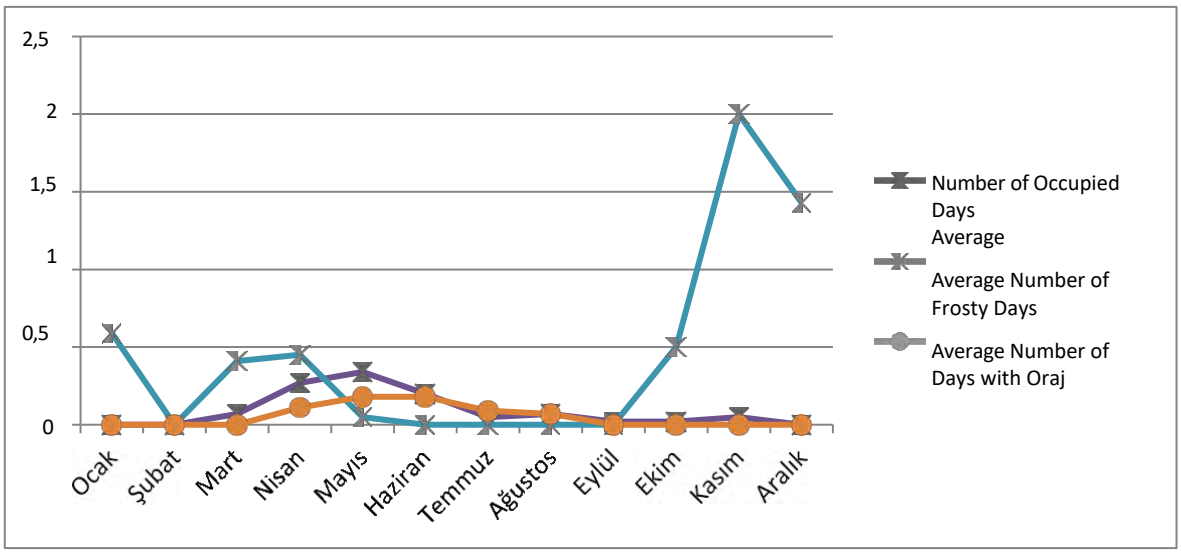



**Figure II.2.1.7.** Graphical Representation of Numbered Days Data (Hail, Precipitation, Oraj Days)
**Source:** Varto Meteorological Station, 1977-2021 Data

According to the observation records of Varto Meteorological Station, the monthly maximum snow height was measured in February with 112 cm. Snow height data are given in Table II.2.1.6 and the graphical representation of the data is given in Figure II.2.1.8.

**Table II.2.1.6.** Snow Height Data

| Meteorological Parameters | Months | | | | | | | | | | | | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | January | February | Mart | April | May | June | July | August | September | October | November | December | |
| Snow Thickness (cm) | 78 | 112 | 100 | 88 | 9 | - | - | - | - | 14 | 38 | 60 | 112,00 |

**Source:** Varto Meteorological Station, 1977-2021 Data

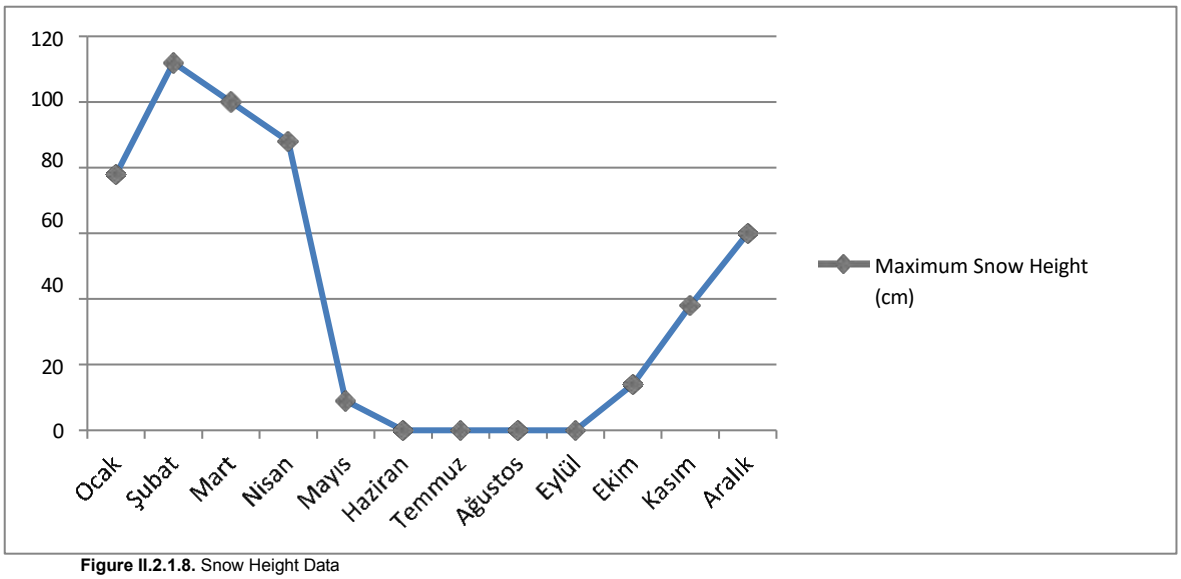



**Figure II.2.1.8.** Snow Height Data
**Source:** Varto Meteorological Station, 1977-2021 Data

Varto Meteorological Station does not have open surface evaporation data in the 1977-2021 long years bulletin.

1) Annual, Seasonal, Monthly Wind Direction Distribution

According to the observation records of Varto Meteorological Station, the total number of wind blows according to directions is given in Table II.2.1.7.

**Table II.2.1.7.** Data on the Total Number of Wind Blows by Direction

| Direction | Meteorological Parameter | Months | | | | | | | | | | | | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | January | February | Mart | April | May | June | July | August | September | October | November | December | |
| N | Total Number of Blowing | 1597 | 1620 | 1555 | 1511 | 1756 | 1477 | 1647 | 1399 | 1341 | 1710 | 1439 | 1626 | 18678 |
| NE | Total Number of Blowing | 839 | 735 | 1072 | 1366 | 1670 | 1827 | 2711 | 2876 | 2488 | 2223 | 1362 | 976 | 20145 |
| NNE | Total Number of Blowing | 614 | 537 | 761 | 965 | 1055 | 1069 | 1672 | 1685 | 1308 | 1370 | 1144 | 765 | 12945 |
| ENE | Total Number of Blowing | 685 | 630 | 950 | 1240 | 1396 | 1379 | 2117 | 2095 | 1971 | 1719 | 1166 | 825 | 16173 |
| E | Total Number of Blowing | 899 | 626 | 950 | 1097 | 1208 | 1105 | 1401 | 1300 | 1205 | 1244 | 827 | 811 | 12673 |
| ESE | Total Number of Blowing | 444 | 406 | 604 | 864 | 937 | 797 | 895 | 905 | 846 | 726 | 659 | 578 | 8661 |
| SE | Total Number of Blowing | 404 | 331 | 424 | 870 | 920 | 880 | 1047 | 1237 | 880 | 780 | 561 | 383 | 8717 |
| SSE | Total Number of Blowing | 360 | 324 | 509 | 1045 | 1428 | 1480 | 1772 | 1619 | 1329 | 1157 | 714 | 404 | 12141 |
| S | Total Number of Blowing | 580 | 467 | 585 | 986 | 1430 | 1268 | 1565 | 1730 | 1506 | 1045 | 893 | 660 | 12715 |
| SSW | Total Number of Blowing | 1206 | 1013 | 1433 | 2197 | 2587 | 2490 | 2143 | 2330 | 2631 | 2249 | 1854 | 1553 | 23686 |
| SW | Total Number of Blowing | 2719 | 2672 | 2501 | 2785 | 2681 | 2615 | 2324 | 2264 | 2476 | 2795 | 3181 | 3483 | 32496 |
| WSW | Total Number of Blowing | 4690 | 4550 | 4088 | 3231 | 3096 | 2597 | 1934 | 1777 | 2481 | 2985 | 3738 | 4393 | 39560 |
| W | Total Number of Blowing | 3294 | 2879 | 3778 | 2876 | 2356 | 1908 | 1490 | 1176 | 1595 | 2101 | 2681 | 3412 | 29546 |
| WNW | Total Number of Blowing | 2237 | 2147 | 2727 | 2542 | 2276 | 1837 | 1627 | 1542 | 1780 | 2159 | 1916 | 2351 | 25141 |

| Direction | Meteorological Parameter | Months | | | | | | | | | | | | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | January | February | Mart | April | May | June | July | August | September | October | November | December | |
| NW | Total Number of Blowing | 1354 | 1448 | 1565 | 1478 | 1439 | 1247 | 1204 | 1284 | 1315 | 1281 | 1059 | 1330 | 16004 |
| NNW | Total Number of Blowing | 939 | 719 | 723 | 693 | 725 | 690 | 780 | 785 | 762 | 717 | 587 | 731 | 8851 |

**Source:** Varto Meteorological Station, 1977-2021 Data

1.Derece 2.Derece 3.Derece 4.Derece

According to the number of blows in the observation records of Varto Meteorological Station, the dominant wind direction is WSW (West-Southwest) with 39560 blows, SW (Southwest) with 32496 blows, W (West) with 29546 blows and WNW (West-Northwest) with 25141 blows. The annual wind diagram according to the number of blows of the wind is given in Figure II.2.1.10.

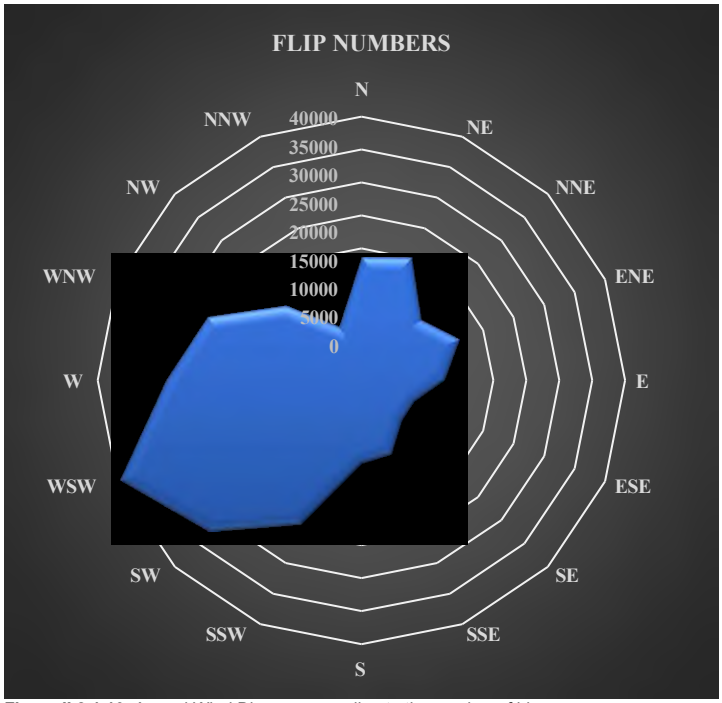



**Figure II.2.1.10.** Annual Wind Diagram according to the number of blows
**Source:** Varto Meteorological Station, 1977-2021 Data

Considering the observation records of Varto Meteorological Station, the sum of the seasonal wind blowing numbers according to the directions is given in Table II.2.1.8 and the seasonal wind diagrams according to the blowing numbers are given in Figure II.2.1.11.

**Table II.2.1.8.** Seasonal Wind Blowing Sum Data by Direction

| Meteorological Parameters | Spring | Summer | Autumn | Winter |
|---|---|---|---|---|
| N Total number of blows | 4,822 | 4,523 | 4,490 | 4,843 |
| NNE Total Number of blows | 2,781 | 4,426 | 3,822 | 1,916 |
| NE Total Number of Blowing Numbers | 4,108 | 7,414 | 6,073 | 2,550 |
| ENE Total Number of Blowing | 3,586 | 5,591 | 4,856 | 2,140 |
| Total number of blows | 3,255 | 3,806 | 3,276 | 2,336 |
| ESE Total number of blows | 2,405 | 2,597 | 2,231 | 1,428 |
| Total SE Blowing Numbers | 2,214 | 3,164 | 2,221 | 1,118 |
| SSE Total Number of Blowing | 2,982 | 4,871 | 3,200 | 1,088 |
| S Total number of blows | 3,001 | 4,563 | 3,444 | 1,707 |

| Meteorological Parameters | Spring | Summer | Autumn | Winter |
|---|---|---|---|---|
| Total Number of SSW Blowing | 6,217 | 6,963 | 6,734 | 3,772 |
| Total Number of SW Blowing | 7,967 | 7,203 | 8,452 | 8,874 |
| Total WSW Blowing Numbers | 10,415 | 6,308 | 9,204 | 13,633 |
| W Total number of blows | 9,010 | 4,574 | 6,377 | 9,585 |
| WNW Total Number of Blows | 7,545 | 5,006 | 5,855 | 6,735 |
| NW Total Number of Blowing | 4,482 | 3,735 | 3,655 | 4,132 |
| NNW Total Number of Blowing | 2,141 | 2,255 | 2,066 | 2,389 |

**Source:** Varto Meteorological Station, 1977-2021 Data

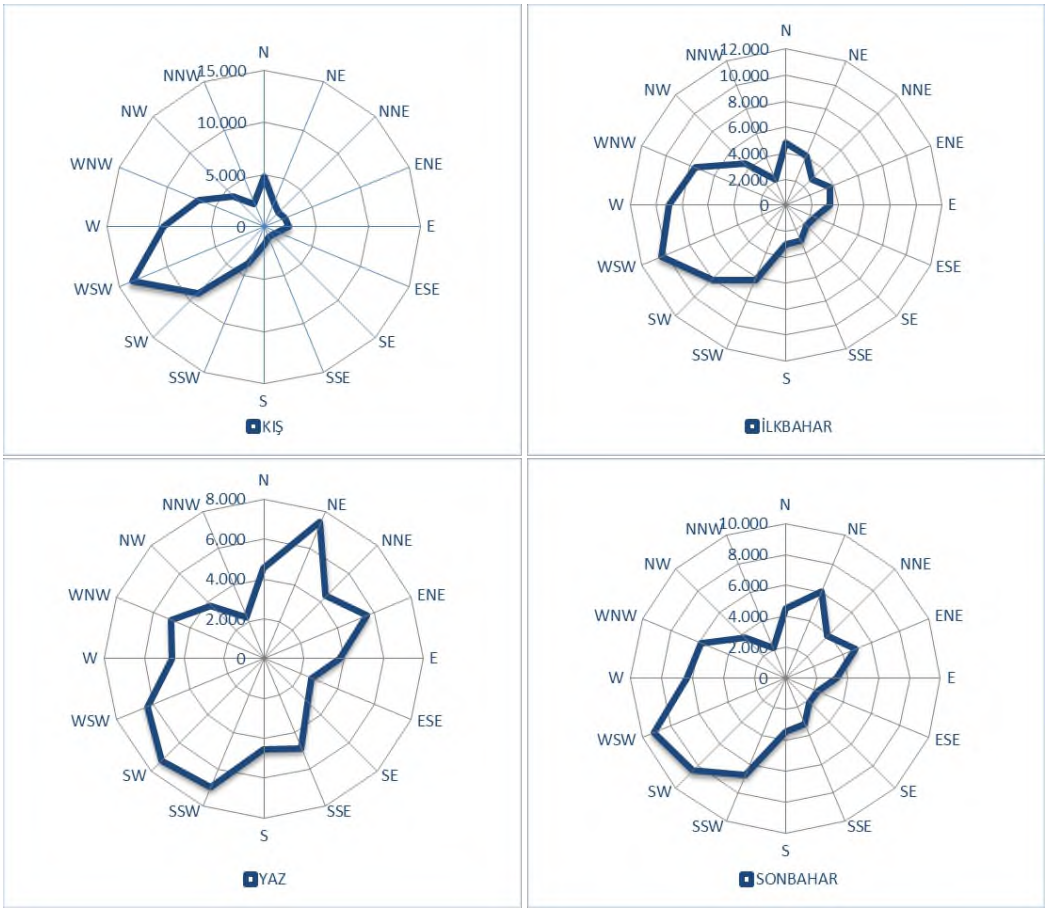



**Figure II.2.1.11.** Seasonal Wind Diagram according to the number of blows
**Source:** Varto Meteorological Station, 1977-2021 Data

The monthly wind diagrams of Varto Meteorological Station according to the number of blows are given in Figure II.2.1.12.


**Figure II.2.1.12.** Monthly Wind Diagram by Number of Blows
**Source:** Varto Meteorological Station, 1977-2021 Data

## 2) Average Wind Speed by Direction

According to the observation records of Varto Meteorological Station, the average wind speed by direction is given in Table II.2.1.9 and the annual wind diagram according to the average wind speed is given in Figure II.2.1.13.

**Table II.2.1.9.** Average Wind Speed Data by Direction

| Direction | Meteorological Parameters | Months | | | | | | | | | | | | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | January | February | Mart | April | May | June | July | August | September | October | November | December | |
| N | Average Wind Speed (m/s) | 0,8 | 0,9 | 1 | 1,2 | 1,1 | 1,1 | 1,1 | 1 | 0,9 | 0,9 | 0,8 | 0,7 | 1 |
| NE | Average Wind Speed (m/s) | 0,8 | 1 | 1,1 | 1,1 | 1,1 | 1,4 | 1,5 | 1,4 | 0,9 | 0,9 | 0,9 | 0,7 | 1,1 |
| NNE | Average Wind Speed (m/s) | 1 | 1,1 | 1,2 | 1,4 | 1,3 | 1,5 | 1,6 | 1,5 | 1,1 | 1 | 1 | 0,9 | 1,2 |
| ENE | Average Wind Speed (m/s) | 1,2 | 1,3 | 1,5 | 1,5 | 1,5 | 1,6 | 1,7 | 1,5 | 1,2 | 1,3 | 1,2 | 1,1 | 1,4 |
| E | Average Wind Speed (m/s) | 1,4 | 1,5 | 1,7 | 1,7 | 1,6 | 1,6 | 1,5 | 1,5 | 1,3 | 1,4 | 1,4 | 1,2 | 1,5 |
| ESE | Average Wind Speed (m/s) | 1,4 | 1,4 | 1,7 | 1,7 | 1,8 | 1,7 | 1,6 | 1,6 | 1,5 | 1,4 | 1,4 | 1,3 | 1,5 |
| SE | Average Wind Speed (m/s) | 1,2 | 1,2 | 1,5 | 1,9 | 1,8 | 1,7 | 1,5 | 1,5 | 1,4 | 1,4 | 1,2 | 1,2 | 1,5 |
| SSE | Average Wind Speed (m/s) | 1,3 | 1,3 | 1,7 | 2 | 2,1 | 1,9 | 1,7 | 1,8 | 1,6 | 1,4 | 1,4 | 1,3 | 1,6 |
| S | Average Wind Speed (m/s) | 0,9 | 1,1 | 1,6 | 2,1 | 2,2 | 1,9 | 1,7 | 1,9 | 1,8 | 1,6 | 1,1 | 1,1 | 1,6 |
| SSW | Average Wind Speed (m/s) | 0,9 | 1 | 1,4 | 1,9 | 1,9 | 1,7 | 1,6 | 1,6 | 1,6 | 1,3 | 1,1 | 1 | 1,4 |

| Direction | Meteorological Parameters | Months | | | | | | | | | | | | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | January | February | Mart | April | May | June | July | August | September | October | November | December | |
| SW | Average Wind Speed (m/s) | 0,9 | 0,9 | 1,2 | 1,8 | 1,7 | 1,4 | 1,3 | 1,4 | 1,4 | 1,2 | 1,1 | 0,9 | 1,3 |
| WSW | Average Wind Speed (m/s) | 0,9 | 1 | 1,4 | 1,8 | 1,6 | 1,4 | 1,3 | 1,4 | 1,6 | 1,2 | 1,1 | 1 | 1,3 |
| W | Average Wind Speed (m/s) | 0,9 | 1,1 | 1,2 | 1,7 | 1,5 | 1,3 | 1,2 | 1,1 | 1,3 | 1,1 | 1,1 | 1 | 1,2 |
| WNW | Average Wind Speed (m/s) | 1,2 | 1,2 | 1,5 | 1,9 | 1,7 | 1,5 | 1,3 | 1,2 | 1,2 | 1,2 | 1,3 | 1,2 | 1,4 |
| NW | Average Wind Speed (m/s) | 1 | 1,2 | 1,4 | 1,7 | 1,7 | 1,4 | 1,1 | 1,1 | 1,2 | 1,2 | 1,3 | 1,1 | 1,3 |
| NNW | Average Wind Speed (m/s) | 0.8 | 1 | 1,2 | 1,4 | 1,5 | 1,5 | 1,2 | 1,1 | 1 | 1 | 1 | 0,8 | 1,1 |

**Source:** Varto Meteorological Station, 1977-2021 Data

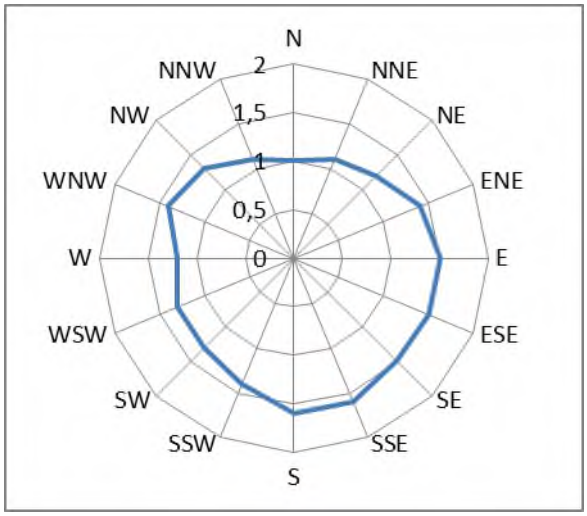



**Figure II.2.1.13.** Wind Diagram According to Average Wind Speed
**Source:** Varto Meteorological Station, 1977-2021 Data

3) Average Wind Speed

The average wind s p e e d distribution values of Varto Meteorological Station are presented in Table II.2.1.10 and the graphical representation of the values is presented in Figure II.2.1.14.

**Table II.2.1.10.** Average Wind Speed Values

| Meteorological Parameter | Months | | | | | | | | | | | | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | January | February | Mart | April | May | June | July | August | September | October | November | December | |
| Average Wind Speed (m/s) | 0,8 | 0,9 | 1,2 | 1,6 | 1,6 | 1,4 | 1,4 | 1,4 | 1,3 | 1,1 | 1 | 0,8 | 1,2 |

**Source:** Varto Meteorological Station, 1977-2021 Data

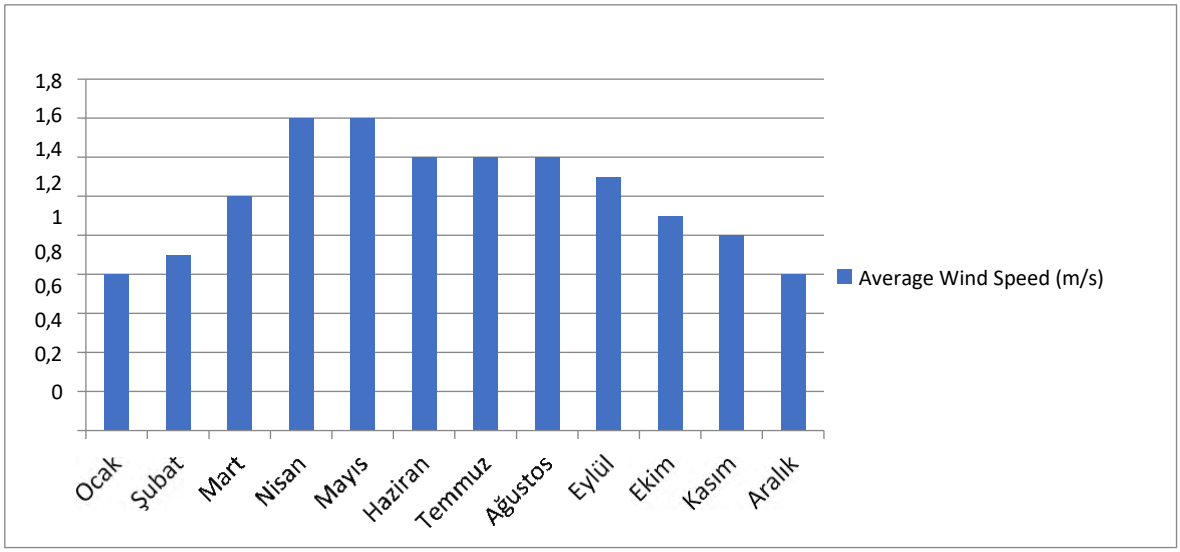



**Figure II.2.1.14.** Average Wind Speed Graph
**Source:** Varto Meteorological Station, 1977-2021 Data

4) Maximum Wind Speed and Direction

The maximum wind speed and direction distribution values of Varto Meteorological Station are presented in Table II.2.1.11 and the graphical representation of the values is presented in Figure II.2.1.15. As can be seen from the data, the direction of the maximum wind is S (South) and the speed is 36 m/s.

**Table II.2.1.11.** Maximum Wind Speed and Direction Distribution Values

| Meteorological Parameters | Months | | | | | | | | | | | | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | January | February | Mart | April | May | June | July | August | September | October | November | December | |
| Average Wind Speed (m/s) | 0,8 | 0,9 | 1,2 | 1,6 | 1,6 | 1,4 | 1,4 | 1,4 | 1,3 | 1,1 | 1 | 0,8 | 1,2 |
| Maximum Wind Speed (m/s) | 23.4 | 25.0 | 28.5 | 28.1 | 25.4 | 25.2 | 24.6 | 20.1 | 22.3 | 36.0 | 23.6 | 27.8 | 36.0 |
| Maximum Wind Direction | WSW | NW | SW | NNE | WNW | WSW | NNE | NNE | NW | S | N | N | S |

**Source:** Varto Meteorological Station, 1977-2021 Data

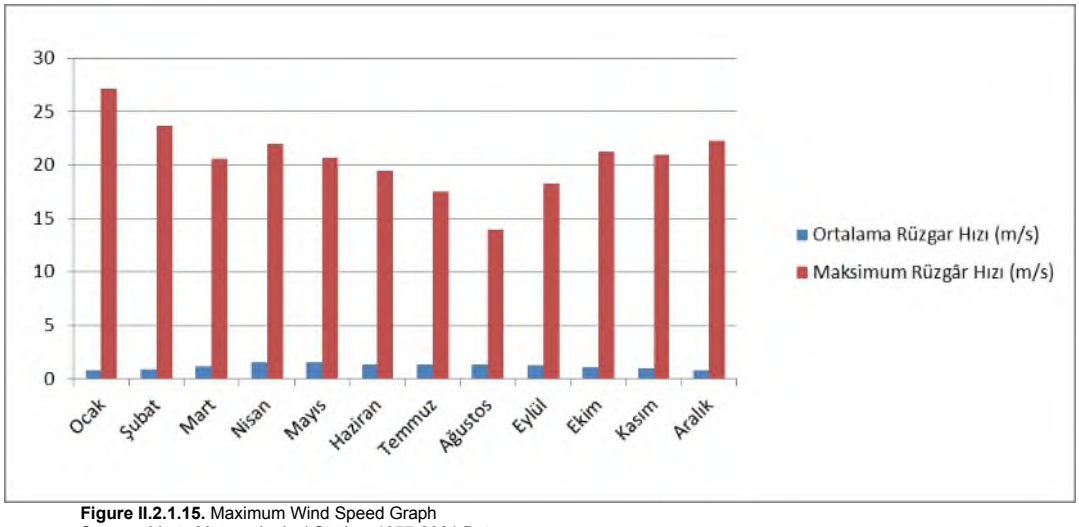



**Figure II.2.1.15.** Maximum Wind Speed Graph
**Source:** Varto Meteorological Station, 1977-2021 Data

5) Average Number of Days with Strong Wind

According to the observation records of Varto Meteorological Station, the annual average number of days with strong winds is 80.99 and the annual average number of days with storms is 18.84. The annual average number of days with strong winds is presented in Table II.2.1.12 and the graphical representation of the values is presented in Figure II.2.1.16.

**Table II.2.1.12.** Number of Stormy Days and Average Strong Windy Days

| Meteorological Parameter | Months | | | | | | | | | | | | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | January | February | Mart | April | May | June | July | August | September | October | November | December | |
| Average Number of Days with Strong Wind | 1,03 | 1,09 | 2,24 | 5,03 | 6,29 | 4,56 | 5,09 | 5,79 | 4,68 | 3,47 | 1,85 | 0,91 | 42,03 |
| Average Number of Stormy Days | 0,18 | 0,21 | 0,32 | 0,35 | 0,97 | 0,44 | 0,44 | 0,32 | 0,5 | 0,24 | 0,24 | 0,21 | 4,42 |

**Source:** Varto Meteorological Station, 1977-2021 Data

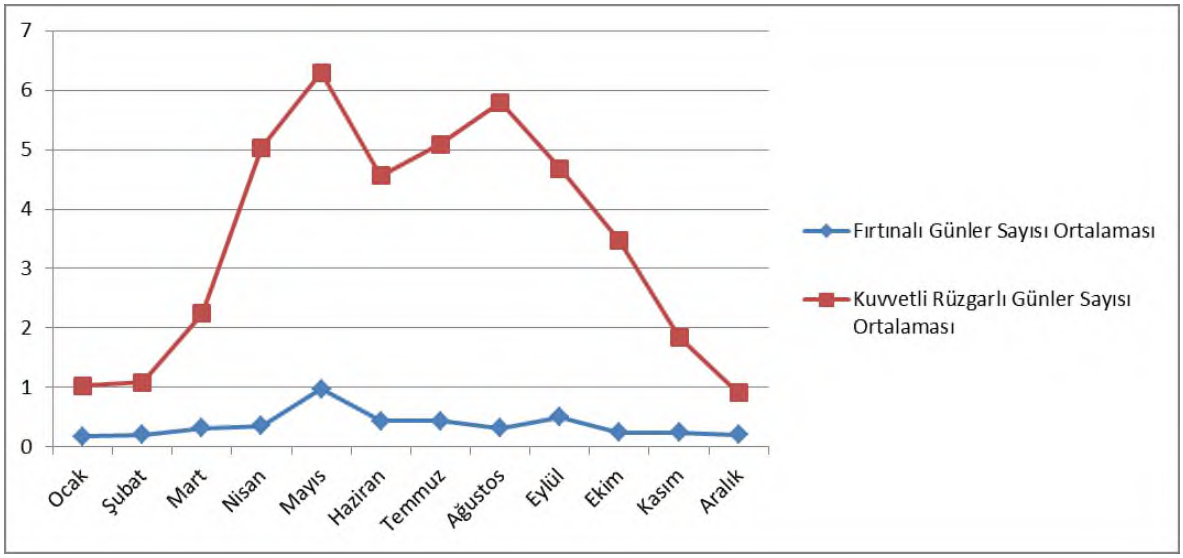



**Figure II.2.1.14.** Number of Stormy Days and Average Graph
**Source:** Varto Meteorological Station, 1977-2021 Data

### Fevk Events

The information on extraordinary meteorological events (Extreme Events) in the records of Varto Meteorological Station is given in Table II.2.1.13. Possible extreme events and possible damages will be evaluated while creating the final project and implementation projects.

**Table II.2.1.13.** Information on Extraordinary Meteorological Events

| HISTORY | STATION | EVENT | LOSS |
|---|---|---|---|
| 02.08.1988 | Varto | Rainfall and flooding | Agricultural crops damaged by rainfall and floods |
| 18.01.1989 | Varto | Storm | Settlements damaged by the storm |
| 23.05.2005 | Varto | Lightning strike | People were hurt |

**Source:** Varto Meteorological Station, 1977-2021 Data

### Air Quality Assessment Studies

Within the scope of the planned project, vegetative soil stripping and excavation removal works will be carried out due to land preparation, road works and solar panel installation activities. The dust emissions that will be generated as a result of these activities have been calculated using the "Emission Factors to be Used in Dust Emission Mass Flow Calculations" given in the "Regulation on the Control of Industrial Air Pollution" published in the R.G. dated 03.07.2009 and numbered 27277 (See Table III.1.1.1).

03.07.2009 dated and 27277 numbered "Regulation on the Control of Industrial Air Pollution (SKHKKY)" which entered into force after being published in the Official Gazette dated 03.07.2009 and numbered 27277 Annex 2 states that *"it is not necessary to determine values representing air pollution, air quality values obtained by measurements, air pollution contribution values obtained by calculation and total pollution values constituted by these values, if the emissions from places other than stacks are less than 1 kg/hour".*

Since the calculated value for total dust emission during the excavation works to be carried out during the land preparation and construction phase of the Project is **1.2228 kg/h** for the controlled case and **2.4453 kg/h** for the uncontrolled case, an air quality modeling study was carried out.

Air Quality Modeling studies have been carried out with Breeze AERMOD modeling program and Air Quality Modeling Report is given in Annex-13 and related calculations and measures to be taken are given in Section III.1.1.

***Meteorological Data Used in Modeling:***

Meteorology is the most important factor affecting the atmospheric distribution of pollutants. For the meteorological information required for the modeling studies, the "Varto and Erzurum Regional Meteorological Station" data obtained from the General Directorate of Meteorology were used.

Republic of Turkey Ministry of Environment, Urbanization and Climate Change, General Directorate of Meteorology's Annex-
According to the opinion given in 2.9, Varto Meteorological Station with station number 17778 was used for ground level data and Erzurum Ravinsonde data from Erzurum Regional Meteorological Station with station number 17095 was used for upper level data.

The number of wind blows in 2020 and the number of wind blows for many years and the last 10 years are given below in graphical and tabular representation.

**Table II.2.1.14.** Comparison of Wind Blowing Data for Long Years, 10 Years and 2020

| Directions | Long Years | 10 Years | Year 2020 |
|---|---|---|---|
| **N** | 18678 | 8913 | 1253 |
| **NNE** | 12945 | 8117 | 926 |
| **NE** | 20145 | 6809 | 848 |
| **ENE** | 16173 | 5843 | 667 |
| **E** | 12673 | 4050 | 336 |
| **ESE** | 8661 | 2611 | 226 |
| **SE** | 8717 | 2306 | 200 |
| **SSE** | 12141 | 2282 | 180 |
| **S** | 12715 | 3277 | 219 |
| **SSW** | 23686 | 3662 | 264 |
| **SW** | 32496 | 4125 | 363 |
| **WSW** | 39560 | 4983 | 404 |
| **W** | 29546 | 4732 | 384 |
| **WNW** | 25141 | 4417 | 385 |
| **NW** | 16004 | 3821 | 375 |
| **NNW** | 8851 | 4049 | 475 |
| **Prevailing Wind Directions** | **Long Years** | **10 Years** | **Year 2020** |
| **Grade 1** | WSW | N | N |
| **2nd Degree** | SW | NNE | NNE |
| **Grade 3** | W | NE | NE |
| **Grade 4** | WNW | ENE | ENE |
| **Blowing Numbers According to Prevailing Directions** | **Long Years** | **10 Years** | **Year 2020** |
| **Grade 1** | 39560 | 8913 | 1253 |
| **2nd Degree** | 32496 | 8117 | 926 |
| **Grade 3** | 29546 | 6809 | 848 |
| **Grade 4** | 25141 | 5843 | 667 |

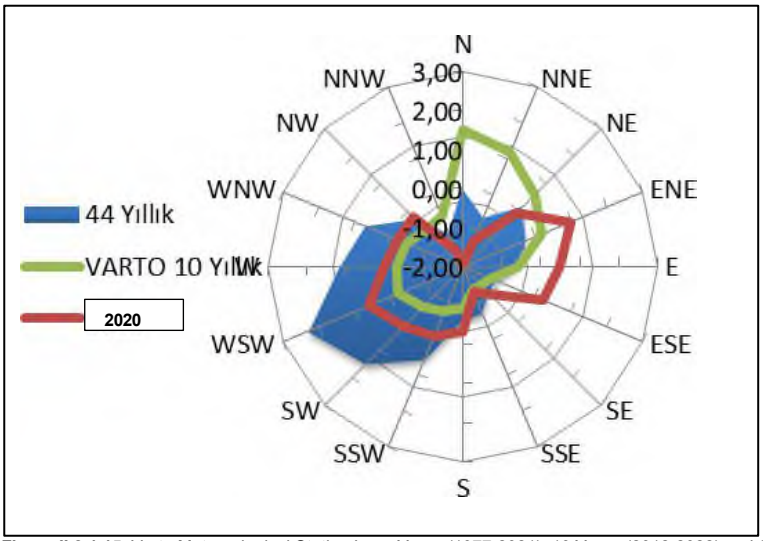



**Figure II.2.1.15.** Varto Meteorological Station Long Years (1977-2021), 10 Years (2012-2022) and 2020 Comparison of Breeze Numbers

While determining the year in which hourly data will be used in the Air Quality Modeling study; 1977-2021 Meteorological Bulletin of Varto Meteorological Station with Station Number 17778 and 2012- 2022 Monthly Blowing Number Total Values by Direction were compared. As a result of the comparison, **2020** was determined as the appropriate year in line with the opinion of the General Directorate of Meteorology of the Republic of Turkey Ministry of Environment, Urbanization and Climate Change given in Annex-2.10.

Varto Meteorological Station with Station Number 17778, which was used to create the meteorological data set for the air quality modeling study, All Parameters Long Term Meteorological Bulletin for 1977-2021 is presented in Annex-2.10.

The AERMOD Model accepts wind speed and direction, temperature, stability class, main level sounding data on an hourly basis. Therefore, some adjustments need to be made in order to use the data in the model. At this stage, the AERMET Program, which is a pre-processor that edits the meteorological data to be used in AERMOD, was used to create meteorological files to be entered into the model.

**II.2.2. Geological features (general geology and geology of the study area, topographic features, 1/25.000 scale general geology map of the site, stratigraphic column sections, geology of the project area, large scale (1/25.000 or 1/100.000 if available) geology map of the study area and sections of the units within the scope of the project (attaching relevant sections from the Geological-Geotechnical Survey Report of the project, if available),**

**General Geology**

The neotectonic regime that started in the Middle Miocene in Eastern Anatolia has significantly affected the geologic development of the region. During the neotectonic period, folds, thrusts, strike-slip faults, strike-slip faults and strike-slip cracks occurred in Eastern Anatolia and intermountain basins and pull-apart basins were formed under the control of these structures. The Muş basin is a good example of an inter-mountain basin. The Muş basin, which is approximately east-west trending, is bounded by the Bitlis Mountains in the south and Bingöl, Hamurpet and Nemrut Mountains in the north.

Metaophyolites, metamorphics and granitic rocks form the base of the units surfacing in the region. On top of all these rock units, the units deposited in the Upper Miocene-Lower Miocene interval were placed with angular unconformity. These units a r e vertically and laterally transitional with each other and contain wedges, lenses and intercalations of lava and volcanic clasts.

Lower Miocene and earlier units are overlain by Middle Miocene aged volcano-sedimentary units with angular unconformity. These are unconformably overlain by Upper Miocene aged volcanocrusts, lavas and lacustrine sediments. All these units are overlain by Lower Pliocene aged volcanic-plutonic rocks of oceanic and terrestrial rock melt origin, Middle-Upper Pliocene aged sediments and Quaternary aged units with separate unconformities, respectively.

The regional geology map of the Project area and its surroundings is given in Figure II.2.2.1.

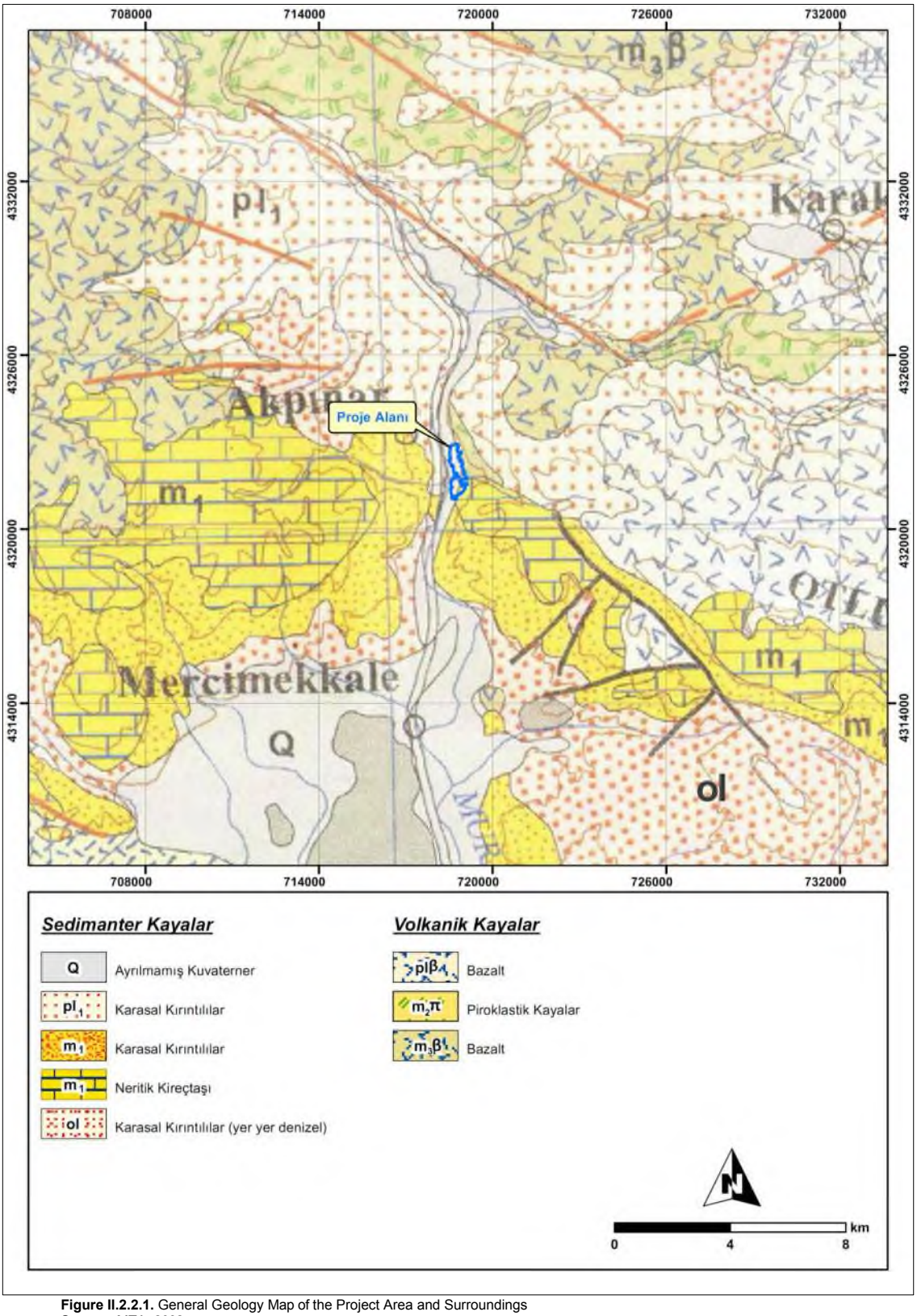



**Figure II.2.2.1.** General Geology Map of the Project Area and Surroundings
**Source:** MTA, 2002

## Project Area Geology

The SPP area is generally located on the Bezan Member of the Upper Miocene aged Zırnak Formation, the Zırnak Formation is observed in the vegetative soil storage area and east of the SPP Area, and the Lower Miocene aged Adilcevaz Formation is observed in the south.

The Geological Geotechnical Survey Report for the project area is given in Annex-18 and the report was approved by the Provincial Directorate of Environment, Urbanization and Climate Change on 01.12.2022 in accordance with the circular dated 28.09.2011 and numbered 102732.

In this context, in order to determine the geological-geotechnical properties of the ground in the activity area, 10 exploration pits with a depth of 5.00 m and 40 geotechnical boreholes with a depth of 15.00 m were drilled (Table II.2.2.1). Sandy gravelly clay units belonging to the Zırnak formation were identified in the foundation boreholes and exploration pits in the activity area.

The geologic units of the project area and its surroundings are described below u n d e r sub-headings from old to young. The strafigraphic section is presented in Figure II.2.2.2, the 1/25.000 scale geological map of the project area and its vicinity is presented in Figure II.2.2.3 and Annex-7.

**Stratigraphy**

**Oligocene**

**Mollakulac Stream Formation (Olm)**

The formation was first named as Mollakulac Creek Formation by Özcan (1967). Marl, calcarenite, sandstone, limestone, tuffaceous marl, tuffite, siltstone, volcanic clastic sandstone, agglomerate, mudstone rock units form the formation. It contains salt-gypsum-anhydrite, plant coal crumb and lava (basaltic andesite, andesite) interbeds. The formation is composed of units representing different depositional environments (terrestrial and marine) in the region. It is thin-medium layered and approximately 400-800 meters thick. It is compatible and transitional with the terrestrial units of the Memiskomu Formation.

Previous researchers (Mercier, 1948; Lahn, 1950; Altinli, 1966) mentioned the existence of marine Oligo-Miocene aged sediments in Eastern Anatolia. The fauna giving a definite age to the formation could not be determined. However, stratigraphically, it is thought that the clastic and evaporite units between the Upper Eocene aged terrestrial sediments and the Lower Miocene aged shallow marine limestones were mixed in the Oligocene.

**Lower Miocene**

**Adilcevaz Formation (Mia)**

The formation was first named as Adilcevaz limestone by Demirtasli and Pisoni (1965) and later as Adilcevaz formation by Akay et al. It is thought that it would be more accurate to name the unit at the formation level.

The formation consists of yellowish-gray, taupe colored, tuff-bearing reefal limestone, tuffite, calcarenite, sandstone and pebble interbeds. The limestones are solid and the thickness varies between 15-500 meters. It contains macrofossils and coral colonies. It is compatible and transitional with the Tanir Formation.

The age of the formation was determined as Burdigalian according to the fossils of Miogypslnoides cf. dehaarti Van Der Vlerk, Miogypsina cf. irregularis Michelotti, Amphistegina sp., Lithcthanrıiua sp. (det: Erdoğan İNAL; Sefer ÖRÇEN, 1989).

**Upper Miocene**

**Bezan Member (Mivzb)**

This member consists of marl, claystone, tuffaceous marl and tuffites. The dominant rock units are marl and claystone. It corresponds to the basal parts of the Zirnak Formation. It is thin-medium layered and approximately 500-600 m thick.

**Zirnak Formation (Mivz)**

The formation was named for the first time by Ilker (1966). It consists of marl, tuffite, tuffaceous marl, sandstone, pebble, siltstone, tuff, chert, travertine, clayey-fluffy limestone, calcarenite and lacustrine limestone rock stratigraphy units. Lenses and wedges of volcanic debris (tuff, lapilli, agglomerate), lava, coal intercalation lenses and wedges were observed in places. It is thin-medium layered and approximately 1000-1500 meters thick. Two members, Bezan and Zırnıkkale, were distinguished in this study (Tarhan, 1989a).The formation unconformably overlies the Middle Miocene aged Bingöl Mountain Group. Stratigraphically, its age is Upper Miocene.

**Kahkale Hill Lava (Mivsk)**

Its origin is the volcano of Bingol Mountain. Dark-black colored, compact, thick sections with cooling columns. They generally show a slab-like structure. The rock types of these lavas are basalt, basaltic andesite, andesitic basalt, andesite. Approximate thickness is 1-20 meters.

This member forms the most widespread lavas of the Solhan Formation; wedges, lenses and intercalations are commonly observed. In Kohkale and Koh Tepede (around Bingol Mountain volcano crater), it corresponds to the latest products of Bingol volcano in the Upper Miocene. It is observed in the form of a thick lava flow away from the crater rim. This lava was probably formed by partial melting of rocks of oceanic crustal origin.

**Quaternary**

**Alluvium (Qal)**

It consists of unconsolidated block, gravel, sand, sand, shale, clay and mud materials containing various rock fragments and fragments in river beds.

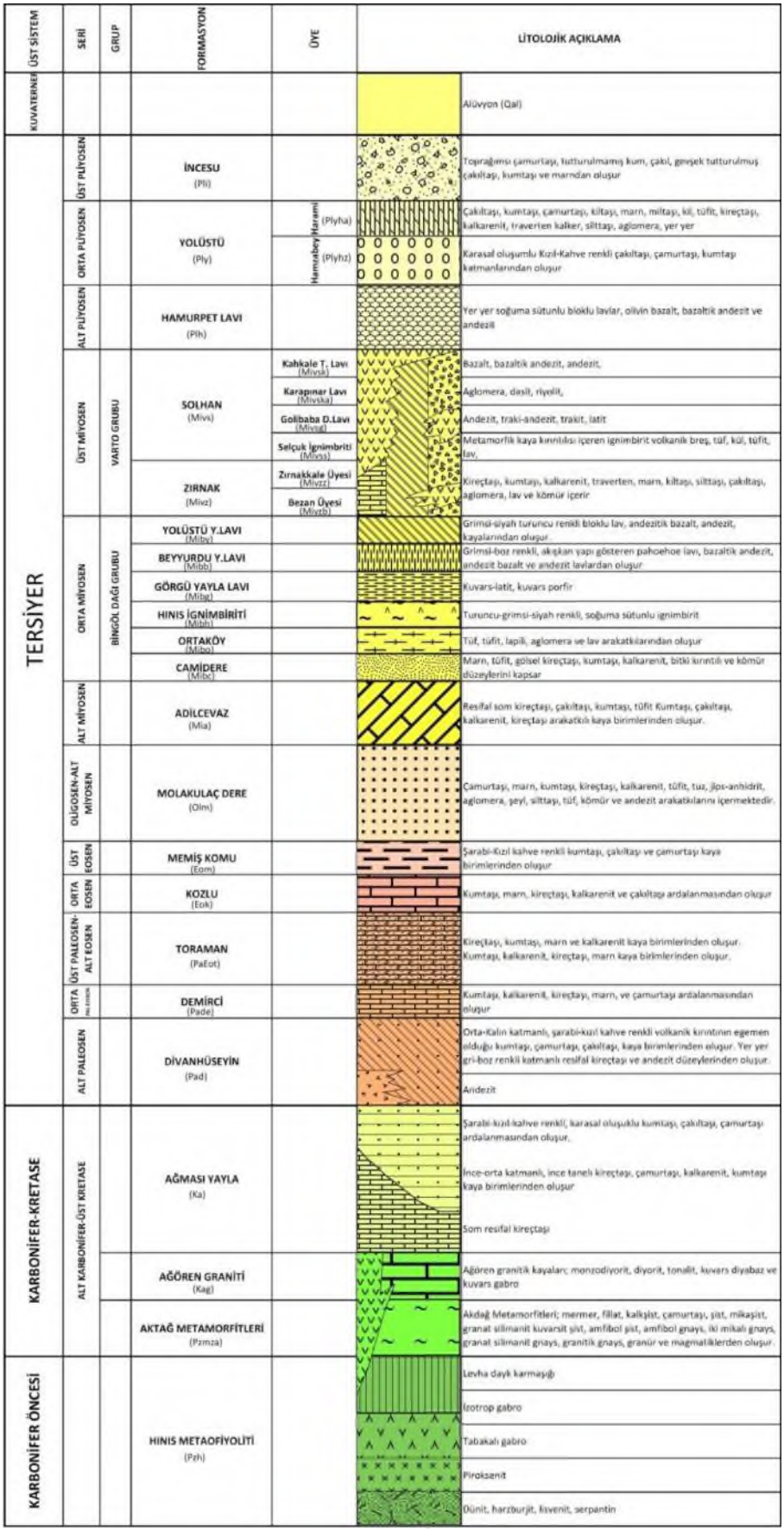



**Figure II.2.2.2.2.** Tectono-Stratigraphic Units of the Project Area and Surroundings
**Source :** MTA, 1990

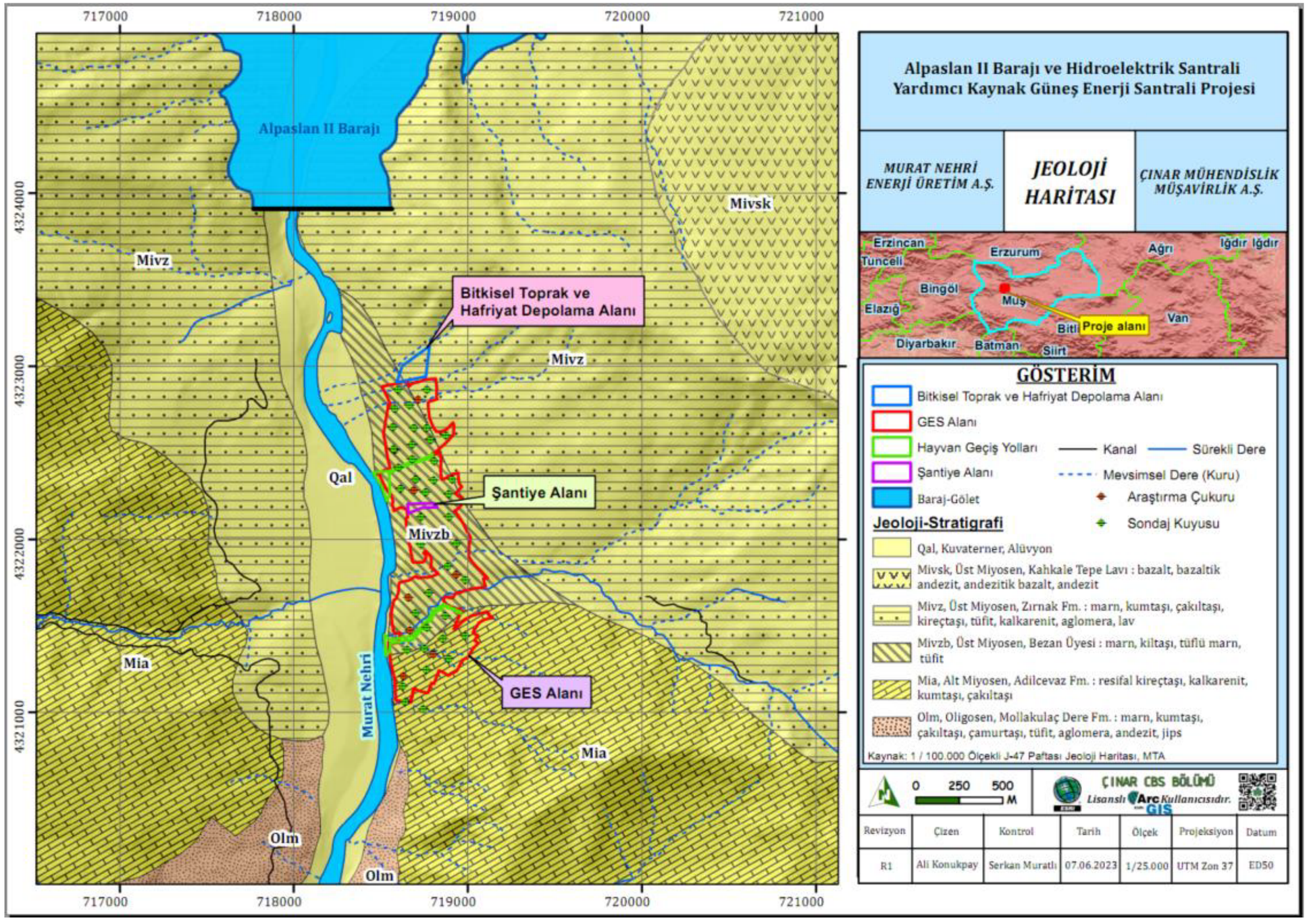



**Figure II.2.2.3.** 1/25000 Scale Geological Map of the Project Area and Surroundings
**Source :** Kandemir and Kanar, 2018

***Geological - Geotechnical Features***

The Geological Geotechnical Survey Report for the project area is given in Annex-18 and the report was approved by the Provincial Directorate of Environment, Urbanization and Climate Change on 01.12.2022 in accordance with the circular dated 28.09.2011 and numbered 102732.

In this context, 10 exploration pits with a depth of 5.00 m and 40 geotechnical boreholes with a depth of 15.00 m were drilled to determine the geological-geotechnical properties of the ground in the activity area (Table II.2.2.1).

In addition, within the scope of geological geotechnical studies, in-situ tests were carried out in soil borings and core samples were taken. Seismic refraction in 15 profiles, 15 Microtremor, 10 ERT and 15 DES studies were carried out to determine the dynamic elastic parameters of the soil and the dominant vibration period of the soil with laboratory experiments to determine the index-physical properties of the soil. The locations of geotechnical borings and exploration pits in the Project area are shown in Figure II.2.2.4.

**Table II.2.2.1.** Information on the Borings Conducted in the Project Area

| | | UTM ED50 6 Degrees | | WGS 84 | | |
|---|---|---|---|---|---|---|
| **Tip** | **Point Name** | **X** | **Y** | **Latitude** | **Longitude** | **Depth (m)** |
| **Research Pit** | **A-1** | 718581.944 | 4322519.395 | 39.022785 | 41.52474 | 5 |
| | **AÇ-2** | 718715.891 | 4322808.296 | 39.025353 | 41.52637 | 5 |
| | **A-3** | 718785.168 | 4322582.996 | 39.023307 | 41.5271 | 5 |
| | **A-4** | 718691.002 | 4322287.985 | 39.020675 | 41.52592 | 5 |
| | **A-5** | 718832.511 | 4322047.751 | 39.018477 | 41.52748 | 5 |
| | **A-6** | 718934.807 | 4321796.327 | 39.016188 | 41.52858 | 5 |
| | **A-7** | 718659.651 | 4321663.563 | 39.015061 | 41.52536 | 5 |
| | **A-8** | 718668.399 | 4321473.372 | 39.013347 | 41.5254 | 5 |
| | **A-9** | 718801.03 | 4321337.237 | 39.012088 | 41.52688 | 5 |
| | **A-10** | 718629.99 | 4321212.855 | 39.011011 | 41.52487 | 5 |
| **Drilling** | **SK-1** | 718744.825 | 4321022.504 | 39.009269 | 41.52614 | 15 |
| | **SK-2** | 718640.867 | 4321060.345 | 39.009635 | 41.52495 | 15 |
| | **SK-3** | 718625.422 | 4321152.602 | 39.01047 | 41.5248 | 15 |
| | **SK-4** | 718761.277 | 4321246.633 | 39.011282 | 41.5264 | 15 |
| | **SK-5** | 718891.708 | 4321312.694 | 39.011845 | 41.52792 | 15 |
| | **SK-6** | 718857.395 | 4321427.188 | 39.012884 | 41.52756 | 15 |
| | **SK-7** | 718984.99 | 4321442.234 | 39.012987 | 41.52904 | 15 |
| | **SK-8** | 718650.853 | 4321362.785 | 39.012356 | 41.52516 | 15 |
| | **SK-9** | 718700.792 | 4321574.312 | 39.014247 | 41.5258 | 15 |
| | **SK-10** | 718775.217 | 4321690.601 | 39.015276 | 41.5267 | 15 |
| | **SK-11** | 718986.29 | 4321767.701 | 39.015917 | 41.52916 | 15 |
| | **SK-12** | 718884.355 | 4321847.342 | 39.01666 | 41.52801 | 15 |
| | **SK-13** | 718936.417 | 4321976.53 | 39.01781 | 41.52865 | 15 |
| | **SK-14** | 718729.036 | 4321972.653 | 39.017826 | 41.52626 | 15 |
| | **SK-15** | 718808.417 | 4322037.524 | 39.018391 | 41.52719 | 15 |
| | **SK-16** | 718891.264 | 4322132.154 | 39.019222 | 41.52818 | 15 |
| | **SK-17** | 718731.31 | 4322128.36 | 39.019228 | 41.52633 | 15 |
| | **SK-18** | 718889.829 | 4322265.506 | 39.020423 | 41.52821 | 15 |

| | | UTM ED50 6 Degrees | | WGS 84 | | |
|---|---|---|---|---|---|---|
| **Tip** | **Point Name** | **X** | **Y** | **Latitude** | **Longitude** | **Depth (m)** |
| | **SK-19** | 718757.714 | 4322271.523 | 39.02051 | 41.52668 | 15 |
| | **SK-20** | 718613.168 | 4322294.916 | 39.020757 | 41.52502 | 15 |
| | **SK-21** | 718701.315 | 4322346.583 | 39.0212 | 41.52606 | 15 |
| | **SK-22** | 718908.885 | 4322347.838 | 39.021159 | 41.52845 | 15 |
| | **SK-23** | 718802.695 | 4322342.62 | 39.021139 | 41.52723 | 15 |
| | **SK-24** | 718807.464 | 4322451.85 | 39.022121 | 41.52732 | 15 |
| | **SK-25** | 718681.084 | 4322463.738 | 39.022259 | 41.52586 | 15 |
| | **SK-26** | 718601.157 | 4322415.399 | 39.021844 | 41.52492 | 15 |
| | **SK-27** | 718575.326 | 4322524.477 | 39.022833 | 41.52466 | 15 |
| | **SK-28** | 718681.895 | 4322551.462 | 39.023049 | 41.5259 | 15 |
| | **SK-29** | 718787.272 | 4322577.171 | 39.023254 | 41.52712 | 15 |
| | **SK-30** | 718872.591 | 4322599.337 | 39.023432 | 41.52812 | 15 |
| | **SK-31** | 718764.427 | 4322646.685 | 39.023886 | 41.52688 | 15 |
| | **SK-32** | 718691.28 | 4322647.634 | 39.023912 | 41.52604 | 15 |
| | **SK-33** | 718568.927 | 4322649.773 | 39.023962 | 41.52463 | 15 |
| | **SK-34** | 718580.192 | 4322757.605 | 39.02493 | 41.52479 | 15 |
| | **SK-35** | 718663.604 | 4322775.179 | 39.025068 | 41.52576 | 15 |
| | **SK-36** | 718765.909 | 4322867.635 | 39.025874 | 41.52697 | 15 |
| | **SK-37** | 718598.477 | 4322866.393 | 39.025905 | 41.52504 | 15 |
| | **SK-38** | 718766.698 | 4321489.085 | 39.013464 | 41.52654 | 15 |
| | **SK-39** | 718870.713 | 4321559.067 | 39.014068 | 41.52776 | 15 |
| | **SK-40** | 718751.563 | 4321370.82 | 39.012403 | 41.52632 | 15 |

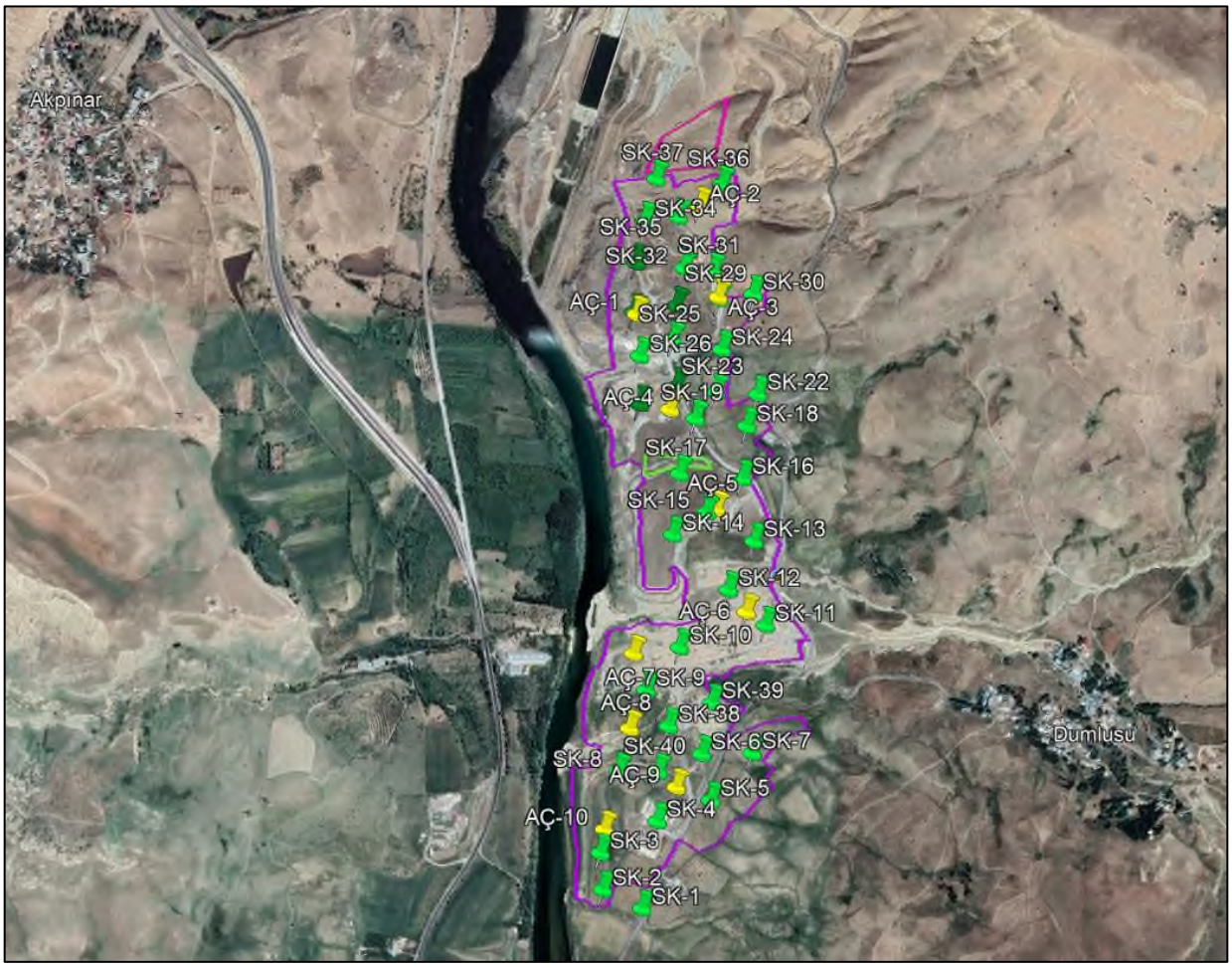



**Figure II.2.2.4.** Location Map of Geotechnical Borings and Research Pits

Sandy gravelly clay units belonging to the Zırnak formation were observed in the basic boreholes and exploration pits in the activity area and the geological sections representing the project area are given in Figure II.2.2.5.

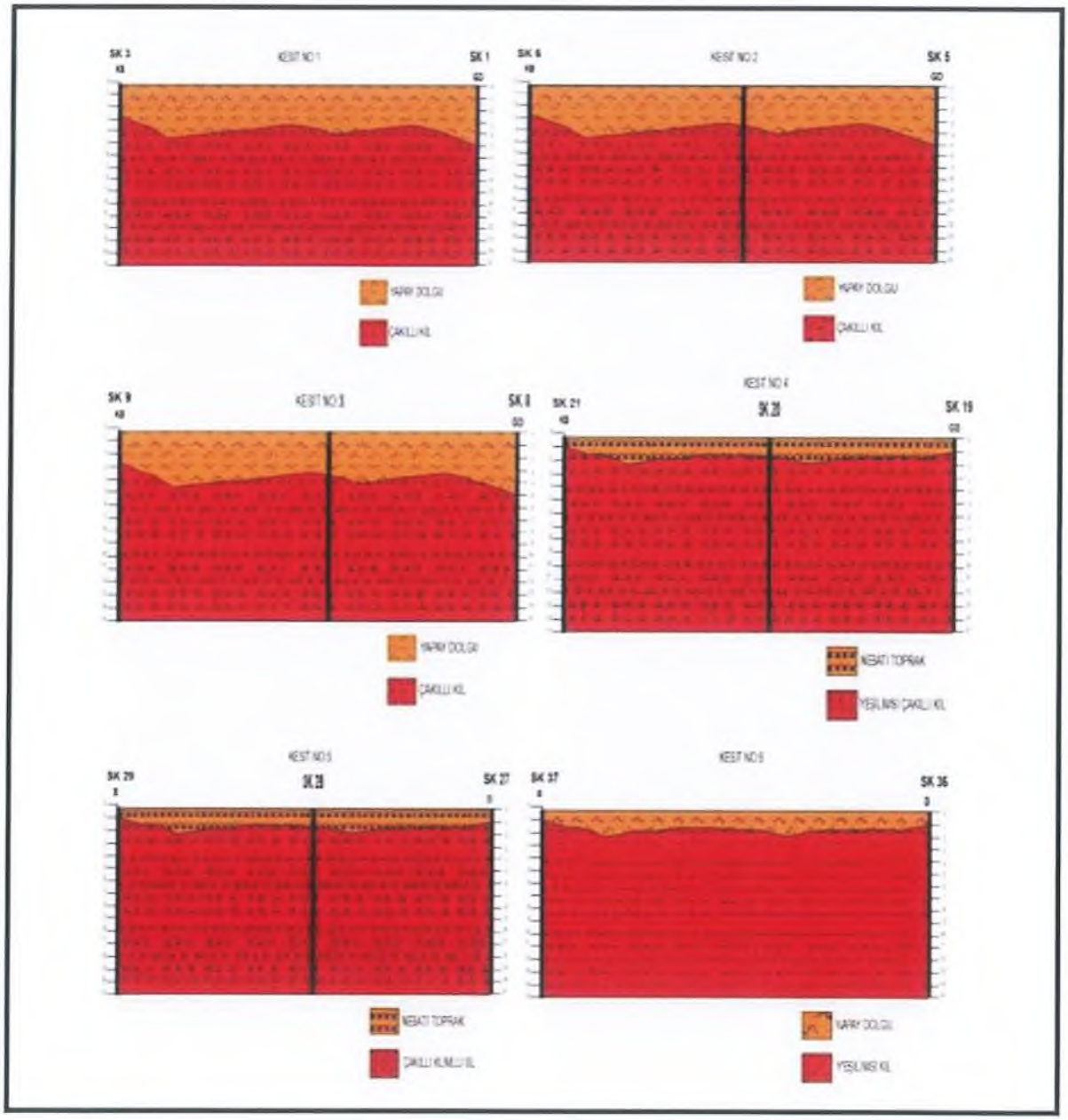



**Figure II.2.2.5.** Geological Sections of the Project Area

In addition, soil mechanics tests were performed on UD samples taken from borings 2, 8, 17, 38 in the project area and the results are given in Table II.2.2.2 and Table II.2.2.3.

**Table II.2.2.2.2.** Table of Soil Mechanics Tests (Triaxial Pressure Test)

| Sondaj No | Numune Tipi | Derinlik (m) | Doğal Birim Hacim Ağırlık (mg/m3) | Üç Eksenli Basınç(UU) | | Konsolidasyon | | Formasyon | Litoloji |
|---|---|---|---|---|---|---|---|---|---|
| | | | | C (kN/m2) | Ø (°) | Şişme Yüzdesi (%) | Şişme Basıncı (kgf/cm2) | | |
| SK-2 | UD | 4.50 | 1.65 | 0.36 | [illegible] | - | - | Tpiz-ZIRNAK FORMASYONU | İRİ ÇAKILLI KİL |
| SK-8 | UD | 4.50 | 1.61 | 0.36 | 4.24 | - | - | Tpiz-ZIRNAK FORMASYONU | KUMLU - ÇAKILLI KİL |
| SK-17 | UD | 4.50 | 1.62 | 0.37 | 4.21 | - | - | Tpiz-ZIRNAK FORMASYONU | ÇAKILLI KUMLU SİLT/KİL |
| SK-38 | UD | 4.50 | 1.63 | 0.40 | 4.20 | - | - | Tpiz-ZIRNAK FORMASYONU | AZ ÇAKILLI KİL |

**Table II.2.2.3.** Table of Soil Mechanics Tests (Point Loading Test)

| Sondaj No | Numune Tipi | Derinlik (m) | Nokta Yükl. Dayanımı Is(50) (kg/cm2) | Litoloji | Formasyon |
|---|---|---|---|---|---|
| SK-3 | Karot | 5 - 6.45 | 6.25 | KİREÇTAŞI - ÇAKILLI MARN | Tplz-ZIRNAK FORMASYONU |
| SK-3 | Karot | 9 - 9.45 | 5.84 | KİREÇTAŞI - ÇAKILLI MARN | Tplz-ZIRNAK FORMASYONU |
| SK-25 | Karot | 6 - 6.45 | 5.87 | PARÇALI BLOKLU KİREÇTAŞI | Tplz-ZIRNAK FORMASYONU |

In the project area, the soft vegetated soil forming the backfill soil will be removed and the foundations of the buildings will be placed and supported on homogeneous units of the Zırnak Formation underneath. No groundwater has been encountered in the Project area and liquefaction is not expected. The project area is located on sandy gravelly clay units belonging to the Zırnak Formation and detailed studies will be carried out if necessary against engineering problems in these units and ground improvement methods will be determined. Existing and construction slopes will not be left exposed and will be supported by appropriately designed retaining structures.

## II.2.3. Natural disaster status; mass movements (landslides, rockfalls, avalanches, floods, etc.), susceptibility analysis; landslide-precipitation relationship, slope stability, slip analysis; seismicity and earthquake risk; landslide risk map, large-scale direct fault map including the activity area and Turkey Earthquake Hazard Map,

In the opinion dated 01.12.2022 and numbered E-30753569-805.02.02.02.02-435026 dated 01.12.2022 given in Annex-2.13 of the Provincial Directorate of Disaster and Emergency of the Governorship of Muş for the project area, it is stated that the project area is not within the boundaries of AMB (Disaster-Prone Zone) according to the Integrated Disaster Maps (landslide, rockfall, avalanche susceptibility maps) and observational and archival information.

The Geological Geotechnical Investigation Report based on the Zoning Plan for the project area is given in Annex-18 and the said report was approved by the Provincial Directorate of Environment, Urbanization and Climate Change on 01.12.2022 in accordance with the circular dated 28.09.2011 and numbered 102732. In addition, as stated in the Geological Geotechnical Survey Report Based on the Zoning Plan, according to the observational field studies and archive records made by the technical personnel of the relevant Provincial Disaster and Emergency Directorate (AFAD) in the activity area; it has been determined that the project area is not within the boundaries of the Disaster-Prone Zone and according to the findings obtained from the observational field study, it has been determined that landslides, avalanches, floods and rockfalls do not pose a disaster risk in the ARAS (Disaster Risk Reduction System) system in areas with a slope of 25°-30°%.

**Landslides, rockfalls, avalanches, floods, etc.**

The SPP area is planned on the eastern border of the MURAT NEHRİ, which drains the region. There is one stream (Köy Dere) with a continuous flow through the planned area, entering from the eastern border of the area and exiting from the western border and discharging into the MURAT NEHRİ. Apart from this, there are no continuous streams passing through the planned activity areas, 2 streams pass through the northern part of the SPP Area, 1 stream passes just north of the construction site, 1 stream passes through the south of the construction site (Beyaz D.) and 1 seasonal dry stream passes through the southern part (Figure II.2.3.1).

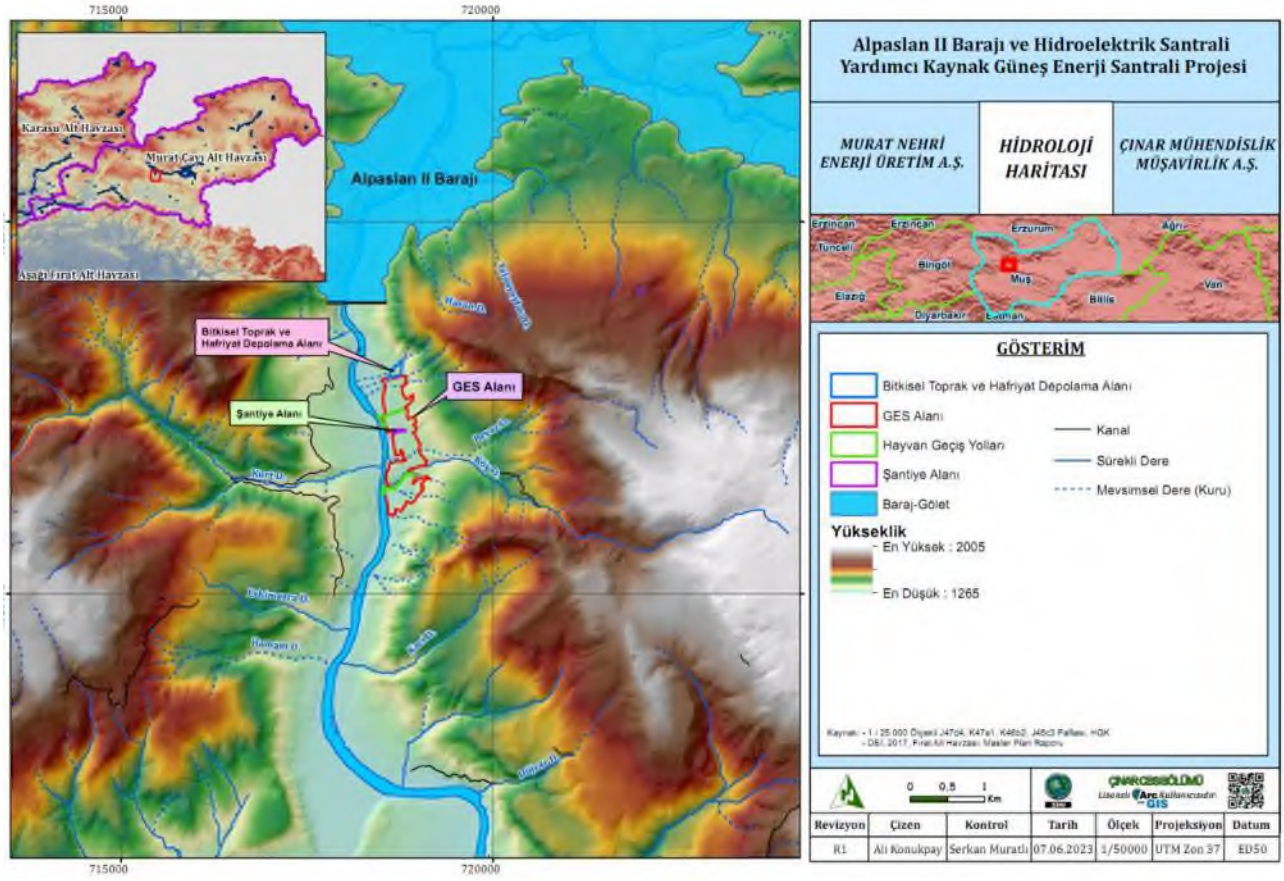



**Figure II.2.3.1.** Hydrology Map of the Project Area and Surroundings

In order to examine the status of mass movements in and around the project area, MTA General Directorate Earth Sciences Map Viewer (http://yerbilimleri.mta.gov.tr) was examined. Accordingly; there are no active and old landslide areas and mass movements such as crip, flow, slip etc. in the project area, and there are old and active landslide structures in the sloping areas around the project area (Figure II.2.3.2).

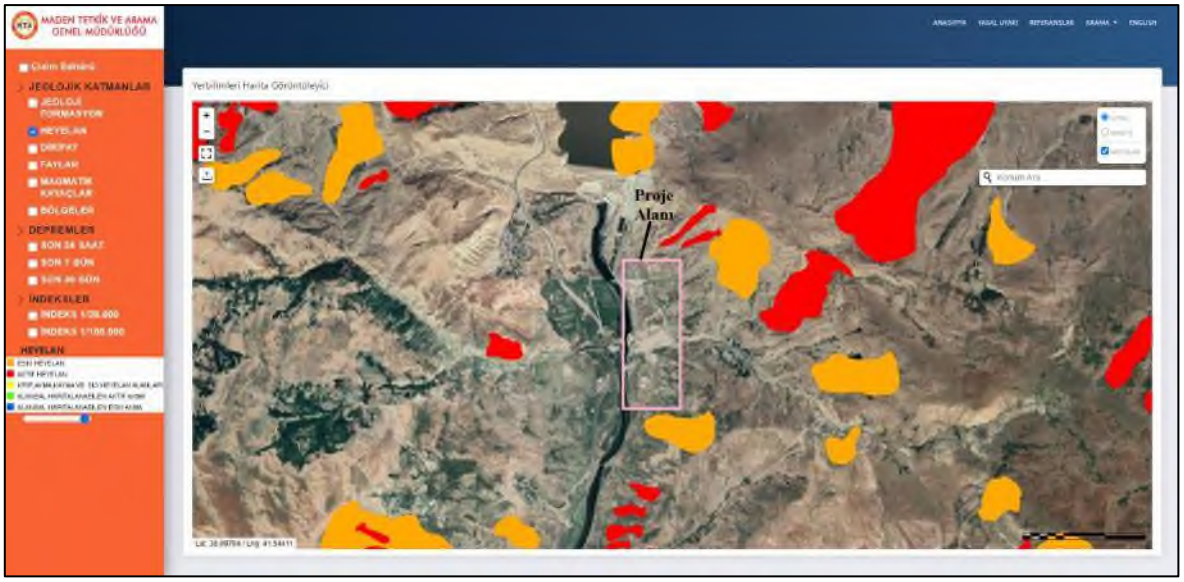



**Figure II.2.3.2.** Landslide Situation in and around the Project Area

All measures against environmental surface and flood waters that may occur in possible excessive rainfall will be taken by the owner of the activity, the flood level of the structures will be applied at a sufficient height from the natural ground level, DSİ will not be requested for damages and DSİ will not be held responsible for flood damages.

In the event that a road crossing is provided on the flowing and dry streams in the project area and its neighborhood, the necessary project design will be made in accordance with the principles of the Disaster Regulation for Highway Roadside Engineering Structures, and will be constructed in accordance with the scientific procedures and principles after obtaining a hydraulically appropriate opinion from the DSİ 17th Regional Directorate. The minimum culvert size applied in the flood control facilities constructed by DSİ is determined as 2 m x 2 m. The passage structures constructed in the form of multi compartment culverts are blocked due to the sediment and plant roots and branches dragged during floods, causing loss of life and property. For this reason, all works related to the streams will be within the permission of DSİ 17th Regional Directorate.

No waste material, solid or liquid waste, including those with seasonal flow, will be poured into the existing stream beds in the vicinity of the project site, the cross-sections will not be narrowed, the existing and cadastral width of the stream beds will be preserved, no excavation and filling will be carried out in the strip-like area of at least 20 meters from the slope tops on both banks of the streams, no waste, production waste, etc. from production activities will be placed in the stream beds and on the banks. The excavation residue material to be released in the area in question during the project activities and the transfer of the erosion residue to the stream beds will be prevented by the measures to be taken within the site.

For the streams in and around the project area, the provisions of the Prime Ministry Circular No. 2006/27 on "Stream Beds and Floods" published in the Official Gazette dated September 09, 2006 and numbered 26284 and the Flood and Sediment Control Regulation published in the Official Gazette dated 03.05.2019 and numbered 30763 shall be complied with.

**Tectonics**

The most important tectonic formation in the region is the intersection of the Eastern Anatolian Fault Zone (EAF) and the Northern Anatolian Fault Zone (NAF). In the eastern part of this intersection, referred to as the Karlıova triple junction (Şaroğlu, 1986), it was observed that the faults connected to the CAF system extend eastward by opening accordion-shaped to the south (by diverging from each other). In the eastern continuation of the Karlıova triple junction, these faults are observed to continue until Hamurpet Lake. These faults, which are the extensions of the North Anatolian Fault system, are cut at an acute angle by the faults connected to the East Anatolian Fault system around Hamurpet Lake.

In Eastern Anatolia, the fault systems related to the NW-SE trending North Anatolian and NE-SW trending East Anatolian zones cut each other at 50-60 degree acute angles in different regions, extending and spreading eastward as sheared zones; they have developed sheared areas such as the Karlıova triple intersection. However, it is observed that the Karlıova triple intersection is much clearer and more prominent than the others. As a matter of fact, Bingöl volcano, which erupted in the Middle and Upper Miocene, was active right next to this triple intersection. Therefore, the faults connected to the North Anatolian and East Anatolian Fault systems are active and will continue to be active with successive rhythmic movements and future re-movements.

From time to time developed with re mobilizations, they developed triple intersection shear points in different regions. For example, after an earthquake on the North Anatolian Fault zone due to the release of accumulated energy, energy will start to accumulate on the East Anatolian Fault zone. The development of the next earthquake will be caused by the release of the accumulated energy on this zone. In other words, large earthquakes in Eastern Anatolia usually develop as rhythmic repetitions on one North Anatolian Fault system and one East Anatolian Fault system at different time intervals following each other.

In Eastern Anatolia, the North Anatolian and Eastern Anatolian Fault zones are gradually increasing their extension towards the east and deeper and will become transform faults in the future.

Studies conducted in the region have revealed that the number and intensity of earthquakes are increasing every year, and the focal centers of earthquakes are increasing towards deeper depths. Therefore, it is inevitable that frequent earthquakes will occur in the region in the future.

The planned SPP area is located 14 km south of the Muş Fault Zone and 14 km east of the Kaynarca Fault Zone, which was opened in the Holocene. There is Varto Fault Zone 12.8 km to the north and Akdoğan Lake Fault 15 km to the north. All these tectonic formations are live faults. The fault map of the project area and its surroundings is given in Figure II.2.3.3.

*Mus Fault Zone :* It is a fault line formed by several faults running parallel to each other on the slopes surrounding the Muş Plain. It gains a thrust character towards the east of the plain. The fact that the parts forming this fault zone lie parallel to each other and in stages indicates that it also h a s a vertical throw. In the west of the Muş Plain, in the south-southwest of the antesedant strait where the MURAT NEHRİ opens into the plain (around Mercimekkale), the shifts observed in the streams on the slopes indicate that the faults have directional throw. The epicenters of the earthquakes that occurred in September 1363 and 2013 are located on this fault line.

*Varto Fault Zone :* This fault zone is located northwest of Muş province. The mechanism of the 1966 earthquake was reported by McKenzie (1972) to be a strike-slip fault with a thrust component. After the 1966 earthquake, it was stated that the fault was right-lateral in the field studies (Wallace 1985 cited in Şaroğlu 1985). The segments of this fault, which consists of three segments, are named as Varto, Leylekdağı and Çayçatı segments from north to south. The Varto segment in the north is a strike-slip right-lateralized fault extending in a NW-SE direction. The Leylek Dagasi segment and Çayçatı segment, on the other hand, show a strike-slip right-lateralized fault character with a thrust component.

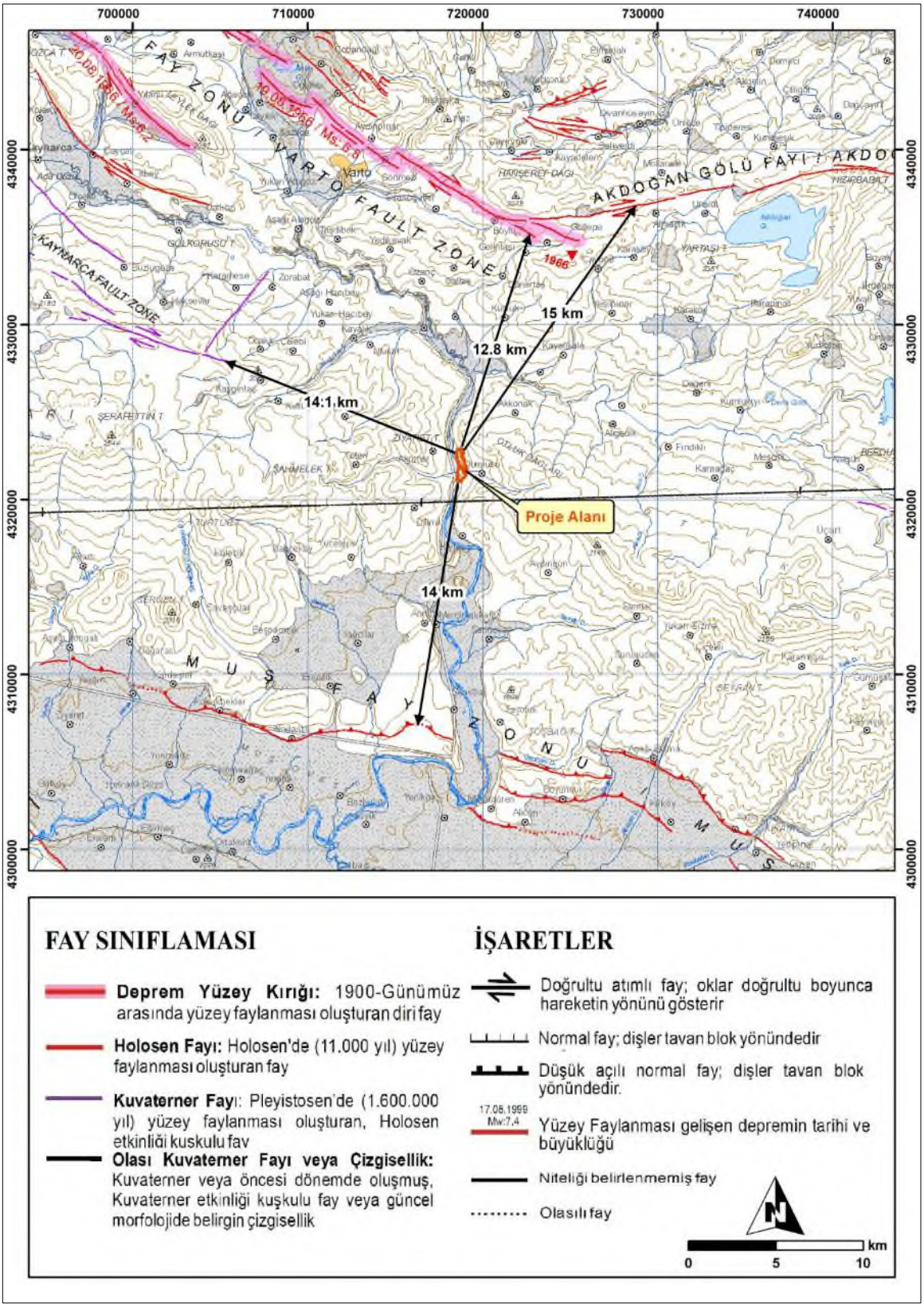



**Figure II.2.3.3.** Project Area and Surrounding Area Direct Fault Map
**Source**: NJ(37-4 / NJ 37-8) Plots, MTA, 2012

**Seismicity**

The revised "Earthquake Hazard Map of Turkey" published in the Official Gazette dated 18.03.2018 and numbered 30364 (repeated) and entered into force as of 01.01.2019 is given in Figure II.2.3.4 below and marked on the project area.

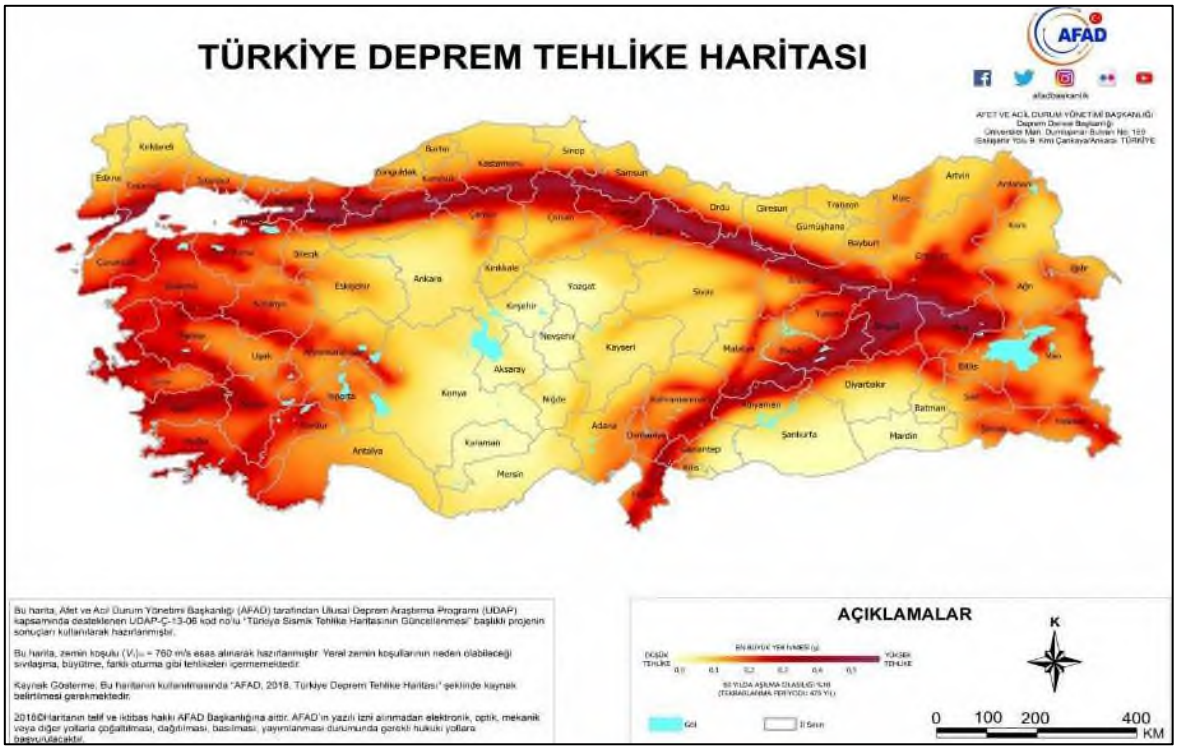



**Figure II.2.3.4.** Turkey Earthquake Hazard Map
**Source:** AFAD, 2018

The project area has been examined on the interactive earthquake hazard map published by AFAD and it has been determined that the maximum ground acceleration (PGA 475) for the 475 Year Recurrence Period is 0.626 g (Figure II.2.3.5).


**Figure II.2.3.5.** Maximum Ground Acceleration for 475 Year Recurrence Period for the Project Area
**Source:** AFAD, 2018

Earthquakes with magnitudes M≥4 f r o m 1900 to the present (2022) within a radius of 100 km, centered on the project area, are shown in Figure II.2.3.6.

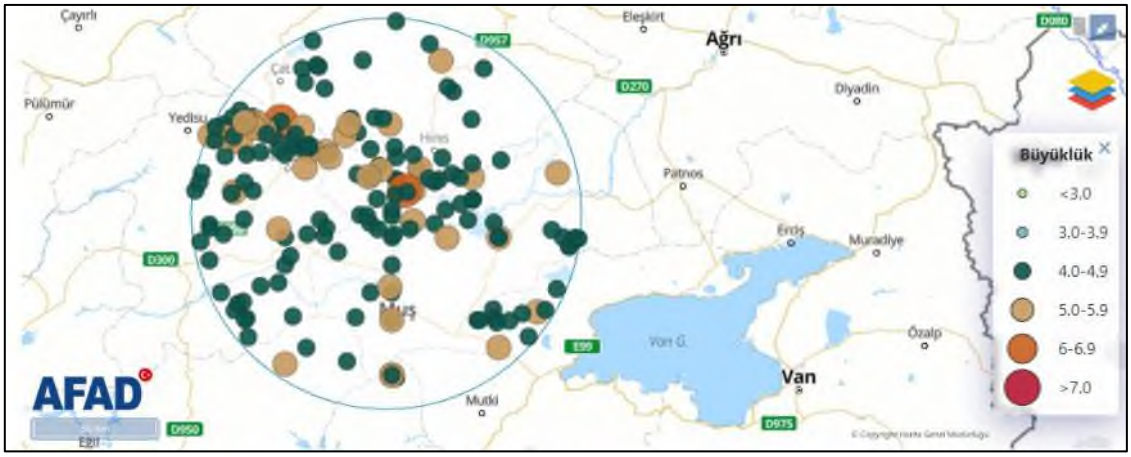



**Figure II.2.3.6.** M≥4 Earthquakes that occurred within a radius of 100 km from the center of the Project Area
**Source:** https://deprem.afad.gov.tr/depremkatalogu

**Table II.2.3.1.** M≥4 Earthquakes that occurred within a radius of 100 km from the center of the Project Area

| *Date/Time* | *Latitude* | *Longitude* | *Depth* | *Tip* | *Size* | *Location* |
|---|---|---|---|---|---|---|
| 02-08-2022 00:37:17 | 39,5388 | 41,1855 | 6,99 | Mw | 4,3 | Tekman (Erzurum) |
| 7.04.2021 08:47 | 38,6975 | 42,0508 | 11,15 | Mw | 4,2 | Korkut (Muş) |
| 25.02.2021 09:48 | 39,3190 | 41,0966 | 6,96 | Mw | 4,1 | Karliova (Bingöl) |
| 8.11.2020 09:22 | 39,3793 | 40,7516 | 9,15 | ML | 4,2 | Karliova (Bingöl) |
| 18.09.2020 00:15 | 38,6910 | 41,9913 | 13,14 | Mw | 4,2 | Korkut (Muş) |
| 16.09.2020 14:48 | 38,7058 | 41,981 | 17,8 | Mw | 4,7 | Korkut (Muş) |
| 9.09.2020 19:32 | 39,3291 | 41,0421 | 7 | Mw | 4,1 | Karliova (Bingöl) |
| 7.09.2020 08:47 | 38,7390 | 41,974 | 9,6 | Mw | 4,1 | Korkut (Muş) |
| 16.06.2020 12:57 | 39,3508 | 40,6721 | 7,2 | Mw | 4,3 | Yedisu (Bingöl) |
| 15.06.2020 06:51 | 39,3678 | 40,7435 | 7,1 | Mw | 5,6 | Karliova (Bingöl) |
| 14.06.2020 15:09 | 39,3668 | 40,7488 | 9,28 | Mw | 4,7 | Karliova (Bingöl) |
| 14.06.2020 14:34 | 39,3621 | 40,739 | 7,32 | Mw | 4,6 | Karliova (Bingöl) |
| 14.06.2020 14:24 | 39,3650 | 40,714 | 8 | Mw | 5,7 | Karliova (Bingöl) |
| 12.04.2020 06:38 | 39,3083 | 40,8841 | 19,94 | Mw | 4,3 | Karliova (Bingöl) |
| 21.06.2016 06:25 | 39,4001 | 40,675 | 18,29 | Mw | 4,1 | Yedisu (Bingöl) |
| 10.06.2016 18:57 | 39,0118 | 40,7121 | 12,81 | Mw | 4,5 | Merkez (Bingöl) |
| 30.10.2014 14:35 | 38,7235 | 42,1101 | 12,23 | Mw | 4,4 | Guroymak (Bitlis) |
| 28.09.2014 08:22 | 38,8356 | 40,9686 | 5,24 | Mw | 4,1 | Solhan (Bingöl) |
| 18.09.2013 18:22 | 39,6987 | 41,6773 | 11,24 | Ml | 4,3 | Tekman (Erzurum) |
| 17.09.2013 23:14 | 39,0798 | 41,3833 | 21.97 | Ml | 4.0 | Varto (Mus) |
| 17.09.2013 20:40 | 39,0516 | 41,3988 | 19,1 | Mw | 4,9 | Center (Muş) |
| 16.09.2013 10:31 | 39,0297 | 41,4348 | 19.46 | Ml | 4,5 | Center (Muş) |
| 15.05.2013 07:09 | 39,0063 | 41,1835 | 15.64 | Ml | 4,4 | Solhan (Bingöl) |
| 12.12.2012 07:52 | 39,3738 | 40,9137 | 14.84 | Ml | 4.0 | Karliova (Bingöl) |
| 4.04.2012 14:18 | 39,3475 | 41,0317 | 18.65 | Ml | 4,3 | Karliova (Bingöl) |
| 26.03.2012 10:35 | 39,2340 | 42,276 | 16.96 | Ml | 5.0 | Bulanık (Mus) |
| 17.11.2011 02:37 | 39,1645 | 41,5725 | 19.61 | Ml | 4,4 | Varto (Mus) |
| 23.10.2011 17:08 | 39,0273 | 42,2482 | 11,5 | Ml | 4.0 | Bulanık (Mus) |
| 22.02.2011 18:15 | 38,9658 | 42,3288 | 4,25 | Ml | 4,4 | Bulanık (Mus) |
| 22.02.2011 09:16 | 38,9960 | 42,3733 | 27,4 | Ml | 4,2 | Bulanık (Mus) |
| 22.02.2011 09:11 | 38,9868 | 42,3498 | 18,1 | Ml | 4,5 | Bulanık (Mus) |
| 22.02.2011 09:08 | 38,9992 | 42,3583 | 7,47 | Ml | 4,3 | Bulanık (Mus) |
| 22.02.2011 06:36 | 38,9712 | 42,3288 | 9,96 | Ml | 4,2 | Bulanık (Mus) |
| 22.05.2010 02:30 | 39,3360 | 41,1112 | 13.72 | Md | 4,2 | Karliova (Bingöl) |
| 11.04.2010 16:10 | 39,0662 | 40,8078 | 18.15 | Ml | 4,2 | Merkez (Bingöl) |
| 11.03.2009 17:26 | 39,0633 | 41,8563 | 30.65 | Ml | 4,3 | Varto (Mus) |
| 12.07.2008 05:54 | 39,2138 | 41,6732 | 24.24 | Md | 4.0 | Hınıs (Erzurum) |
| 21.06.2008 03:58 | 38,9480 | 41,2473 | 14.42 | Ml | 4,4 | Center (Muş) |
| 15.11.2007 04:11 | 39,0540 | 41,978 | 4,2 | Ml | 4.0 | Alpaslan Dam - [00.90 km] Bulanık (Muş) |
| 28.10.2007 22:00 | 39,0118 | 41,104 | 17.99 | Ml | 4,2 | Solhan (Bingöl) |
| 27.10.2007 04:02 | 39,3656 | 40,757 | 27.31 | Md | 4,2 | Karliova (Bingöl) |

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|---|---|---|---|---|---|---|
| 25.08.2007 22:05 | 39,2517 | 41,0935 | 23.88 | Ml | 5,5 | Karliova (Bingöl) |
| 5.05.2007 21:11 | 38,7367 | 42,218 | 5 | Ml | 4,4 | Ahlat (Bitlis) |
| 9.03.2007 01:13 | 39,3640 | 40,9498 | 5 | Ml | 4.0 | Karliova (Bingöl) |
| 1.11.2006 21:19 | 39,4347 | 40,7555 | 4,8 | Md | 4,8 | Çat (Erzurum) |
| 25.10.2006 22:00 | 39,0348 | 41,1933 | 8 | Md | 4,1 | Solhan (Bingöl) |
| 21.07.2006 22:01 | 39,4072 | 40,8175 | 8,46 | Md | 4,2 | Karliova (Bingöl) |
| 2.07.2006 19:39 | 39,4173 | 40,8471 | 15.26 | Md | 4,3 | Karliova (Bingöl) |
| 10.12.2005 00:09 | 39,3976 | 40,8547 | 18.94 | Md | 5,2 | Karliova (Bingöl) |
| 10.08.2005 08:58 | 39,0636 | 41,1627 | 7,42 | Md | 4,2 | Solhan (Bingöl) |
| 6.06.2005 07:41 | 39,3888 | 40,9038 | 10,5 | Md | 5,1 | Karliova (Bingöl) |
| 23.03.2005 21:44 | 39,4164 | 40,8094 | 12 | Md | 5,4 | Karliova (Bingöl) |
| 18.03.2005 12:42 | 39,4371 | 40,8457 | 10,5 | Md | 4.0 | Karliova (Bingöl) |
| 15.03.2005 20:31 | 39,3966 | 40,9341 | 2,74 | Md | 4,1 | Karliova (Bingöl) |
| 14.03.2005 04:58 | 39,3734 | 41,0492 | 15.58 | Md | 4,5 | Karliova (Bingöl) |
| 14.03.2005 01:55 | 39,4186 | 40,8183 | 9,95 | Md | 5,9 | Karliova (Bingöl) |
| 12.03.2005 07:36 | 39,4165 | 40,8672 | 7,2 | Md | 5,6 | Karliova (Bingöl) |
| 17.10.2002 00:53 | 39,1700 | 40,58 | 5,6 | Md | 4,2 | Adakli (Bingöl) |
| 29.05.2001 14:15 | 39,7800 | 41,52 | 10 | Md | 4,5 | Tekman (Erzurum) |
| 1.02.2000 19:45 | 39,1600 | 40,75 | 10,6 | Md | 4,1 | Karliova (Bingöl) |
| 1.03.1999 10:46 | 39,2000 | 40,81 | 10 | mb | 4.0 | Karliova (Bingöl) |
| 1.03.1999 10:46 | 39,4600 | 40,79 | 14,8 | Md | 4.0 | Çat (Erzurum) |
| 13.04.1998 15:14 | 39,3150 | 41,123 | 15 | Mw | 5,2 | Karliova (Bingöl) |
| 13.04.1998 15:14 | 39,2200 | 41,39 | 5,9 | Md | 5.0 | Varto (Mus) |
| 3.11.1997 08:46 | 38,8130 | 42,272 | 35 | mb | 4,3 | Ahlat (Bitlis) |
| 23.10.1997 16:06 | 38,7100 | 41,33 | 10 | mb | 4,1 | Center (Muş) |
| 26.09.1997 11:13 | 39,2290 | 41,3386 | 74 | mb | 4,1 | Varto (Mus) |
| 19.04.1997 11:00 | 39,0000 | 42,3 | 10 | mb | 4.0 | Bulanık (Mus) |
| 4.03.1997 14:23 | 39,2949 | 40,7192 | 46.1 | mb | 4,1 | Karliova (Bingöl) |
| 20.12.1996 08:09 | 38,9328 | 41,0249 | 30,4 | mb | 4.0 | Solhan (Bingöl) |
| 18.09.1996 05:16 | 39,6402 | 41,3646 | 15 | mb | 4,1 | Tekman (Erzurum) |
| 4.05.1996 08:19 | 39,5601 | 41,0929 | 40.9 | mb | 4,1 | Çat (Erzurum) |
| 3.07.1995 00:35 | 39,3254 | 41,1147 | 33 | mb | 4.0 | Karliova (Bingöl) |
| 3.07.1995 00:34 | 39,0811 | 41,3507 | 13 | mb | 4,3 | Varto (Mus) |
| 3.07.1995 00:34 | 39,0100 | 41,51 | 31 | Md | 4,4 | Center (Muş) |
| 29.10.1994 23:52 | 39,4101 | 40,715 | 1,3 | mb | 4,2 | Çat (Erzurum) |
| 27.11.1992 23:32 | 39,0000 | 41 | 11 | Md | 4.0 | Solhan (Bingöl) |
| 14.07.1992 18:46 | 39,2100 | 41,72 | 20 | Md | 4,4 | Hınıs (Erzurum) |
| 14.07.1992 18:46 | 39,2305 | 41,782 | 10 | mb | 4,5 | Hınıs (Erzurum) |
| 14.07.1992 04:26 | 39,0000 | 42 | 31 | Md | 5.0 | Bulanık (Mus) |
| 14.07.1992 04:26 | 39,2882 | 41,7369 | 46.6 | mb | 4,5 | Hınıs (Erzurum) |
| 5.09.1991 19:23 | 39,0310 | 41,5844 | 49 | mb | 4,2 | Center (Muş) |
| 24.04.1991 10:54 | 39,7100 | 41,13 | 29 | Md | 4,3 | Çat (Erzurum) |
| 24.04.1991 10:54 | 39,6170 | 41,158 | 35 | mb | 4,5 | Çat (Erzurum) |

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|---|---|---|---|---|---|---|
| 1.01.1991 02:14 | 39,2100 | 41,52 | 8 | Md | 4.0 | Varto (Mus) |
| 1.01.1991 02:14 | 39,2100 | 41,52 | 8 | Md | 4.0 | Varto (Mus) |
| 8.01.1989 07:07 | 38,7669 | 40,8036 | 10 | mb | 4,3 | Genc (Bingöl) |
| 1.01.1986 06:09 | 39,1210 | 41,823 | 35 | mb | 4,8 | Varto (Mus) |
| 27.08.1983 11:46 | 38,7136 | 41,037 | 10 | mb | 4,5 | Solhan (Bingöl) |
| 13.10.1982 03:51 | 39,1350 | 41,877 | 35 | mb | 4,7 | Bulanık (Mus) |
| 15.05.1982 05:09 | 39,5440 | 41,7615 | 10 | mb | 4,4 | Tekman (Erzurum) |
| 28.03.1982 01:34 | 39,1383 | 41,8794 | 10 | mb | 4,3 | Bulanık (Mus) |
| 27.03.1982 19:57 | 39,2180 | 41,877 | 35 | mb | 5,4 | Hınıs (Erzurum) |
| 23.03.1982 15:10 | 39,5272 | 41,7871 | 10 | mb | 4,6 | Tekman (Erzurum) |
| 23.03.1982 09:56 | 39,2165 | 41,8186 | 10 | mb | 4,5 | Hınıs (Erzurum) |
| 19.03.1982 23:14 | 39,2675 | 41,8755 | 33 | mb | 4,3 | Hınıs (Erzurum) |
| 11.04.1979 22:34 | 39,3272 | 41,5123 | 88.8 | mb | 4,5 | Hınıs (Erzurum) |
| 13.08.1978 17:20 | 39,3286 | 41,0724 | 127.9 | mb | 4,3 | Karliova (Bingöl) |
| 17.01.1978 00:09 | 39,4336 | 41,4203 | 139 | mb | 4,6 | Tekman (Erzurum) |
| 8.07.1977 18:59 | 39,6227 | 41,1477 | 52.9 | mb | 4,3 | Çat (Erzurum) |
| 12.10.1975 21:47 | 38,7010 | 40,8126 | 41.7 | mb | 4,2 | Genc (Bingöl) |
| 20.09.1975 15:53 | 38,7352 | 40,7642 | 69.8 | mb | 4,2 | Genc (Bingöl) |
| 19.09.1975 12:00 | 38,7065 | 40,8194 | 51.5 | mb | 4,4 | Genc (Bingöl) |
| 17.09.1975 09:12 | 38,7596 | 40,779 | 51.4 | mb | 4,4 | Genc (Bingöl) |
| 17.09.1975 00:14 | 38,6385 | 40,8275 | 28,7 | mb | 4,2 | Genc (Bingöl) |
| 7.09.1975 07:13 | 38,8000 | 40,7 | 58 | mb | 4.0 | Genc (Bingöl) |
| 29.07.1974 01:16 | 39,0470 | 40,6469 | 17,3 | mb | 4,2 | Merkez (Bingöl) |
| 24.05.1971 02:20 | 38,9848 | 40,6044 | 33 | mb | 4,6 | Merkez (Bingöl) |
| 22.05.1971 18:43 | 39,2340 | 40,6113 | 49.7 | mb | 4,4 | Adakli (Bingöl) |
| 22.05.1971 18:35 | 39,0330 | 40,,648 | 46.1 | mb | 4,7 | Merkez (Bingöl) |
| 22.05.1971 17:34 | 38,9171 | 40,6465 | 25,7 | mb | 4,7 | Merkez (Bingöl) |
| 21.04.1970 14:51 | 39,2200 | 41,4 | 28 | mb | 4,4 | Varto (Mus) |
| 10.09.1969 12:14 | 39,2440 | 41,448 | 35 | MS | 5,3 | Varto (Mus) |
| 23.07.1969 02:54 | 38,9000 | 41 | 169 | mb | 4,3 | Solhan (Bingöl) |
| 13.08.1968 04:40 | 39,4300 | 41,46 | 62 | mb | 4,5 | Hınıs (Erzurum) |
| 12.07.1968 13:42 | 39,1000 | 41,5 | 39 | mb | 4,2 | Varto (Mus) |
| 31.12.1967 03:28 | 39,0000 | 42 | 33 | MS | 4,3 | Bulanık (Mus) |
| 30.01.1967 12:25 | 39,4100 | 41,49 | 76 | MS | 5.0 | Hınıs (Erzurum) |
| 26.12.1966 04:21 | 38,8240 | 40,885 | 37.8 | mb | 4,7 | Genc (Bingöl) |
| 6.10.1966 07:48 | 39,1000 | 41,75 | 46 | mb | 4,5 | Varto (Mus) |
| 13.09.1966 20:23 | 39,1700 | 40,85 | 46 | mb | 4,5 | Karliova (Bingöl) |
| 31.08.1966 20:54 | 38,9000 | 41,5 | 131 | mb | 4,2 | Center (Muş) |
| 23.08.1966 01:35 | 39,3200 | 40,97 | 30 | mb | 4,6 | Karliova (Bingöl) |
| 22.08.1966 20:36 | 39,3200 | 41,4 | 40 | mb | 4,6 | Varto (Mus) |
| 21.08.1966 22:36 | 39,2600 | 41,44 | 22 | mb | 4,8 | Varto (Mus) |
| 21.08.1966 02:25 | 39,0800 | 41,5 | 69 | mb | 4,7 | Varto (Mus) |
| 21.08.1966 00:15 | 39,4270 | 41,873 | 35 | mb | 4,6 | Hınıs (Erzurum) |
| 20.08.1966 17:54 | 39,3000 | 40,82 | 70 | mb | 4,2 | Karliova (Bingöl) |

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|---|---|---|---|---|---|---|
| 20.08.1966 12:01 | 39,1650 | 40,762 | 18,7 | mb | 5,4 | Karliova (Bingöl) |
| 20.08.1966 11:59 | 39,4200 | 40,98 | 14 | MS | 6,2 | Karliova (Bingöl) |
| 20.08.1966 04:45 | 38,8200 | 41,49 | 47 | MS | 5.0 | Center (Muş) |
| 20.08.1966 02:13 | 39,3000 | 41,6 | 27 | mb | 4,8 | Hınıs (Erzurum) |
| 19.08.1966 21:42 | 38,8000 | 41,4 | 33 | mb | 4,5 | Center (Muş) |
| 19.08.1966 18:41 | 39154,0000 | 41,516 | 35 | mb | 4,7 | Varto (Mus) |
| 19.08.1966 14:17 | 39,3100 | 41,192 | 35 | mb | 5.0 | Varto (Mus) |
| 19.08.1966 14:03 | 39,2100 | 41,4 | 14 | mb | 4,7 | Varto (Mus) |
| 19.08.1966 13:54 | 38,9990 | 41,759 | 35 | mb | 5,2 | Center (Muş) |
| 19.08.1966 13:15 | 39,4100 | 41,3 | 62 | MS | 5,3 | Tekman (Erzurum) |
| 19.08.1966 12:22 | 39,1700 | 41,56 | 26 | MS | 6,9 | Varto (Mus) |
| 12.07.1966 00:04 | 39,2500 | 41,62 | 40 | mb | 4,5 | Varto (Mus) |
| 7.03.1966 01:16 | 39,1740 | 41602 | 35 | mb | 5,2 | Varto (Mus) |
| 31.08.1965 07:29 | 39,3460 | 40792 | 5,6 | mb | 5,1 | Karliova (Bingöl) |
| 31.08.1965 05:57 | 39,3000 | 41,2 | 33 | mb | 4,5 | Varto (Mus) |
| 3.09.1960 00:00 | 39,2900 | 41,52 | 70 | MS | 4,8 | Varto (Mus) |
| 22.08.1960 13:42 | 39,2800 | 42,01 | 60 | MS | 4,7 | Karachoban (Erzurum) |
| 9.08.1960 22:01 | 38,6000 | 41,1 | 66 | MS | 4,2 | Kulp (Diyarbakir) |
| 21.02.1960 09:29 | 38,4900 | 41,52 | 40 | MS | 4,8 | Sason (Batman) |
| 25.10.1959 15:57 | 39,2500 | 41,63 | 50 | MS | 5.0 | Hınıs (Erzurum) |
| 10.09.1959 13:59 | 39,6400 | 41,73 | 70 | MS | 5,3 | Tekman (Erzurum) |
| 29.08.1959 10:40 | 38,5500 | 41,29 | 50 | MS | 4,8 | Kulp (Diyarbakir) |
| 28.03.1954 04:47 | 39,0300 | 40,97 | 10 | MS | 5,4 | Solhan (Bingöl) |
| 27.03.1954 14:13 | 38,8000 | 41,5 | 10 | MS | 4,6 | Center (Muş) |
| 15.12.1953 18:25 | 39,0000 | 41,5 | 30 | MS | 4,6 | Center (Muş) |
| 15.12.1953 16:40 | 39,6100 | 41,08 | 40 | MS | 4,6 | Çat (Erzurum) |
| 14.10.1953 20:13 | 38,7000 | 41,9 | 30 | MS | 4,5 | Korkut (Muş) |
| 23.03.1953 05:22 | 39,3700 | 41,28 | 50 | MS | 5.0 | Tekman (Erzurum) |
| 27.08.1950 22:03 | 39,3800 | 41,34 | 60 | MS | 4,9 | Tekman (Erzurum) |
| 2.01.1950 21:15 | 39,3000 | 41 | 10 | MS | 4,9 | Karliova (Bingöl) |
| 23.08.1949 13:40 | 39,4200 | 40,98 | 10 | MS | 4,8 | Karliova (Bingöl) |
| 12.10.1948 12:57 | 38,5000 | 41,5 | 10 | MS | 4,6 | Sason (Batman) |
| 20.06.1948 14:58 | 39,1400 | 41,43 | 30 | MS | 4,8 | Varto (Mus) |
| 19.05.1948 17:52 | 39,4300 | 41,31 | 20 | MS | 4,6 | Tekman (Erzurum) |
| 31.05.1946 03:12 | 39,2900 | 41,21 | 60 | MS | 5,9 | Varto (Mus) |
| 23.03.1936 19:46 | 39,0000 | 42 | 10 | MS | 4,5 | Bulanık (Mus) |
| 14.10.1935 07:27 | 39,2000 | 40,6 | 10 | MS | 4,6 | Adakli (Bingöl) |
| 12.11.1934 07:19 | 38,5400 | 41 | 50 | MS | 5,9 | Kulp (Diyarbakir) |
| 28.02.1915 12:48 | 38,5000 | 41,5 | 10 | MS | 5,2 | Sason (Batman) |
| 14.02.1915 08:19 | 38,5000 | 41,5 | 10 | MS | 5,5 | Sason (Batman) |
| 9.12.1913 02:30 | 39,4000 | 41,08 | 10 | MS | 5,2 | Karliova (Bingöl) |
| 27.01.1913 19:39 | 39,0600 | 41,6 | 10 | MS | 5,6 | Varto (Mus) |
| 24.03.1911 00:00 | 39,2000 | 41,7 | 10 | MS | 4,1 | Hınıs (Erzurum) |
| 19.11.1909 17:03 | 38,7000 | 41,91 | 10 | MS | 4,5 | Korkut (Muş) |

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|---|---|---|---|---|---|---|
| 5.03.1909 12:17 | 39,3700 | 40,65 | 10 | MS | 5.0 | Yedisu (Bingöl) |
| 3.06.1907 06:46 | 38,7000 | 41,5 | 10 | MS | 5.0 | Center (Muş) |
| 29.03.1907 07:37 | 38,6000 | 42 | 10 | MS | 5.0 | Guroymak (Bitlis) |
| 24.01.1907 03:38 | 38,6400 | 42,14 | 10 | MS | 4,1 | Guroymak (Bitlis) |
| 30.10.1903 00:00 | 39,0500 | 41,7 | 10 | MS | 4,5 | Varto (Mus) |
| 13.08.1903 04:48 | 38,7300 | 42,18 | 10 | MS | 5,2 | Ahlat (Bitlis) |
| 7.08.1903 00:00 | 39,6100 | 41,93 | 10 | MS | 4,7 | Karayazı (Erzurum) |
| 3.05.1903 00:00 | 38,7000 | 41,5 | 10 | MS | 4,9 | Center (Muş) |

**Source:** https://deprem.afad.gov.tr/depremkatalogu

*Varto (Muş) Earthquake (19.08.1966, Ms:6.9)*

On August 19, 1966, at 14:22:10, Varto, which had been shaken by earthquakes on March 7 and July 11, 1966, was hit by an earthquake that lasted for about 20 seconds. In Varto, 2,101 people lost their lives and 1,246 were injured. Together with the deaths in the districts and villages of other cities
2,517 people lost their lives, 1,420 people were injured and 20,007 houses were destroyed or severely damaged.

In the structures to be constructed within the scope of the project, the principles of the "Regulation on Structures to be Built in Disaster Zones" published in the Official Gazette dated 14/07/2007 and numbered 26582 by the Ministry of Public Works and Settlement and the provisions of the "Turkey Building Earthquake Regulation" of the Disaster and Emergency Management Presidency, which was published in the Official Gazette dated 18.03.2018 and numbered 30364 and entered into force on 01.01.2019.

### II.2.4. Hydrological and hydrogeological characteristics of surface and underground water resources, current and planned use, distances to the activity area, hydrological and hydrogeological maps,

*Hydrological Features and Surface Waters*

The project area is located within the Murat Stream Sub-basin of the Euphrates Basin, one of the water basins allocated throughout Turkey (DSİ, 2017).

*Euphrates Basin* The Euphrates Basin is the largest water basin of Turkey with a surface area of 127,304 $km^2$ and an average elevation of 1009.87 m. The average precipitation falling in the Euphrates Basin is 540.1 mm/year and the average annual flow is 31.61 $km^3$ , making it the largest basin of Turkey in terms of average annual flow. There are 19 large dams in the basin. Among these dams, Atatürk Dam stands out in terms of the volume of water it collects, and Keban and Karakaya Dams stand out in terms of body height.

*Murat Stream Sub-Basin:* Murat Stream Sub-basin, one of the 4 sub-basins of the Euphrates Sub-basin, covers an area of 25.839 $km^2$ . The Murat Sub-basin is located north-north-east of the Euphrates Sub-basin between 29°38'-33°14' east longitude and 41°09'-37°56' north latitude and covers the lands belonging to the provinces of Ağrı, Muş, Bingöl, Tunceli, Elazığ and Erzurum. The sub-basin, which covers a large part of Eastern Anatolia and Southeastern Anatolia, is topographically characterized by a high plateau. This plateau is fragmented in the direction of Murat Stream by wide and deep valleys developed by the rivers originating from the basin. The topography of the basin is generally shaped by geological structure and tectonism. There is no significant groundwater use in the sub-basin, which has a rich surface water potential. The uses in the basin are generally for drinking water purposes (DSİ, 2017).

The Project area is planned as an auxiliary source to the operational Alpaslan II Dam, which is an asphalt core rock-alluvial embankment for electricity generation. Alpaslan II Dam is located approximately 700 m -1 km north of the planned SPP area.

The SPP area is planned on the eastern border of the MURAT NEHRİ, which drains the region. There is one stream (Köy Dere) with a continuous flow through the planned area, entering from the eastern border of the area and exiting from the western border and discharging into the MURAT NEHRİ. Apart from this, there are no continuous streams passing through the planned activity areas, 2 streams pass through the northern part of the SPP Area, 1 stream passes just north of the construction site, 1 stream passes through the south of the construction site (Beyaz D.) and 1 seasonal dry stream passes through the southern part.

The Hydrology Map of the Project area is given in Figure II.2.4.1.

MURAT NEHRİ, one of the two main branches of the Euphrates River in Eastern Anatolia, covers the provinces of Elazığ, Muş and Bingöl. The total length of the river is 500 km and its length within the provincial borders (Muş) is 205 km. MURAT NEHRİ receives Banşan stream in the west of Malazgirt, Hınıs stream in the Bulanık plain and Liz stream at the end of Liz plain. It flows westward and passes through the narrow Manahik strait. It merges with Bingöl (Çarbuhur) stream near Tepeköy near Varto and flows in north-south direction and enters Muş plain. Taking its Karasu branch in the Muş plain, the MURAT NEHRİ enters the narrow Palu gorge. The river, which draws the northern border of the Elazığ plain, flows westward and takes the Munzur water, which is formed by the combination of Mercan, Kalan, Pülümür and Peri streams, and reaches the Keban region. It receives the tributary of Karasu Stream north of Keban. The average flow rate of the stream used for drinking, irrigation and energy production is 3218.85 $^{m3/sec}$ (DSİ,2020; DSİ,2017)

The SPP area is not located within the absolute and short-distance protection areas of any in-continental surface water source from which drinking and utility water is supplied. In addition, there are no swamps, wetlands or lakes within the SPP area.

*Hydrogeologic Properties and Groundwater*

The project area is located within the borders of Varto Plain within the plain areas divided by DSİ within the Murat Stream Sub-Basin. The drainage area of Varto Plain is 2.824 $^{km2}$ and there is no significant plain opening. There is no significant groundwater use in the plain (DSİ, 2017).

The SPP Area is generally located on the Bezan Member of the Upper Miocene aged Zırnak Formation, the Zırnak Formation is observed in the vegetative soil storage area and east of the SPP Area, and the Lower Miocene aged Adilcevaz Formation is observed in the south.

"Geological-Geotechnical Investigation Report Based on Zoning Plan for Alpaslan II Dam and HEPP Auxiliary Source SPP Project in Dumlusu Village, Central District of Muş Province" has been prepared for the SPP Area and within the scope of the said report, 10 exploration pits, each 5.00 m deep, and 40 soil boring wells, each 15.00 m deep, have been drilled. Clay units were observed in these wells. It was stated that no groundwater was encountered at a depth of 15 m in the geotechnical borings carried out in the Project area.

There are no groundwater reserves defined for this sub-basin in the DSİ records, and the Quaternary aged alluvial units located to the west of the project area, as in the plain, are considered as units providing moderate local groundwater. The Upper Miocene aged Kahkale Tepe Lava consisting of basalt and andesite, Zırnak Formation consisting of marl, sandstone, pebble, limestone, tuffite, calcarenite, agglomerate and lava, Adilcevaz Formation consisting of limestone, calcarenite, sandstone and pebble and marl, The Mollakulaç Dere Formation consisting of sandstone, pebble, mudstone, tuffite, agglomerate, andesite and gypsum was evaluated as units that provide moderately efficient local groundwater from fracture-crack structures with their permeable levels. Bezan member consisting of marl, claystone and tuffite is considered as impermeable.

There are no groundwater wells or springs in the Project area, and there are low flow rate springs with seasonal flow in the region.

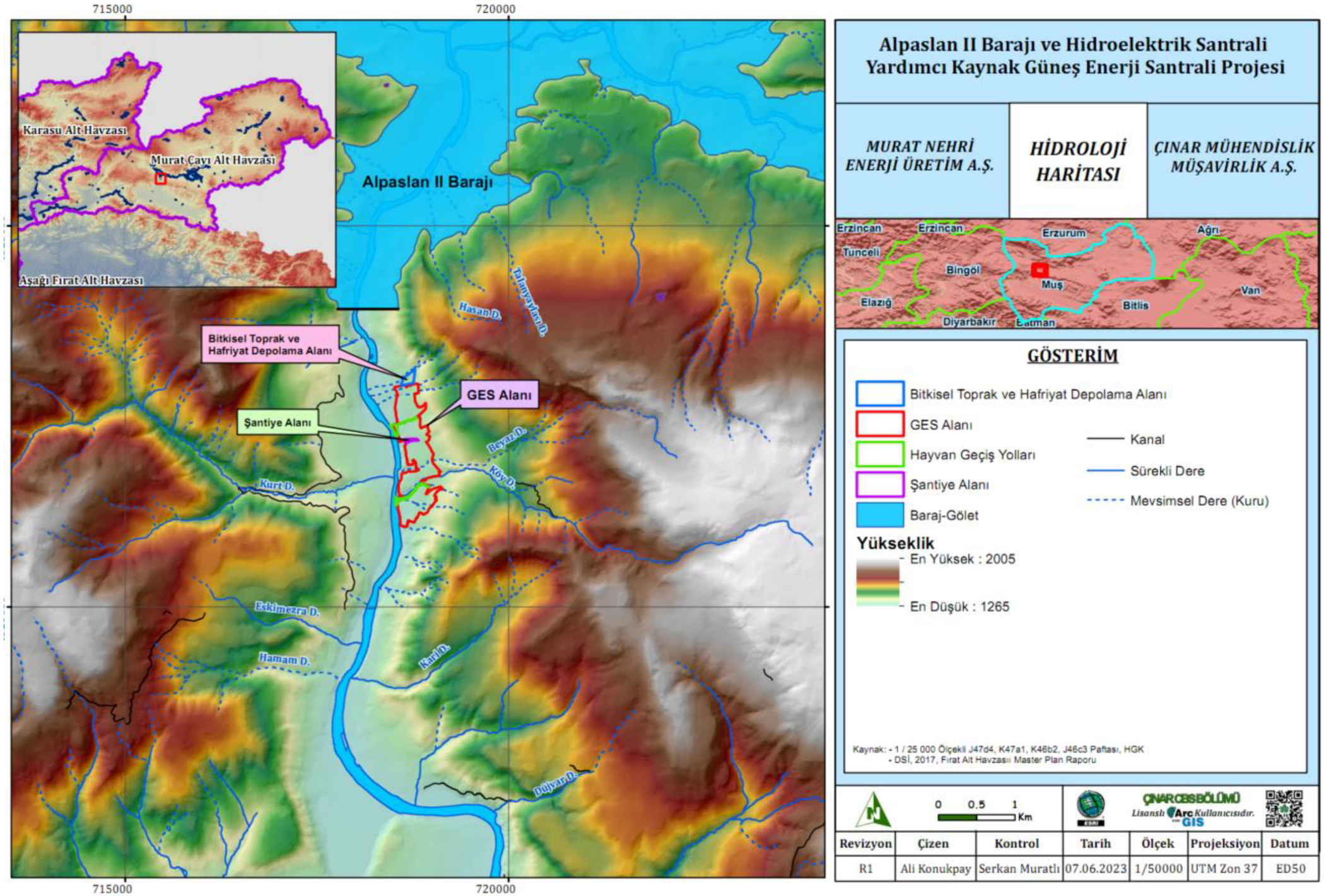
When the operation phase is started in the activity area, water samples will be taken from the nearest groundwater; water sources, water boreholes, fountains, capacities, etc. in the project impact area and necessary analyzes will be carried out, the results of the analysis will be accepted as reference and will be repeated for control purposes in 3-month periods and any changes in groundwater quality will be monitored and reported to the relevant Van DSİ 17th Regional Directorate. All measures will be taken to ensure that groundwater resources (springs, boreholes, etc.) are not adversely affected in terms of quantity and quality.

Within the scope of the Project, the Law No. 167 on Groundwater and the "Regulation on the Protection of Groundwater against Pollution and Degradation" published in the Official Gazette dated April 07, 2012 and numbered 28257 are in force within the framework of the protection of groundwater and resources,
The provisions of the "Communiqué on Determination of Protection Areas of Aquifers and Springs Supplying Drinking Water" dated October 10, 2012 and numbered 28437 and all applicable legislation within the framework of groundwater protection will be complied with.

In case of any negativity towards water resources, boreholes, fountains, capacities, etc., operation activities will be stopped, all damages will be covered by the company and all necessary actions will be taken in line with DSİ directives.

The Project will comply with the provisions of the "Law on Groundwater" and the "Regulation on the Protection of Groundwater against Pollution and Degradation".

The 1/25.000 scale Hydrogeology Map of the Project area is given in Figure II.2.4.2 and hydrogeological sections are given in Figure II.2.4.3.


715000
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Karasu Alt Havzası
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Eskimezra D.
Hamam D.
Karıl D.
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Tunceli
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Hayvan Geçiş Yolları
Şantiye Alanı
Baraj-Gölet
Kanal
Sürekli Dere
Mevsimsel Dere (Kuru)
Yükseklik
En Yüksek : 2005
En Düşük : 1265
Kaynak: - 1 / 25 000 Ölçekli J47d4, K47a1, K46b2, J46c3 Paftası, HGK
- DSİ, 2017, Fırat Alt Havzası Master Plan Raporu
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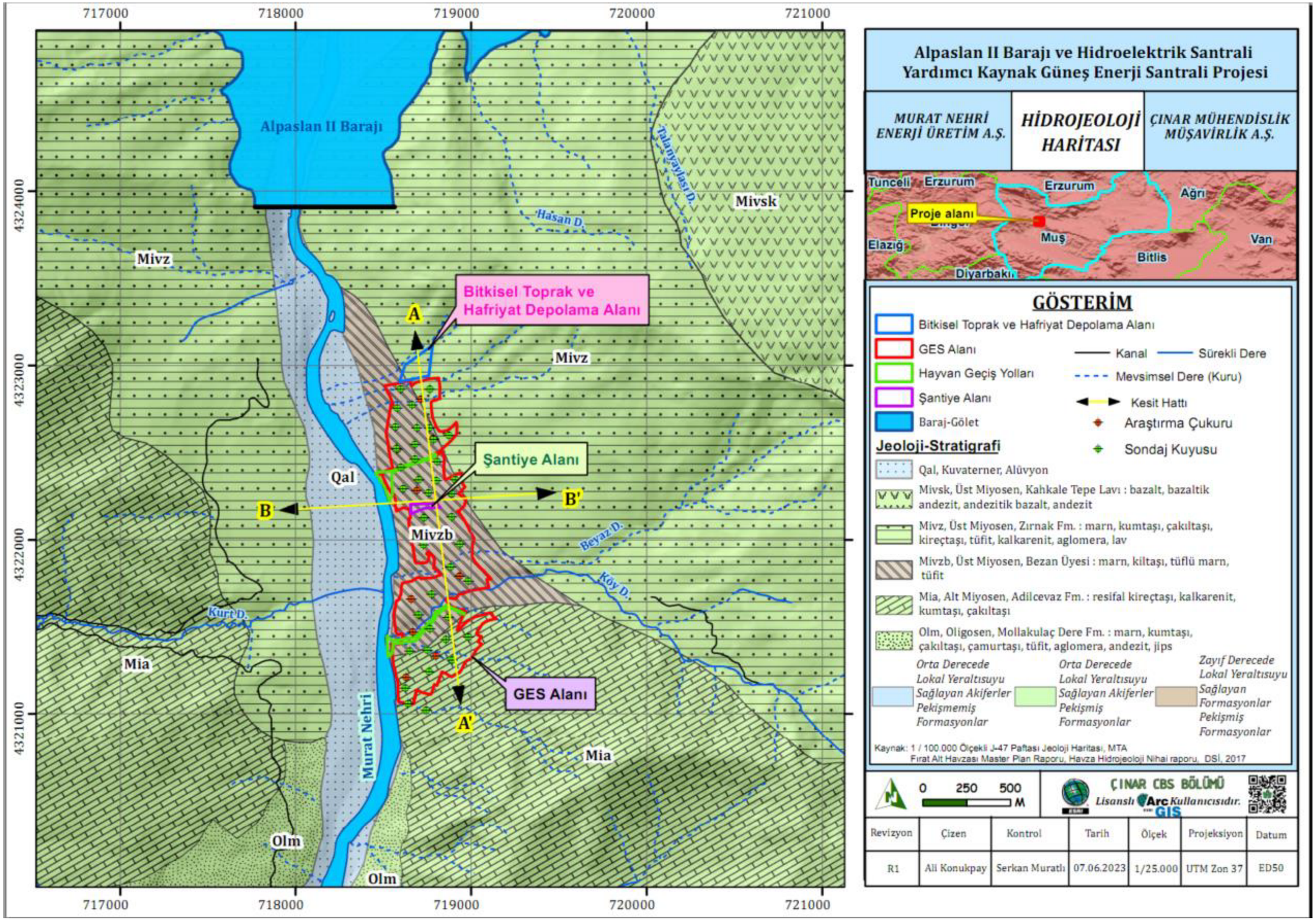
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Tunceli
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Ağrı
Proje alanı
Elazığ
Muş
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Bitlis
Diyarbakır
GÖSTERİM
Bitkisel Toprak ve Hafriyat Depolama Alanı
GES Alanı
Hayvan Geçiş Yolları
Şantiye Alanı
Baraj-Gölet
Kanal
Sürekli Dere
Mevsimsel Dere (Kuru)
Kesit Hattı
Araştırma Çukuru
Sondaj Kuyusu
Jeoloji-Stratigrafi
Qal, Kuvaterner, Alüvyon
Mivsk, Üst Miyosen, Kahkale Tepe Lavı : bazalt, bazaltik andezit, andezitik bazalt, andezit
Mivz, Üst Miyosen, Zırnak Fm. : marn, kumtaşı, çakıltaşı, kireçtaşı, tüfit, kalkarenit, aglomera, lav
Mivzb, Üst Miyosen, Bezan Üyesi : marn, kiltaşı, tüflü marn, tüfit
Mia, Alt Miyosen, Adilcevaz Fm. : resifal kireçtaşı, kalkarenit, kumtaşı, çakıltaşı
Olm, Oligosen, Mollakulaç Dere Fm. : marn, kumtaşı, çakıltaşı, çamurtaşı, tüfit, aglomera, andezit, jips
Orta Derecede Lokal Yeraltısuyu Sağlayan Akiferler Pekişmemiş Formasyonlar
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Kaynak: 1 / 100.000 Ölçekli J-47 Paftası Jeoloji Haritası, MTA
Fırat Alt Havzası Master Plan Raporu, Havza Hidrojeoloji Nihai raporu, DSİ, 2017
0 250 500 M
ÇINAR CBS BÖLÜMÜ
Lisanslı ArcGIS Kullanıcısıdır.
Revizyon
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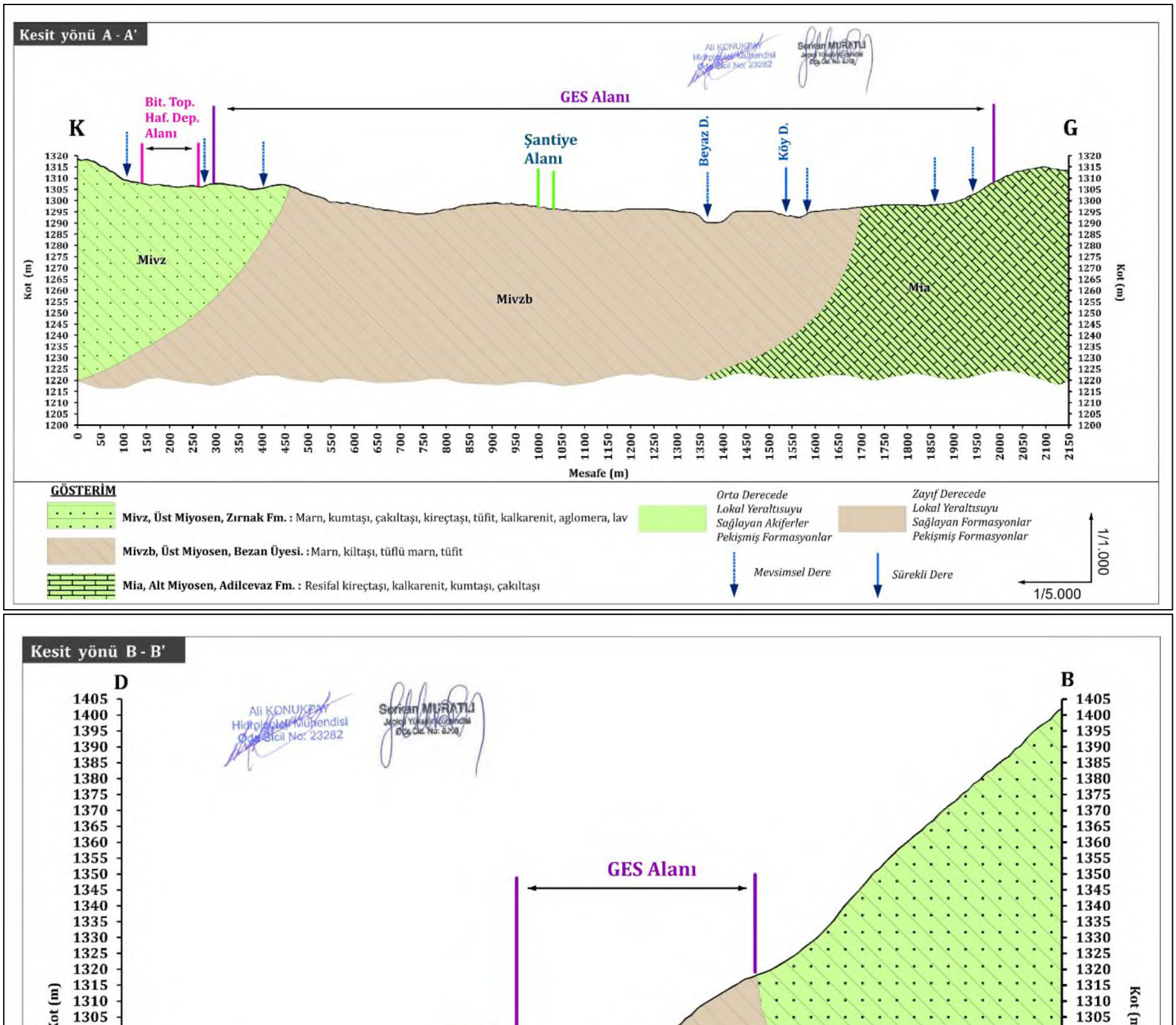


**Figure II.2.4.3.** Hydrogeological Sections

## II.2.5. Soil characteristics and utilization status (land use capability classification of soil, erosion status, current utilization status of soil, etc.),

### Land Classification of Muş Province

Approximately 52% of the land cover distribution of Muş province, where the Project area is located, consists of agricultural areas, 44% of forest and semi-natural areas, 2% of artificial areas and 2% of water bodies. According to the Ministry of Agriculture and Forestry Land Monitoring Corine 2018 data, the land use data graph of Muş province is given in Figure II.2.5.1. and the land use data between 1990-2018 is given in Table II.2.5.1.

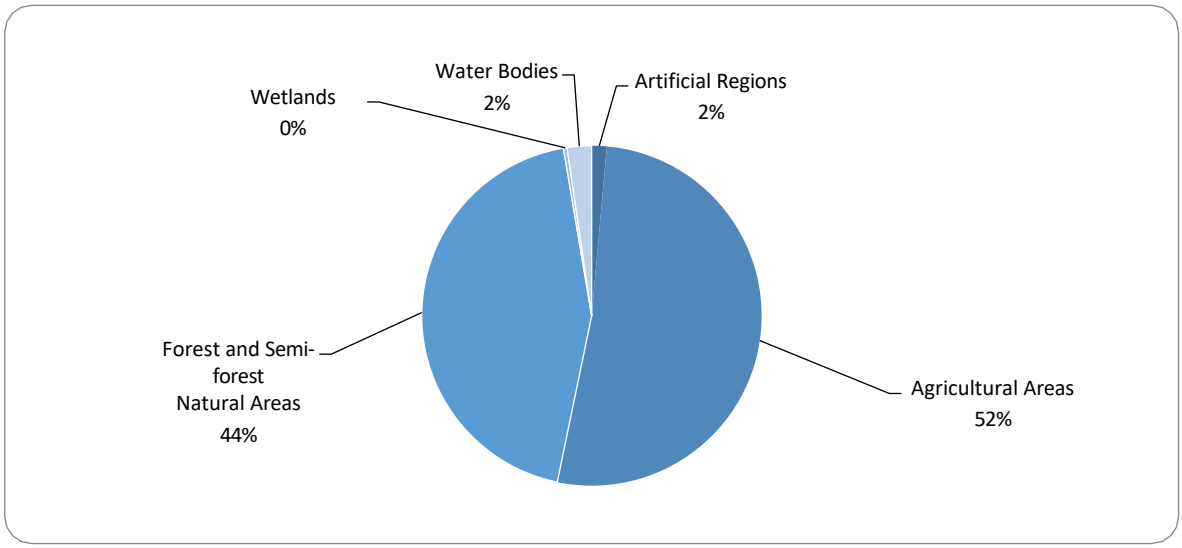


**Figure II.2.5.1.** Land Use Data of Muş Province According to Corine 2018 Data
**Source:** https://corinecbs.tarimorman.gov.tr/

**Table II.2.5.1.** Land Classification of Muş Province 1990-2018

| MUS | AREA SIZE | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1990 | | 2000 | | 2006 | | 2012 | | 2018 | |
| Land Class | ha | % | ha | % | ha | % | ha | % | ha | % |
| 1) Artificial Fields | 10.391,99 | 1,2 | 10.627,24 | 1,23 | 9.592,72 | 1,11 | 12.074,45 | 1,4 | 12.337,43 | 1,43 |
| 2) Agricultural Areas | 406.693,45 | 47,01 | 405.876,46 | 46,92 | 456.040,27 | 52,72 | 448.907,17 | 51,89 | 448.267 | 51,82 |
| 3) Forest and Semi-Natural Areas | 431.576,24 | 49,89 | 432.211,94 | 49,96 | 385.090,8 | 44,51 | 381.748,68 | 44,13 | 381.498,56 | 44,1 |
| 4) Wetlands | 2.402,33 | 0,28 | 2.402,33 | 0,28 | 2.931,96 | 0,34 | 3.106,45 | 0,36 | 2.909,8 | 0,34 |
| 5) Water Structures | 14.022,81 | 1,62 | 13.968,85 | 1,61 | 11.431,07 | 1,32 | 19.250,06 | 2,23 | 20.074,03 | 2,32 |
| **TOTAL** | **865.086,82** | **100** | **865.086,82** | **100** | **865.086,82** | **100** | 865.086,81 | 100 | **865.086,82** | **100** |

### Central District Land Use Status

Approximately 53% of the land cover distribution of the Central district, where the project area is located, consists of forests and semi-natural areas, 44% of agricultural areas, 2% of artificial areas and 1% of water bodies. The land cover status of the central district is given in Figure II.2.5.2.

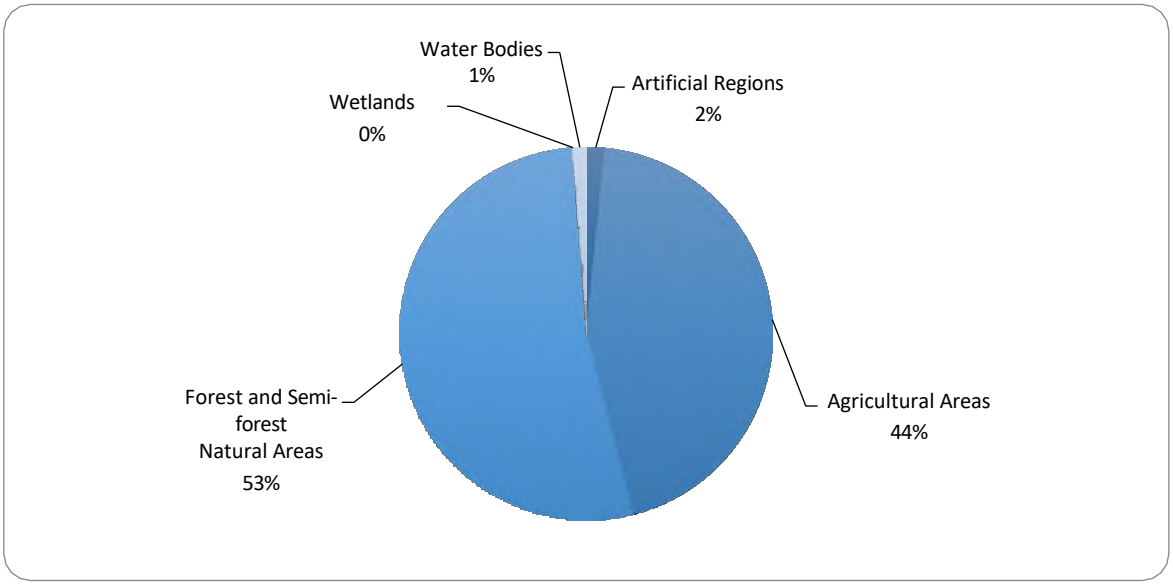


**Figure II.2.5.2.** Central District Land Use Data According to Corine 2018 Data
**Source:** Republic of Turkey Ministry of Agriculture and Forestry Corine Data, https://corinecbs.tarimorman.gov.tr/

**Project Area Land Use Status**

The 1/25.000 Scale Land Asset Map showing the Project area and its surroundings i s given in Annex-5. According to the Project 1/25.000 Scale Land Asset Map, although the SPP Area is within irrigated agriculture (insufficient) areas, it is currently within the **"Solar Energy Area qualified"** areas **with non-agricultural use permits**.

When the ownership documents of the project area given in Annex-2.8 are examined, it is seen that all parcels are in the form of fields.

The planned project area is located in "Treeless Forest Areas" according to the stand map. In this context, there is no use of any forest area and tree felling specific to the activity (See Annex-6 1/50.000 Scale Stand Map of the Project Area and Surroundings).

The approved Environmental Plan, Legends and Relevant Plan Provisions for the Muş-Bitlis-Van Planning Region with a scale of 1/100.000, where the Project area is located, are given in Annex-3 and the EIA Area and SPP Area are defined as "Dam" in the Environmental Plan with a scale of 1/100.000. However, although the project area appears as "Dam" in the Environmental Plan, it is currently within the "Solar Energy Area" areas **that have been granted non-agricultural use permits**.

In addition, part of the project area was previously used as "Construction Site" for the construction of Alpaslan II Dam and Hydroelectric Power Plant.

For the agricultural lands in the project area; within the scope of the Soil Conservation and Land Use Law No. 5403, with the letter dated 20.02.2003 and numbered 2844-002375 of the General Directorate of Agricultural Production and Development of the Ministry of Agriculture and Rural Affairs, a total area of 5469 hectares including the Alparslan II Dam and HEPP project area was given permission for non-agricultural use within the scope of the Regulation on the Protection and Use of Agricultural Lands in force at that time.

The "Non-Agricultural Use Permit Opinion" received by Muş Provincial Directorate of Agriculture and Forestry from the Ministry of Agriculture and Forestry, General Directorate of Agricultural Reform, regarding whether this permit is valid for the planned SPP project is given in Annex-2.4.

In the opinion of the General Directorate of Agricultural Reform given in Annex-2.4, it is stated that *"5469 hectares of land with a surface area of 5469 hectares, which was granted permission for non-agricultural use with the letter dated 20.02.2003 and numbered 2844-002375 of the abrogated Ministry of Agriculture and Rural Affairs General Directorate of Agricultural Production and Development, is outside the scope of Law No. 5403, and it is considered that no action can be taken within the scope of Articles 13, 14, 20 and 21 of Law No. 5403 within this area."* In this context, no additional permission, etc. will be obtained for land use.

Law No. 1380 on Fisheries within the scope of the current legislation;

- In May and August, the larval laying period of the aquatic fauna, the works will be carried out in a controlled manner or minimized after taking the necessary precautions,
- Wire fences will be erected between the water area and the project area (excluding animal passageways) to prevent the transfer of the works to the aquatic fauna,
- During the works, solid and liquid wastes will not be left in the aquaculture and breeding areas, they will not be dried, and the shape of the aquaculture and breeding areas will not be changed partially or completely.

All permits will be obtained within the scope of the Soil Conservation and Land Use Law No. 5403 if required before the construction phase of the Project.

**II.2.6. Agriculture and pasture areas (qualities of agricultural lands, agricultural development project areas, special crop plantation areas, size of irrigated and dry agricultural lands, crop patterns and their annual production amounts,); livestock and aquaculture (types, feeding areas, pasture areas, annual production amounts, the place and value of these products in the national economy, livestock, fishery, beekeeping, etc. within the impact area), (In case the EIA study area covers pasture areas, livestock activities in the region should be evaluated in detail in the Report).**

Approximately 52% of the land cover distribution of Muş province, where the project area is located, consists of agricultural areas, 44% of forest and semi-natural areas, 2% of artificial areas and 2% of water bodies. The land cover distribution of the Central district, where the project area is located, is approximately
53% forest and semi-natural areas, 44% agricultural areas, 2% artificial areas and 1% water bodies.

The 1/25.000 Scale Land Asset Map showing the Project area and its surroundings i s given in Annex-5. According to the Project 1/25.000 Scale Land Asset Map, although the SPP Area is within irrigated agriculture (insufficient) areas, it is currently within the **"Solar Energy Area qualified"** areas **with non-agricultural use permits**.

When the ownership documents of the project area given in Annex-2.8 are examined, it is seen that all parcels have the title of "Solar Power Plant".

For the agricultural lands in the project area; within the scope of the Soil Conservation and Land Use Law No. 5403, with the letter dated 20.02.2003 and numbered 2844-002375 of the General Directorate of Agricultural Production and Development of the Ministry of Agriculture and Rural Affairs, a total area of 5469 hectares including the Alparslan II Dam and HEPP project area was given permission for non-agricultural use within the scope of the Regulation on the Protection and Use of Agricultural Lands in force at that time.

The "Non-Agricultural Use Permit Opinion" received by Muş Provincial Directorate of Agriculture and Forestry from the Ministry of Agriculture and Forestry, General Directorate of Agricultural Reform, regarding whether this permit is valid for the planned SPP project is given in Annex-2.4. In the opinion of the General Directorate of Agricultural Reform given in Annex-2.4, it is stated that *"5469 hectares of land with an area of 5469 hectares, for which permission for non-agricultural use was granted with the letter dated 20.02.2003 and numbered 2844-002375 of the abrogated Ministry of Agriculture and Rural Affairs General Directorate of Agricultural Production and Development, is outside the scope of Law No. 5403, and it is considered that no action can be taken within the scope of Articles 13, 14, 20 and 21 of Law No. 5403 within this area."* In this context, no additional permission, etc. will be obtained for land use.

Animal Passageways

In the Public Participation Meeting held within the scope of the Project, local people requested that a road be left to pass their animals to the MURAT NEHRİ from the planned SPP area within the scope of animal husbandry activities. In this context, the investor has planned to leave two "Animal Passage Roads" within the boundaries of the SPP area. The North Animal Passage Road will be approximately 350 m long and have an area of 14.151 $m^2$ and the South Animal Passage Road will be approximately 525 m long and have an area of 9.971 $m^2$. The animal passage roads and the entire SPP site boundaries will be surrounded by wire fences, and upon the request of the local people at the Public Participation Meeting, no structure such as barbed wire etc. will be added to the wire fences that will harm the animals. Animal Access Roads are shown on all maps and their coordinates are given in Annex-1.

Therefore, within the scope of the project, there will be no loss of agricultural land use, no loss of crops due to loss of agricultural land, and no loss of livestock activities due to the abandonment of animal passage routes.

The routes of the Animal Access Roads were clarified in consultation with Dumlusu Neighborhood and local people. Before entering the Animal Access Roads, consent was obtained from the owners of the private land to be used for transportation outside the project area.

**II.2.7. Forest areas (amount of forest area -m2-, stand type, closure, current and planned protection and/or utilization purposes, 1/25.000 scale country and stand map where the project area is marked, 1/10.000 scale Forest Cadastre map if available)**

The planned project area is located within the "Treeless Forest Areas" in the 1/25.000 Scale Stand Map and no forest area will be used within the scope of the project (See Annex-6 and Figure II.2.7.1).

There will be no use of forested areas in the activity area within this scope and no damage will be caused to any forest commodity and no tree cutting will be carried out within this scope.

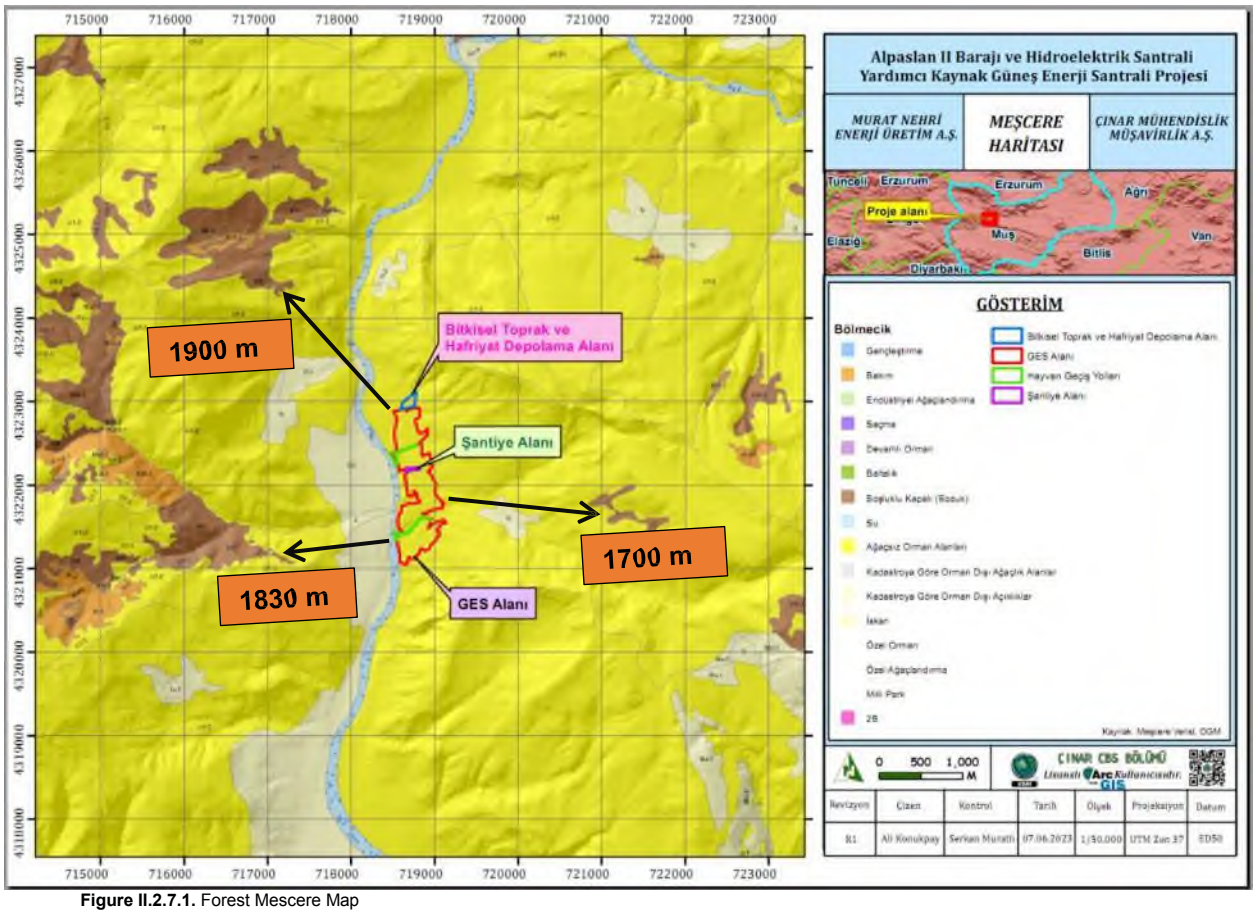


**Figure II.2.7.1.** Forest Mescere Map

There are no forested areas within the project area, but there are forested areas near the project area and within the impact area (See Figure II.2.7.1. Forest Mescere Map). It is seen that the closest forested areas to the Project area are located 1700 meters as the crow flies, 1830 meters as the crow flies and 1900 meters as the crow flies respectively.

**II.2.8. Cultural assets, protected areas (List of Sensitive Areas in Annex-5) taking into account) (national parks, nature parks, wetlands, natural monuments, nature conservation areas, wildlife protection areas, biogenetic reserve areas, biosphere reserves, natural sites and monuments, archaeological, historical, cultural sites, special environmental protection zones, special protection areas, tourism areas and centers, areas covered by pasture law, etc., sensitivity degree, water table changes that will affect historical environments and protected areas); EIA review area and distances of protected areas, if any, in the impact area on the map,**

In the institutional opinion of the Regional Board of Protection of Cultural Assets Directorate of Van dated 14.11.2022 and numbered 3144597, it is stated *that "... it has been understood that there is no record of any archaeological site or immovable cultural asset that has been identified and registered so far and that it does not remain within the protection area, and there is no objection to the construction of SPP by our Directorate."* (See Annex-2.16).

No cultural property requiring protection has been encountered in the project area, and if any Cultural Property is encountered as a result of the construction and physical interventions to be made, the nearest Museum Directorate or the Local Administrative Authority will be notified in accordance with Articles 4 and 5 of the Law No. 2863. During all works to be carried out within the scope of the Project, Law No. 2863 will be complied with.

As stated in the opinion of the General Directorate for the Protection of Natural Assets presented in Annex-2.17, there are no registered natural protected areas and natural assets in the project area.

In the event that any protected natural assets are encountered during the works to be carried out in the project area, the Provincial Directorate of Environment, Urbanization and Climate Change of Muş Governorship will be informed without any intervention in accordance with Article 4 of the Law No. 2863.

**Assessment in terms of Protected Areas**

The Project area is not located within National Parks (MP), Wildlife Protection Areas (WPA), Nature Parks (TP), Natural Parks (TP), Natural Monuments (TA), Ramsar Areas (RA) and Special Environmental Protection Areas (SEPA) when evaluated according to the ecologically protected areas under the legal legislation of both the Republic of Turkey Ministry of Agriculture and Forestry, General Directorate of Nature Conservation and National Parks and the Republic of Turkey Ministry of Environment, Urbanization and Climate Change.

According to the General Directorate of Nature Conservation and National Parks, the protected areas close to the project area within the borders of Muş province are Malazgirt Meydan Muharebesi Historical National Park, Sazlıkbaşı Nature Park, Süphandağı Wildlife Development Area, Akdoğan Lakes Wetland, Iron Reed Wetland, Bulanık Lake Wetland, Haçlı Lake Wetland and Nazik Lake Wetland (Figure II.2.8.1) and no impact is expected to occur on these areas.

According to the 2022-2023 Hunting Areas Map, the Project area is located within "General Hunting Areas" (Figure II.2.8.2). Bird flight distances of the Project area to protected areas are summarized in Table II.2.8.1.

**Table II.2.8.1.** Distance of the Project Area to the Nearest Protected Areas

| Protected Area | Bird Flight Distance |
|---|---|
| Malazgirt Battlefield Historical National Park | 85.26 km |
| Sazlikbasi Nature Park | 55.92 km |
| Süphandağı Wildlife Development Area | 98.98 km |
| Akdogan Lake Wetland of Local Importance | 19.43 km |
| Iron Reed Wetland of National Importance | 51.93 km |
| Bulanık Plain Wetland of National Importance | 55.91 km |
| Lake Crusader Wetland of Local Importance | 63.72 km |
| Nazik Lake Wetland of National Importance | 59.62 km |

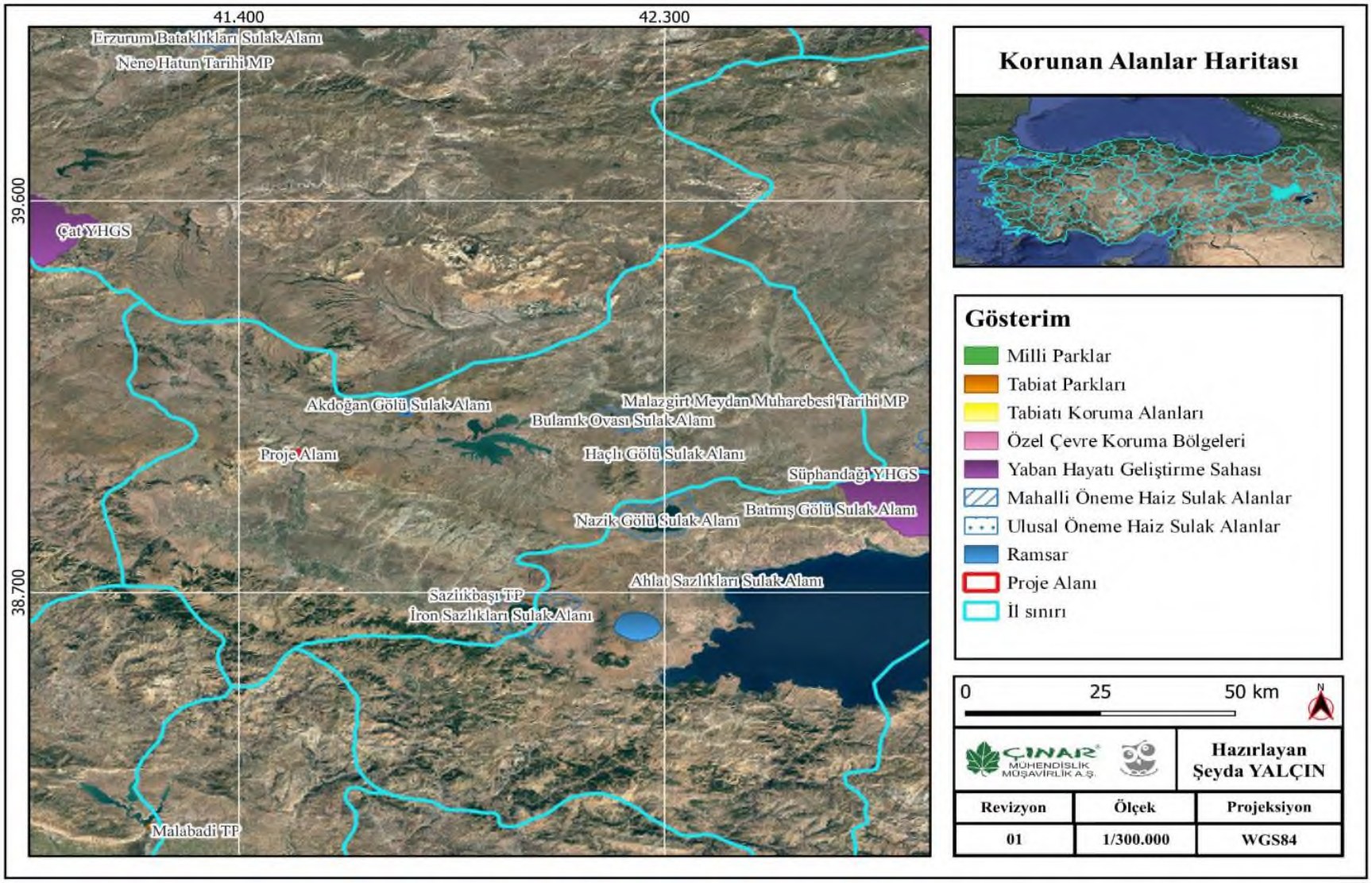


**Figure II.2.8.1.** Image of Protected Areas around the Project Area

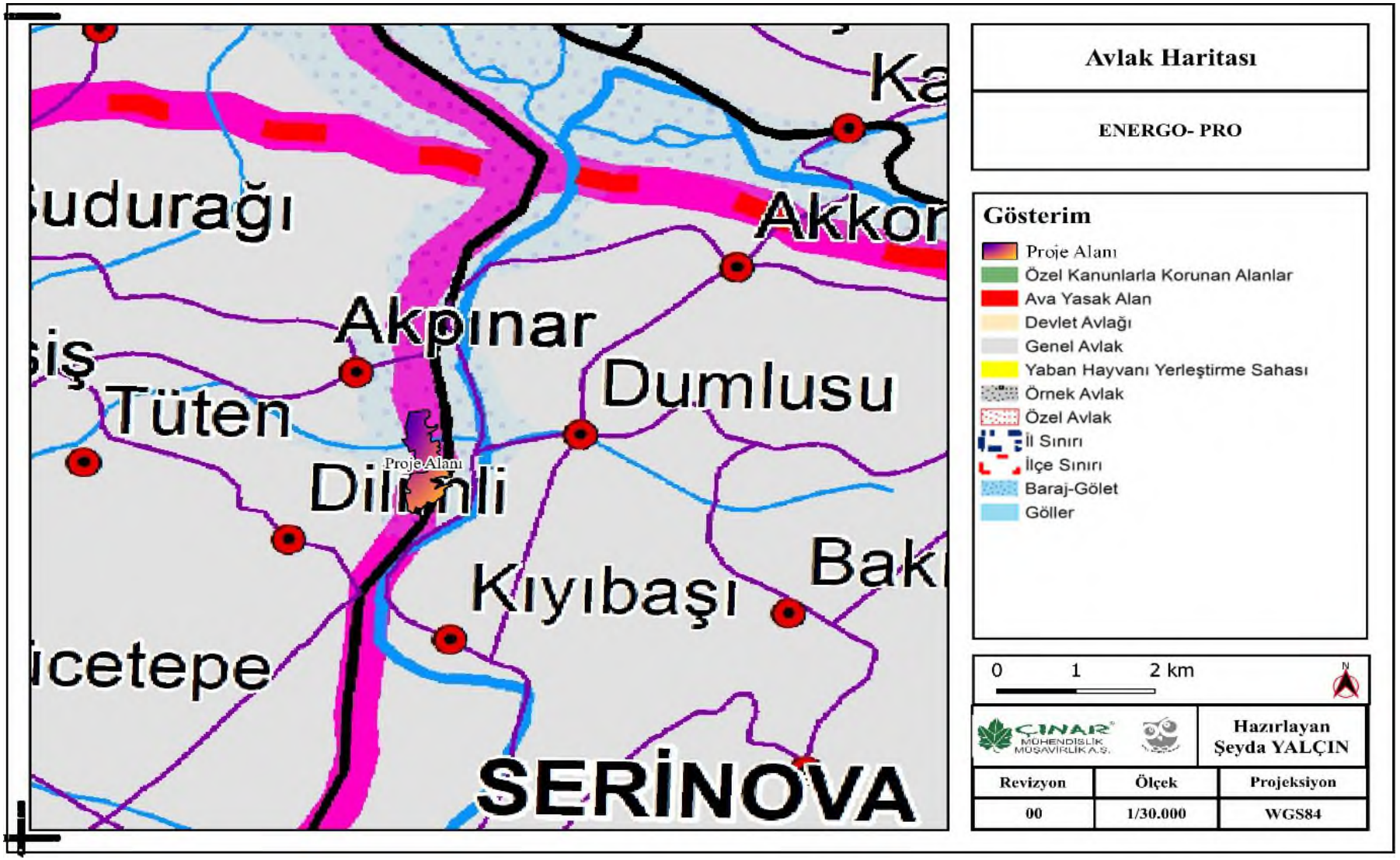


**Figure II.2.8.2.** Hunting Area Map

**II.2.9. Flora and Fauna (identification of species; endangerment categories, endemicity status, relative abundance of the identified species, species under protection by international agreements (Bern Convention, etc.); rare and endangered species and their habitats, game animals, populations and Central Hunting Commission Decisions taken for these species; protection measures to be taken for living creatures that will be affected by the activity in the project-birds, bats, bees, etc.), (providing information about ornithological assessment studies),**

The Ecosystem Assessment Report prepared by Dr. Levent BİLER (Ecologist / Hydrobiologist), Şeyda YALÇIN (Biologist) and Gamze KAYA (Scientist Biologist Candidate), in which the flora and fauna species in the Project area and its immediate vicinity are examined in detail, is given in Annex-12.

**NATIONAL AND INTERNATIONAL LAWS AND REGULATIONS**

The abbreviations of national and international conventions and regulations used in the species tables created within the scope of field studies and literature reviews within the scope of the project are summarized below.

Endemic, Rare or Threatened Plant Taxa

The evaluation of endemic plant species among the plant taxa identified in the project area and its immediate vicinity as a result of literature and field work will be included in the tables.

Endemic, Rare or Threatened Animal Taxa

The evaluation of endemic animal species among the animal taxa identified in the project area and its immediate vicinity as a result of literature and field work will be included in the tables.

Endemic, Rare and Threatened Flora-Fauna Species and Threat Categories (IUCN, BERN, CITES, MAKK, RDB)

**a) Endemic, Rare or Endangered Plant Species**

Considering that the endemism rate of plants in our country is 31.82% (Güner et al. 2012) and the endemism rate in Muş Province is approximately 8.8% (Muş Province's Terrestrial and Inland Water Ecosystems Biodiversity Inventory and Monitoring Project, Republic of Turkey Ministry of Agriculture and Forestry-http://www.nuhungemisi.gov.tr/public/), it is seen that the endemism of plants in the project area has a weak character (see Figure II.2.9.1).

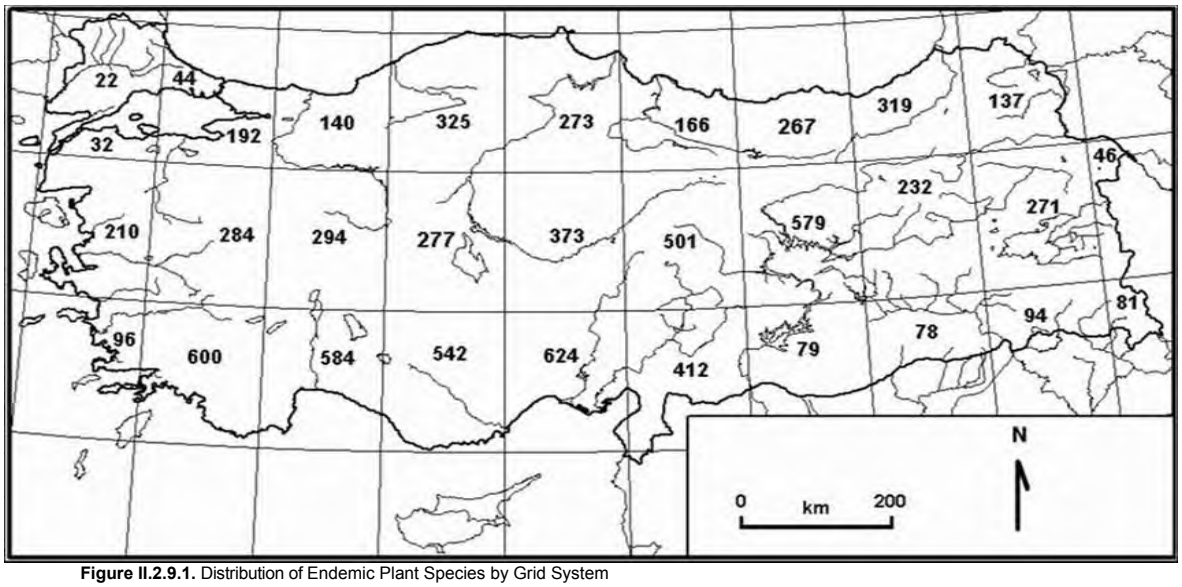


**Figure II.2.9.1.** Distribution of Endemic Plant Species by Grid System

**b) Endemic, Rare and Endangered Fauna Species**

As a result of field and literature studies, lists of bivalve, reptile, bird and mammal species found in and around the project area and likely to be found due to their habitat characteristics were created and evaluated in their own sections in the report.

c) IUCN Red List

IUCN Red List Classes are a system for classifying species at high risk of extinction. IUCN Risk Classes are summarized below (see Figure II.2.9.2).

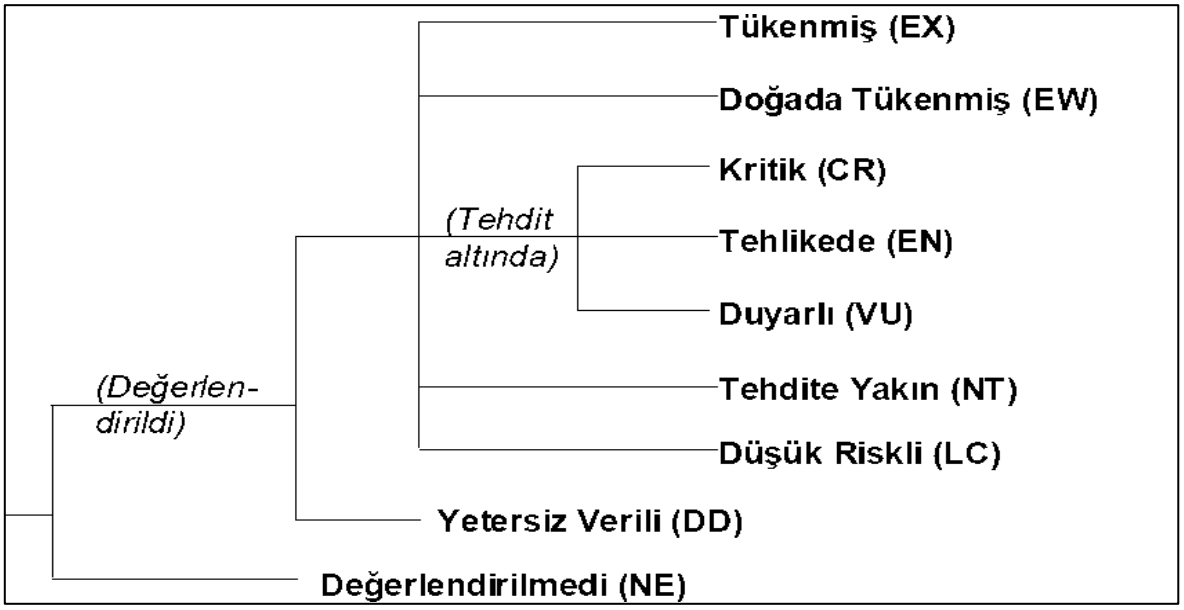


**Figure II.2.9.2.** IUCN Risk Classes

**d) Convention for the Conservation of Wildlife and Habitats in Europe (Bern)**

The Bern Convention is a convention to protect wild flora and fauna and their habitats, to ensure that necessary measures are taken for endangered or endangered species, and to ensure the dissemination of wild flora and fauna education. Annex lists and explanations of the Bern Convention are given in Table II.2.9.1.

**Table II.2.9.1.** Annex Lists and Explanations of the Bern Convention

| | |
|---|---|
| **Annex I** | Strictly protected flora species |
| **Annex II** | Strictly protected fauna species (SPFS- Strictly Protected Fauna Species) |
| **Annex-III** | Protected fauna species (PFS- Protected Fauna Species) |

**e) Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)**

The CITES Convention is a convention that binds the import, export, in short, international trade of wild animal and plant species between the countries that are parties to the convention to certain permits and documents. Appendix lists and explanations of the CITES Convention are given in Table II.2.9.2.

**Table II.2.9.2.** CITES Convention Appendix Lists and Explanations

| | |
|---|---|
| **Annex I** | It covers all species threatened with extinction that are or may be affected by trade. Trade in specimens of these species must be subject to particularly stringent legislation and only permitted in exceptional circumstances to avoid further jeopardizing their continued extinction. |
| **Annex II** | (a) Species that are not currently threatened with absolute extinction but could become extinct if trade in specimens is not strictly regulated to prevent uses incompatible with their continued extinction; and<br>(b) In order to effectively control trade in specimens of certain species referred to in subparagraph (a) |

| | |
|---|---|
| | other species that need to be subject to legislation. |
| **Annex-III** | Any Party has the right to regulate within its jurisdiction in order to prevent or restrict the use of to which it has indicated that it is subjected and that it needs cooperation with other Parties in controlling its trade. species. |

### f) Central Hunting Commission Decisions (MAKK) (2022-2023)

The Central Hunting Commission convenes every year within the framework of the authority it receives from the Land Hunting Law No. 4915 and determines the game animals to be protected throughout the country in that hunting period, the game animals to be allowed to be hunted and their hunting periods, times and days, hunting amounts, prohibited hunting tools and equipment, hunting areas to be prohibited, hunting principles and procedures for combat purposes (www.milliparklar.gov.tr). Central Hunting Commission Decisions and Explanations are given in Table II.2.9.3.

**Table II.2.9.3.** Central Hunting Commission Decisions and Explanations (2022-2023)

| | |
|---|---|
| **Annex I** | Game Animals Protected by the Central Hunting Commission |
| **Annex II** | Game Animals Permitted to Hunt by the Central Hunting Commission for Specified Periods |

### g) Red Data Book Categories of Birds of Turkey (Kiziroğlu, 2008)

A.1.0 = Species that have disappeared beyond any doubt and are no longer seen in their natural habitat.

A.1.1 = Domesticated, domesticated species whose natural populations are now extinct or have not been seen in the wild for at least the last fifteen to twenty-five years, but continue to live in voles, cages and other artificial conditions.

A.1.2 = Populations of these species are very low throughout Turkey. They are represented by 1 individual - 10 pairs (=1- 20 individuals) in the regions where they are monitored.

A.2= The numbers of these species vary between 11-25 pairs (22-50 individuals) in the regions where they are observed.
These are significantly threatened with extinction.

A.3= The populations of these species in Turkey generally vary between (52- 500) individuals in the regions where they are observed. These species are also vulnerable to extinction and have a high risk of extinction in the wild.

A.3.1= Populations of these species are declining in the areas where they are observed. The population of these species also varies between 251- 500 pairs (502- 1000 individuals).

A.4= The densities of these species according to IUCN and ATS criteria are not yet threatened with extinction in the regions where they are observed, but there is a local decrease in their populations and they are candidates to become threatened with extinction in time. Populations of these species range from 501 to 5000 pairs (=1002 to 10 000 individuals) in the areas where they are observed.

A.5= The observed populations of these species a r e not yet threatened with decline or extinction.

A.6= Includes species that have not been adequately researched and for which there is no reliable data. Since they are based on one or at most two observations only as "incidental species= RT", there is currently no chance of a reliable assessment and they need to be researched

A.7= It is not possible to make an assessment of these species at this time because the records of these species in Turkey are not complete and reliable. Species categorized as NE: (not evaluated) according to IUCN criteria are included in this group. These include species whose compliance with the above criteria has not been fully assessed so far. they are marked with "*" in the relevant tables.

Species in group "B" are either winter visitors or transit migrants. These species are significantly threatened with extinction and will be assessed in the same way as in group "A". Therefore, the criteria in steps B.1.0 - B.7 will also be used for the species in group "B":

B1.0= There are no examples of species in this status that were previously recorded as wintering in Turkey but are now extinct.

B.1.1 = These species use Turkey as a wintering or transit area, but their populations are threatened with significant extinction. The natural populations of birds in their wintering grounds are now extinct: they are domesticated species that survive in voliers, cages and other artificial conditions. These species have no chance of surviving in the wild. If they are released into the wild, it is no longer possible for them to adapt to natural living conditions.

B.1.2 = The populations of these species are very low throughout Turkey and are represented by 1 individual - 10 pairs (1- 20 individuals) in the regions where they are monitored. Since these species are under great threat of extinction, they must be protected throughout Turkey.

B.2= The number of these species varies between 11 to 25 pairs (22 to 50 individuals) in the regions where they are observed.

These species are significantly threatened with extinction.

B.3= Populations of these species in Turkey generally range between 26-50 pairs (52-500 individuals) in the regions where they are observed. Species in great danger of extinction in the wild. These species are also vulnerable to extinction and in great danger of extinction in the wild.

B.3.1= Populations of these species are declining in the areas where they are observed. Their population also ranges between 251- 500 pairs (502- 1000 individuals). It includes species that tend to decline in the areas where they are observed, according to previous records.

B.4= Population densities of these species are not yet threatened with extinction in the areas where they are observed, but there is a localized decline in their populations. These species are candidates to be threatened with extinction in time. Populations of these species range between 501- 5000 pairs (1002- 10 000 individuals) in the areas where they are observed.

B.5= The observed populations of these species are not yet i n decline or threatened with extinction.

B.6= Includes under-researched and poorly recorded species. Since they are based on fewer than two observations as "chance species= RT" only, there is currently no chance for a reliable assessment and need to be investigated.

B.7= It is not possible to make an assessment of these species at this time because their records are few, uncertain and unreliable.

**FLORA**

The identification of terrestrial plant taxa of the Project area is based on field observations and a detailed literature study on the floristic and ecological structure of the region. In this context, the EIH line EDR studies carried out by Çınar Engineering in 2019, the aquatic biota monitoring carried out between 2019-2020 and the 2019-2022 biological monitoring reports carried out by Integra were also evaluated.

Field studies were carried out by collecting and recording plant samples, recording vegetation and ecosystem characteristics, determining land use characteristics and recording cover-abundance values. During the field studies, 1/25.000 scale topographic map of the region, satellite images, Magellan handheld GPS, digital camera, notebook, transparent bags for collecting plant samples, hoe, plant press, seed envelope were used.

During the field studies, common and directly identifiable taxa were noted and photographed with their localities, altitudes, habitats and dates. On the other hand, sample materials (leaves, flowers, stems, roots, tubers, rhizomes, etc.) were collected from plant species that could not be directly identified during field studies in a way not to harm their populations and were stored in transparent bags until they were pressed. These bags were numbered and labeled with information such as elevation, habitat, date of collection, and the expert who collected them, and the collected plant taxa were photographed together with their habitat. At the end of the fieldwork, the collected specimens were pressed between newspapers and cartons in accordance with herbarium techniques. In order to obtain herbarium specimens, blotting papers were changed several times until the plant specimens were dry. Herbarium specimens were then processed for identification.

"Flora of Turkey and the East Aegean Island" [Davis, 1965-1985; Davis et al., 1988; Güner et al., 2000] was used for the identification of plant specimens. Latin and Turkish names, family information and taxon rankings were obtained from the book "List of Plants of Turkey (Vascular Plants)" published by the Flora Research Association of Turkey in 2012 (Güner et al., 2012). In addition, new publications in recent years and new taxon records added to the flora of Turkey were also reviewed. The Red List of Plants of Turkey (Ekim et al., 2000) and the list of threatened plant species (http://www.tehditaltindabitkiler.org.tr/v2/) were used as the main source for determining the IUCN Red List classes of endemic and non-endemic rare taxa at the species and subspecies level to be identified in the Project Area.

*Phytogeographic Region*

Due to its geographical location, our country is under the influence of various climates. As a matter of fact, oceanic climatic conditions prevail on the slopes of the North Anatolian and Yıldız (Istranca) Mountains facing north, especially the Black Sea; Mediterranean in the Marmara Sea, Aegean and Mediterranean regions; and continental climatic conditions prevail in Central, Eastern and Southeastern Anatolia. Thus, the north of Anatolia and Thrace is a country where humid temperate climates prevailing in the west of the continents to the east of the oceans, the Aegean and Mediterranean subtropical, and the central and eastern regions of Anatolia are a collection of continental climates prevailing in the interior of the continents. In the high mountainous areas, cold climatic conditions effective in more northern latitudes are observed. For this reason, the existence of different areas and phytogeographical regions in terms of vegetation in Turkey is a necessity of natural conditions.

As a general assessment, the north of Turkey as a whole falls within the Euro-Siberian Flora Region. In the north, the Eastern Black Sea Region, starting from the east of Ordu, falls within the Colchic, while the western parts fall within the Euxine sub-flora or sections of the same flora realm. The northern coasts of the Marmara Sea and the Aegean and Mediterranean regions constitute the Eastern Mediterranean Flora. The Central and Eastern Anatolia regions fall within the Turanian-Eurasian or Irano-Turanian Flora Region, and the steppe areas of Southeastern Anatolia fall within the Irano-Turanian Flora Division. In short, Turkey is a country where Euro-Siberian, Mediterranean and Irano-Turanian flora regions coexist (see Figure II.2.9.3).

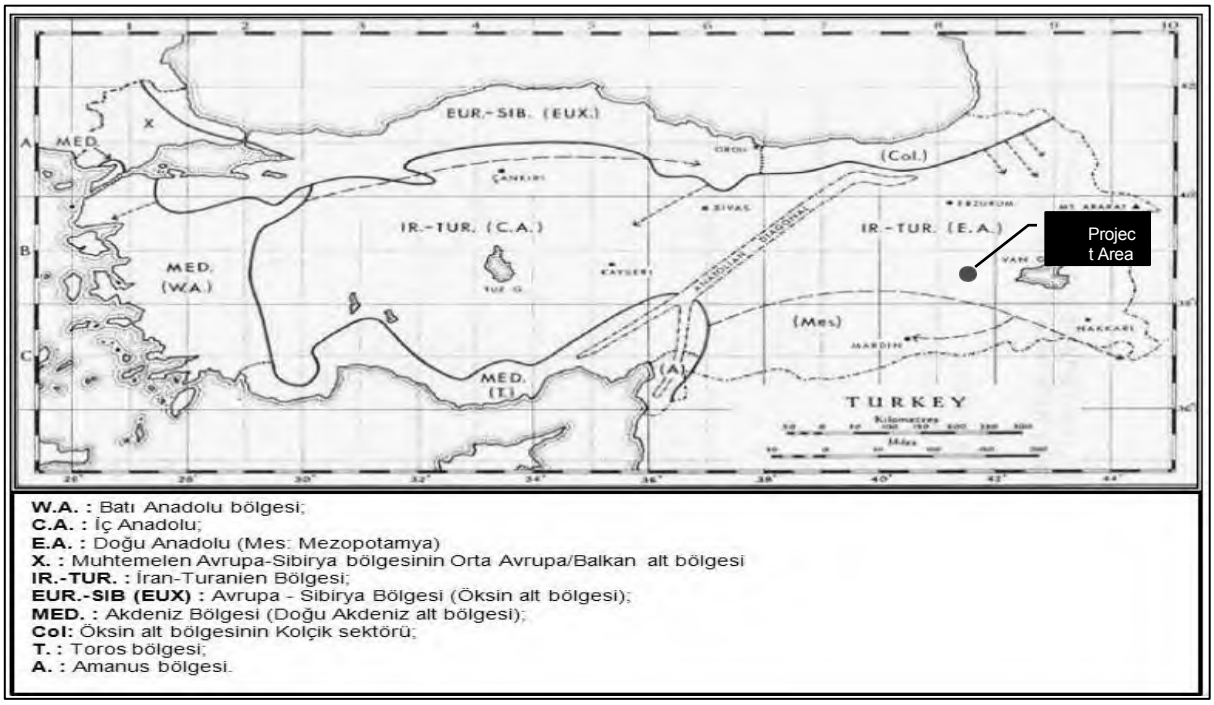


**Figure II.2.9.3.** Plant Geography Distribution and Davis Grid Quadrature System

However, in our country, altitude and aspect conditions make it difficult to distinguish these flora regions from each other with clear lines. In the Auxin flora zone, dry forests are found on the south-facing slopes of the mountains and arid shrubs are found in valleys and depressions. Likewise, in the Mediterranean Region, as in the Nur (Amanos) Mountains, there are plant associations consisting of Eucine elements on the north-facing slopes and high places and formations consisting of grass, shrub and tree communities in terms of physiognomic appearance. Thus, there are also different parts of the flora that are sheltered in local areas and maintain their life under suitable ecological conditions. The activity area is located within the borders of Iran-Turanian Flora Region.

In terms of plant geography, the region where the study was carried out is completely within the Iran-Turanian Plant Geography region. In terms of climate, the project area is located in square B8 according to (Davis et al. 1965-1985) Grid Gridding System.

**Floristic Findings**

As a result of field and literature studies, 193 plant taxa were identified in the project area. Among the identified species, there is 1 endemic species (*Ferula huber-morathii*). In addition, there are no non-endemic, rare or endangered plant species in the project area. As a result of the studies conducted, there are important species in the project area. According to IUCN endangerment criteria, 37 species are categorized as "LC" (Low Risk), 153 species as "NE" (Not Evaluated), 1 species (*Ferula huber-morathii*) as "EN" (Endangered) and 2 species as "DD" (Data Deficient). According to the Bern Convention, 193 taxa identified in the project area and its immediate vicinity are not included in the annex lists. According to the CITES Convention, 193 taxa identified in the project area and its immediate vicinity are not included in the additional lists (see Table II.2.9.4).

**Table II.2.9.4.** Plant Taxa and Threat Categories Identified in the Project Area and its Vicinity

| FAMILY | SPECIES NAME | TURKISH NAME | ENDEMISM | IUCN | CITES | BERN | DEGREE OF RELATIVE ABUNDANCE | TYPE OF DETECTION |
|---|---|---|---|---|---|---|---|---|
| Amaranthaceae (Spinach family) | *Amaranthus albus* | Kholy Mancar | Not Endemic | NE | Off List | Off List | | Literature |
| Amaranthaceae (Spinach family) | *Chenopodium foliosum* | Cülek | Not Endemic | NE | Off List | Off List | | Literature |
| Amaryllidaceae (Daffodils) | *Allium atroviolaceum* | Fibrous Curmen | Not Endemic | DD | Off List | Off List | | Literature |
| Amaryllidaceae (Daffodils) | *Allium kharputense* | Harput Onion | Not Endemic | NE | Off List | Off List | | Literature |
| Apiaceae (Parsley family) | *Bupleurum kurdicum* | Tavşandili | Not Endemic | NE | Off List | Off List | | Literature |
| Apiaceae (Parsley family) | *Scandix iberica* | Horsetail | Not Endemic | NE | Off List | Off List | | Literature |
| Apiaceae (Parsley family) | *Eryngium campestre* | Kirsenet | Not Endemic | NE | Off List | Off List | sparse | Field+Literature |
| Apiaceae (Parsley family) | *Falcaria vulgaris* | Sickleweed | Not Endemic | NE | Off List | Off List | | Literature |
| Apiaceae (Parsley family) | *Ferula huber-morathii* | Helizan | Endemic | EN | Off List | Off List | sparse | Field+Literature |
| Apiaceae (Parsley family) | *Prangos ferulacea* | Donkey Grackle | Not Endemic | NE | Off List | Off List | | Literature |
| Apiaceae (Parsley family) | *Daucus carota* | Wild Carrot | Not Endemic | LC | Off List | Off List | | Literature |
| Apiaceae (Parsley family) | *Turgenia latifolia* | Karaheci | Not Endemic | NE | Off List | Off List | | Literature |
| Apocynaceae (Oleander family) | *Vincetoxicum tmoleum* | Hıyaluk | Not Endemic | NE | Off List | Off List | | Literature |
| Asparagaceae (Asparagaceae) | *Muscari armeniacum* | Gâvurbaşı | Not Endemic | NE | Off List | Off List | | Literature |
| Asparagaceae (Asparagaceae) | *Muscari longipes* | Misty Hyacinth | Not Endemic | NE | Off List | Off List | | Literature |
| Asparagaceae (Asparagaceae) | *Ornithogalum oligophyllum* | Wolf Onion | Not Endemic | NE | Off List | Off List | sparse | Field+Literature |
| Asteraceae (Daisy family) | *Tanacetum vulgare* | Common Flea Weed | Not Endemic | NE | Off List | Off List | | Literature |
| Asteraceae (Daisy family) | *Xanthium spinosum* | Hiceratopsis | Not Endemic | NE | Off List | Off List | | Literature |
| Asteraceae (Daisy family) | *Xanthium strumarium* | Big Hibiscus | Not Endemic | NE | Off List | Off List | | Literature |
| Asteraceae (Daisy family) | *Xeranthemum annuum* | Paper Flower | Not Endemic | NE | Off List | Off List | | Literature |
| Asteraceae (Daisy family) | *Artemisia austriaca* | Yavshan | Not Endemic | NE | Off List | Off List | sparse | Field+Literature |
| Asteraceae (Daisy family) | *Artemisia campestris* | Black Rabbit | Not Endemic | LC | Off List | Off List | sparse | Field+Literature |
| Asteraceae (Daisy family) | *Centaurea balsamita* | Fancy Saribash | Not Endemic | NE | Off List | Off List | | Literature |
| Asteraceae (Daisy family) | *Centaurea pterocaula* | Corusbozan | Not Endemic | NE | Off List | Off List | | Literature |
| Asteraceae (Daisy family) | *Centaurea solstitialis* | Cakirdikeni | Not Endemic | NE | Off List | Off List | | Literature |
| Asteraceae (Daisy family) | *Centaurea virgata* | Bitter Broom | Not Endemic | NE | Off List | Off List | | Literature |
| Asteraceae (Daisy family) | *Crupina vulgaris* | Break the Bride's Swivel | Not Endemic | NE | Off List | Off List | | Literature |
| Asteraceae (Daisy family) | *Cnicus benedictus* | Topdiken | Not Endemic | DD | Off List | Off List | sparse | Field+Literature |
| Asteraceae (Daisy family) | *Cichorium intybus* | Chicory | Not Endemic | LC | Off List | Off List | sparse | Field+Literature |
| Asteraceae (Daisy family) | *Sonchus asper* | Donkey flakes | Not Endemic | NE | Off List | Off List | sparse | Field+Literature |
| Asteraceae (Daisy family) | *Onopordum acanthium* | Galagan | Not Endemic | NE | Off List | Off List | | Literature |
| Asteraceae (Daisy family) | *Picnomon acarna* | Pinchthorn | Not Endemic | NE | Off List | Off List | | Literature |
| Asteraceae (Daisy family) | *Carduus pycnocephalus* | Stripper | Not Endemic | NE | Off List | Off List | | Literature |

| FAMILY | SPECIES NAME | TURKISH NAME | ENDEMISM | IUCN | CITES | BERN | DEGREE OF RELATIVE ABUNDANCE | TYPE OF DETECTION |
|---|---|---|---|---|---|---|---|---|
| Asteraceae (Daisy family) | *Carduus nutans* | Donkey thorn | Not Endemic | NE | Off List | Off List | sparse | Field+Literature |
| Asteraceae (Daisy family) | *Cirsium haussknechtii* | Thin Kangal | Not Endemic | NE | Off List | Off List | | Literature |
| Asteraceae (Daisy family) | *Lactuca serriola* | Donkeyhelva | Not Endemic | LC | Off List | Off List | | Literature |
| Asteraceae (Daisy family) | *Crepis sancta* | Wild Mare | Not Endemic | NE | Off List | Off List | sparse | Field+Literature |
| Asteraceae (Daisy family) | *Echinops pungens* | Bongil | Not Endemic | NE | Off List | Off List | sparse | Field+Literature |
| Asteraceae (Daisy family) | *Gundelia tournefortii* | Kenger | Not Endemic | NE | Off List | Off List | | Literature |
| Asteraceae (Daisy family) | *Helichrysum plicatum* | Mantuvar | Not Endemic | NE | Off List | Off List | sparse | Field+Literature |
| Asteraceae (Daisy family) | *Inula britannica* | Meadow Vetch | Not Endemic | NE | Off List | Off List | | Literature |
| Asteraceae (Daisy family) | *Picris strigosa* | Acisiro | Not Endemic | NE | Off List | Off List | | Literature |
| Asteraceae (Daisy family) | *Pulicaria vulgaris* | White Horseradish | Not Endemic | LC | Off List | Off List | | Literature |
| Asteraceae (Daisy family) | *Sonchus asper* | Donkey flakes | Not Endemic | NE | Off List | Off List | | Literature |
| Asteraceae (Daisy family) | *Bellis perennis* | Koyungozu | Not Endemic | NE | Off List | Off List | | Literature |
| Asteraceae (Daisy family) | *Senecio vernalis* | Canary grass | Not Endemic | NE | Off List | Off List | sparse | Field+Literature |
| Asteraceae (Daisy family) | *Achillea vermicularis* | Pushan | Not Endemic | NE | Off List | Off List | | Literature |
| Boraginaceae (Boraginaceae) | *Echium italicum* | Wormtail | Not Endemic | NE | Off List | Off List | sparse | Field+Literature |
| Boraginaceae (Boraginaceae) | *Buglossoides arvensis* | Field Stonehenge | Not Endemic | NE | Off List | Off List | | Literature |
| Boraginaceae (Boraginaceae) | *Anchusa strigosa* | Gelezan | Not Endemic | NE | Off List | Off List | | Literature |
| Boraginaceae (Boraginaceae) | *Heliotropium europaeum* | Scorpion Grass | Not Endemic | NE | Off List | Off List | | Literature |
| Boraginaceae (Boraginaceae) | *Heliotropium ellipticum* | Sickle Bambulot | Not Endemic | NE | Off List | Off List | | Literature |
| Boraginaceae (Boraginaceae) | *Rochelia disperma* | Chickweed | Not Endemic | NE | Off List | Off List | | Literature |
| Brassicaceae (Cruciferaceae) | *Alyssum desertorum* | Smokeweed | Not Endemic | NE | Off List | Off List | | Literature |
| Brassicaceae (Cruciferaceae) | *Bunias erucago* | Deliturp | Not Endemic | NE | Off List | Off List | | Literature |
| Brassicaceae (Cruciferaceae) | *Camelina rumelica* | Ketentere | Not Endemic | LC | Off List | Off List | | Literature |
| Brassicaceae (Cruciferaceae) | *Capsella bursa-pastoris* | Shepherd's Bag | Not Endemic | LC | Off List | Off List | sparse | Field+Literature |
| Brassicaceae (Cruciferaceae) | *Descurainia sophia* | Hyacinth | Not Endemic | NE | Off List | Off List | | Literature |
| Brassicaceae (Cruciferaceae) | *Hirschfeldia incana* | Fallow Radish | Not Endemic | NE | Off List | Off List | | Literature |
| Brassicaceae (Cruciferaceae) | *Isatis glauca* | Sogutot | Not Endemic | NE | Off List | Off List | | Literature |
| Brassicaceae (Cruciferaceae) | *Lepidium perfoliatum* | Dungweed | Not Endemic | LC | Off List | Off List | | Literature |
| Brassicaceae (Cruciferaceae) | *Sisymbrium officinale* | Ergelen Mustard | Not Endemic | LC | Off List | Off List | | Literature |
| Campanulaceae (Bellflower family) | *Asyneuma virgatum* | Flowerworm | Not Endemic | NE | Off List | Off List | | Literature |
| Cannabaceae (Cannabis family) | *Celtis tournefortii* | Dardagan | Not Endemic | LC | Off List | Off List | sparse | Field+Literature |
| Caprifoliaceae (Honeysuckle) | *Scabiosa argentea* | Writing Sweeper | Not Endemic | NE | Off List | Off List | | Literature |
| Caprifoliaceae (Honeysuckle) | *Cephalaria syriaca* | Pelemir | Not Endemic | NE | Off List | Off List | | Literature |
| Caryophyllaceae (Carnation family) | *Cerastium dichotomum* | Fork Hornwort | Not Endemic | NE | Off List | Off List | | Literature |

| FAMILY | SPECIES NAME | TURKISH NAME | ENDEMISM | IUCN | CITES | BERN | DEGREE OF RELATIVE ABUNDANCE | TYPE OF DETECTION |
|---|---|---|---|---|---|---|---|---|
| Caryophyllaceae (Carnation family) | *Dianthus cyri* | Selvi Karanfil | Not Endemic | NE | Off List | Off List | sparse | Field+Literature |
| Caryophyllaceae (Carnation family) | *Gypsophila ruscifolia* | Persian Çöveni | Not Endemic | NE | Off List | Off List | sparse | Field+Literature |
| Caryophyllaceae (Carnation family) | *Holosteum umbellatum* | Devil Earring | Not Endemic | NE | Off List | Off List | | Literature |
| Caryophyllaceae (Carnation family) | *Minuartia hamata* | Woodruff | Not Endemic | NE | Off List | Off List | | Literature |
| Caryophyllaceae (Carnation family) | *Saponaria tridentata* | Uchmen | Not Endemic | NE | Off List | Off List | | Literature |
| Caryophyllaceae (Carnation family) | *Silene pungens* | Pillow Embroidery | Not Endemic | NE | Off List | Off List | | Literature |
| Caryophyllaceae (Carnation family) | *Velezia rigida* | Crochet | Not Endemic | NE | Off List | Off List | | Literature |
| Caryophyllaceae (Carnation family) | *Silene vulgaris* | Ecibücü | Not Endemic | NE | Off List | Off List | sparse | Field+Literature |
| Caryophyllaceae (Carnation family) | *Herniaria incana* | Kabayaran | Not Endemic | NE | Off List | Off List | | Literature |
| Cistaceae (Spruce family) | *Helianthemum salicifolium* | Söğüt Güngülü | Not Endemic | NE | Off List | Off List | | Literature |
| Colchicaceae (Bittercresses) | *Colchicum kotschyi* | Bittercrocus | Not Endemic | NE | Off List | Off List | | Literature |
| Convolvulaceae (Field Vine) | *Convolvulus arvensis* | Field Ivy | Not Endemic | NE | Off List | Off List | sparse | Field+Literature |
| Convolvulaceae (Field Vetiver) | *Convolvulus betonicifolius* | Big Spreader | Not Endemic | NE | Off List | Off List | | Literature |
| Convolvulaceae (Field Vine) | *Cuscuta kurdica* | Uslu Cinsaçı | Not Endemic | NE | Off List | Off List | | Literature |
| Cornaceae (Dogwoods) | *Cornus sanguinea* | Anti-cancer | Not Endemic | NE | Off List | Off List | | Literature |
| Cyperaceae (Cyperaceae) | *Cyperus longus* | Blackthorn | Not Endemic | LC | Off List | Off List | | Literature |
| Elaeagnaceae (Rowan) | *Elaeagnus angustifolia* | Needle | Not Endemic | LC | Off List | Off List | | Literature |
| Euphorbiaceae (Euphorbiaceae) | *Euphorbia herniariifolia* | Bead Spurge | Not Endemic | NE | Off List | Off List | sparse | Field+Literature |
| Euphorbiaceae (Euphorbiaceae) | *Euphorbia macroclada* | Neblul | Not Endemic | NE | Off List | Off List | | Literature |
| Fabaceae (Legumes) | *Astragalus angustifolius* | Goat Geveni | Not Endemic | NE | Off List | Off List | | Literature |
| Fabaceae (Legumes) | *Astragalus amblolepis* | Kut Geven | Not Endemic | NE | Off List | Off List | | Literature |
| Fabaceae (Legumes) | *Astragalus eriocephalus* | Long Geven | Not Endemic | LC | Off List | Off List | | Literature |
| Fabaceae (Legumes) | *Astragalus gummifer* | Gummy Geven | Not Endemic | NE | Off List | Off List | | Literature |
| Fabaceae (Legumes) | *Astragalus oleifolius* | Crazy Geven | Not Endemic | NE | Off List | Off List | | Literature |
| Fabaceae (Legumes) | *Robinia pseudoacacia* | False Acacia | Not Endemic | LC | Off List | Off List | | Literature |
| Fabaceae (Legumes) | *Lotus corniculatus* | Gazal horn | Not Endemic | NE | Off List | Off List | | Literature |
| Fabaceae (Legumes) | *Ononis spinosa* | Demirdelen | Not Endemic | NE | Off List | Off List | sparse | Field+Literature |
| Fabaceae (Legumes) | *Vicia cracca* | Oak Vetch | Not Endemic | NE | Off List | Off List | sparse | Field+Literature |
| Fabaceae (Legumes) | *Trifolium campestre* | Üçgül | Not Endemic | NE | Off List | Off List | sparse | Field+Literature |
| Fabaceae (Legumes) | *Trifolium physodes* | Oak Triangle | Not Endemic | NE | Off List | Off List | sparse | Field+Literature |
| Fabaceae (Legumes) | *Trifolium diffusum* | Grove Clover | Not Endemic | NE | Off List | Off List | | Literature |
| Fabaceae (Legumes) | *Medicago lupulina* | Litchiwort | Not Endemic | LC | Off List | Off List | | Literature |
| Fabaceae (Legumes) | *Medicago x varia* | Wild Clover | Not Endemic | NE | Off List | Off List | | Literature |
| Fabaceae (Legumes) | *Melilotus officinalis* | Fragrant Clover | Not Endemic | LC | Off List | Off List | | Literature |

| FAMILY | SPECIES NAME | TURKISH NAME | ENDEMISM | IUCN | CITES | BERN | DEGREE OF RELATIVE ABUNDANCE | TYPE OF DETECTION |
|---|---|---|---|---|---|---|---|---|
| Fabaceae (Legumes) | *Medicago rigidula* | Rough Clover | Not Endemic | NE | Off List | Off List | sparse | Field+Literature |
| Fagaceae (Beech family) | *Quercus robur pedunculiflora* | Akmeşe | Not Endemic | NE | Off List | Off List | | Literature |
| Geraniaceae (Cranesbillaceae) | *Erodium cicutarium* | Pincushion | Not Endemic | NE | Off List | Off List | | Literature |
| Hypericaceae (Cantharongillera) | *Hypericum triquetrifolium* | Crimsonweed | Not Endemic | NE | Off List | Off List | sparse | Field+Literature |
| Hypericaceae (Cantharongillera) | *Hypericum perforatum* | Cantaron | Not Endemic | LC | Off List | Off List | | Literature |
| iridaceae (Irises) | *Crocus cancellatus* | Pivok | Not Endemic | NE | Off List | Off List | | Literature |
| iridaceae (Irises) | *Gladiolus atroviolaceus* | Prairie Iris | Not Endemic | NE | Off List | Off List | | Literature |
| Juncaceae (Cofagaceae) | *Juncus compressus* | Karahasirlik | Not Endemic | LC | Off List | Off List | | Literature |
| Juncaceae (Cofagaceae) | *Juncus heldreichianus* | Short Dombay | Not Endemic | NE | Off List | Off List | | Literature |
| Lamiaceae (Viburnum) | *Lamium amplexicaule* | Baltutan | Not Endemic | NE | Off List | Off List | | Literature |
| Lamiaceae (Viburnum) | *Prunella laciniata* | Dwarf Basil | Not Endemic | NE | Off List | Off List | | Literature |
| Lamiaceae (Viburnum) | *Stachys annua* | Haciosmanweed | Not Endemic | NE | Off List | Off List | sparse | Field+Literature |
| Lamiaceae (Viburnum) | *Mentha longifolia* | Punk | Not Endemic | NE | Off List | Off List | | Literature |
| Lamiaceae (Viburnum) | *Phlomis rigida* | Diri Çalba | Not Endemic | NE | Off List | Off List | | Literature |
| Lamiaceae (Viburnum) | *Salvia multicaulis* | Kurdish Reyhan | Not Endemic | NE | Off List | Off List | | Literature |
| Lamiaceae (Viburnum) | *Salvia virgata* | Fatmanaweed | Not Endemic | NE | Off List | Off List | | Literature |
| Lamiaceae (Viburnum) | *Salvia suffruticosa* | Thick Shalba | Not Endemic | NE | Off List | Off List | | Literature |
| Lamiaceae (Viburnum) | *Sideritis montana* | Karachay | Not Endemic | NE | Off List | Off List | | Literature |
| Lamiaceae (Viburnum) | *Teucrium chamaedrys* | Hotweed | Not Endemic | NE | Off List | Off List | | Literature |
| Lamiaceae (Viburnum) | *Teucrium orientale* | Vetiver | Not Endemic | NE | Off List | Off List | | Literature |
| Lamiaceae (Viburnum) | *Teucrium polium* | Bitterrabbit | Not Endemic | NE | Off List | Off List | | Literature |
| Lamiaceae (Viburnum) | *Thymus fallax* | Catri | Not Endemic | NE | Off List | Off List | | Literature |
| Lamiaceae (Viburnum) | *Ziziphora capitata* | Anuk | Not Endemic | NE | Off List | Off List | | Literature |
| Liliaceae (Lily family) | *Gagea luteoides* | Gold Star | Not Endemic | NE | Off List | Off List | | Literature |
| Lythraceae (Claretaceae) | *Lythrum salicaria* | Hevhulma | Not Endemic | LC | Off List | Off List | | Literature |
| Malvaceae (Hibiscus) | *Malva neglecta* | Shepherd's Pie | Not Endemic | LC | Off List | Off List | sparse | Field+Literature |
| Malvaceae (Hibiscus) | *Alcea hohenackeri* | Hevur | Not Endemic | NE | Off List | Off List | | Literature |
| Oleaceae (Olive trees) | *Fraxinus angustifolia* | Syria Toothpick | Not Endemic | NE | Off List | Off List | | Literature |
| Onagraceae (Ragweedaceae) | *Epilobium angustifolium* | Moxibustion | Not Endemic | LC | Off List | Off List | | Literature |
| Onagraceae (Ragweedaceae) | *Epilobium parviflorum* | Iraz Ragweed | Not Endemic | LC | Off List | Off List | | Literature |
| Orobanchaceae (Monsterotaceae) | *Parentucellia latifolia* | Threewort | Not Endemic | NE | Off List | Off List | | Literature |
| Orobanchaceae (Monsterotaceae) | *Orobanche alba* | Boğasak | Not Endemic | NE | Off List | Off List | | Literature |
| Papaveraceae (Poppy family) | *Fumaria vaillantii* | Pigeonpea | Not Endemic | NE | Off List | Off List | | Literature |
| Pinaceae (Pine family) | *Pinus nigra* | Black pine | Not Endemic | LC | Off List | Off List | | Literature |

| FAMILY | SPECIES NAME | TURKISH NAME | ENDEMISM | IUCN | CITES | BERN | DEGREE OF RELATIVE ABUNDANCE | TYPE OF DETECTION |
|---|---|---|---|---|---|---|---|---|
| Plantaginaceae (Sinirotugiller) | *Plantago lanceolata* | Damarca | Not Endemic | LC | Off List | Off List | | Literature |
| Plantaginaceae (Sinirotugiller) | *Veronica anagallis-aquatica* | Sugedemesi | Not Endemic | NE | Off List | Off List | | Literature |
| Plantaginaceae (Sinirotugiller) | *Veronica gentianoides* | Candlelflower | Not Endemic | NE | Off List | Off List | | Literature |
| Plantaginaceae (Sinirotugiller) | *Lagotis stolonifera* | Sururotu | Not Endemic | NE | Off List | Off List | | Literature |
| Plumbaginaceae (Cardikenigyls) | *Plumbago europaea* | Karakuna | Not Endemic | NE | Off List | Off List | | Literature |
| Poaceae (Wheataceae) | *Aegilops cylindrica* | Ciliated Grass | Not Endemic | LC | Off List | Off List | | Literature |
| Poaceae (Wheataceae) | *Alopecurus arundinaceus* | Reed Foxtail | Not Endemic | LC | Off List | Off List | | Literature |
| Poaceae (Wheataceae) | *Bromus tectorum* | Prairie Bromine | Not Endemic | NE | Off List | Off List | | Literature |
| Poaceae (Wheataceae) | *Bromus scoparius* | Ibubuk Crop | Not Endemic | NE | Off List | Off List | | Literature |
| Poaceae (Wheataceae) | *Bromus japonicus* | Iyegrass | Not Endemic | NE | Off List | Off List | | Literature |
| Poaceae (Wheataceae) | *Cynodon dactylon* | Dogtooth | Not Endemic | NE | Off List | Off List | | Literature |
| Poaceae (Wheataceae) | *Elymus hispidus* | Ilamuk | Not Endemic | NE | Off List | Off List | | Literature |
| Poaceae (Wheataceae) | *Lolium perenne* | Grass | Not Endemic | LC | Off List | Off List | | Literature |
| Poaceae (Wheataceae) | *Phragmites australis* | Reed | Not Endemic | LC | Off List | Off List | | Literature |
| Poaceae (Wheataceae) | *Stipa holosericea* | Pitchfork Sword | Not Endemic | NE | Off List | Off List | | Literature |
| Poaceae (Wheataceae) | *Poa trivialis* | Rough Wisteria | Not Endemic | NE | Off List | Off List | sparse | Field+Literature |
| Poaceae (Wheataceae) | *Poa bulbosa* | Tuberous Cluster | Not Endemic | NE | Off List | Off List | sparse | Field+Literature |
| Poaceae (Wheataceae) | *Zingeria biebersteiniana* | Loyalist | Not Endemic | NE | Off List | Off List | | Literature |
| Poaceae (Wheataceae) | *Dactylis glomerata* | Hairy Hogweed | Not Endemic | NE | Off List | Off List | | Literature |
| Poaceae (Wheataceae) | *Hordeum bulbosum* | Bead Barley | Not Endemic | LC | Off List | Off List | | Literature |
| Poaceae (Wheataceae) | *Echinaria capitata* | Thistlehead weed | Not Endemic | NE | Off List | Off List | | Literature |
| Poaceae (Wheataceae) | *Taeniatherum caput-medusae* | Fishbone Barley | Not Endemic | NE | Off List | Off List | | Literature |
| Polygonaceae (Lemongrass) | *Polygonum cognatum* | Madımak | Not Endemic | NE | Off List | Off List | sparse | Field+Literature |
| Polygonaceae (Lemongrass) | *Polygonum arenastrum* | Ragweed | Not Endemic | NE | Off List | Off List | | Literature |
| Polygonaceae (Lemongrass) | *Polygonum lapathifolium* | Corkscrew | Not Endemic | NE | Off List | Off List | sparse | Field+Literature |
| Polygonaceae (Lemongrass) | *Rumex alpinus* | Shortah | Not Endemic | LC | Off List | Off List | | Literature |
| Polygonaceae (Lemongrass) | *Rumex scutatus* | Sourgrass | Not Endemic | NE | Off List | Off List | | Literature |
| Primulaceae (Primroses) | *Androsace maxima* | Chicken gizzard | Not Endemic | NE | Off List | Off List | | Literature |
| Ranunculaceae (Buttercupaceae) | *Clematis orientalis* | Dog box | Not Endemic | NE | Off List | Off List | | Literature |
| Ranunculaceae (Buttercupaceae) | *Consolida orientalis* | Purpleflower | Not Endemic | NE | Off List | Off List | | Literature |
| Ranunculaceae (Buttercupaceae) | *Nigella segetalis* | Black Nigella | Not Endemic | NE | Off List | Off List | | Literature |
| Ranunculaceae (Buttercupaceae) | *Ranunculus constantinopolitanus* | Kagithane Flower | Not Endemic | NE | Off List | Off List | | Literature |
| Ranunculaceae (Buttercupaceae) | *Ranunculus ficaria* | Shallot parsley | Not Endemic | NE | Off List | Off List | | Literature |
| Ranunculaceae (Buttercupaceae) | *Ranunculus repens* | Tiktakdana | Not Endemic | LC | Off List | Off List | sparse | Field+Literature |

| FAMILY | SPECIES NAME | TURKISH NAME | ENDEMISM | IUCN | CITES | BERN | DEGREE OF RELATIVE ABUNDANCE | TYPE OF DETECTION |
|---|---|---|---|---|---|---|---|---|
| Ranunculaceae (Buttercupaceae) | *Thalictrum flavum* | Yalanravend | Not Endemic | NE | Off List | Off List | | Literature |
| Resedaceae (Choker family) | *Reseda lutea* | Budgerigar | Not Endemic | NE | Off List | Off List | | Literature |
| Rosaceae (Rosaceae) | *Cerasus brachypetala* | Torn Cherry | Not Endemic | NE | Off List | Off List | | Literature |
| Rosaceae (Rosaceae) | *Cerasus mahaleb* | Mahlep | Not Endemic | NE | Off List | Off List | | Literature |
| Rosaceae (Rosaceae) | *Crataegus pseudoheterophylla* | Oxbow | Not Endemic | NE | Off List | Off List | | Literature |
| Rosaceae (Rosaceae) | *Malus sylvestris* | Sour Apple | Not Endemic | NE | Off List | Off List | | Literature |
| Rosaceae (Rosaceae) | *Potentilla recta* | Water Fingerwort | Not Endemic | NE | Off List | Off List | | Literature |
| Rosaceae (Rosaceae) | *Pyrus elaeagnifolia* | Mountain Pear | Not Endemic | NE | Off List | Off List | | Literature |
| Rosaceae (Rosaceae) | *Rosa canina* | Rosehip | Not Endemic | LC | Off List | Off List | | Literature |
| Rosaceae (Rosaceae) | *Rubus caesius* | Twistberry | Not Endemic | LC | Off List | Off List | | Literature |
| Rubiaceae (Rootballaceae) | *Cruciata taurica* | Miss Crimea | Not Endemic | NE | Off List | Off List | | Literature |
| Salicaceae (Willowherbs) | *Populus alba* | Akkavak | Not Endemic | LC | Off List | Off List | | Literature |
| Salicaceae (Willowherbs) | *Populus nigra* | Hairy Poplar | Not Endemic | NE | Off List | Off List | | Literature |
| Salicaceae (Willowherbs) | *Salix alba* | White Willow | Not Endemic | LC | Off List | Off List | | Literature |
| Salicaceae (Willowherbs) | *Salix pseudodepressa* | Koyak Willow | Not Endemic | NE | Off List | Off List | | Literature |
| Sapindaceae (Soapwoodaceae) | *Acer tataricum* | Tatar Maple | Not Endemic | LC | Off List | Off List | | Literature |
| Scrophulariaceae (Commonacaaceae) | *Verbascum agrimoniifolium* | Majak | Not Endemic | NE | Off List | Off List | | Literature |
| Scrophulariaceae (Commonacaaceae) | *Verbascum oreophilum* | Mountaineer Motherwort | Not Endemic | LC | Off List | Off List | | Literature |
| Tamaricaceae (Tamarisk) | *Tamarix smyrnensis* | Ilgin | Not Endemic | NE | Off List | Off List | | Literature |
| Typhaceae (Sedge family) | *Typha laxmannii* | Papur | Not Endemic | NE | Off List | Off List | | Literature |
| Typhaceae (Sedge family) | *Sparganium erectum* | Little Kındıra | Not Endemic | NE | Off List | Off List | | Literature |
| Urticaceae (Nettles) | *Urtica dioica* | Nettle | Not Endemic | NE | Off List | Off List | sparse | Field+Literature |
| Xanthorrhoeaceae | *Aloe vera* | Yellowcap | Not Endemic | NE | Off List | Off List | | Literature |
| Xanthorrhoeaceae | *Asphodeline damascena* | Hammer | Not Endemic | NE | Off List | Off List | sparse | Field+Literature |

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Among the plant taxa identified in the Project area and its immediate vicinity, 1 endemic species (Ferula huber-morathii) was identified. It was detected at 2 points (see Map 10). These points are "Latitude: 39.021949°, Longitude: 41.527245°" and "Latitude: 39.022572°, Longitude: 41.529513°" coordinates. The distribution of this species in Turkey is detailed below and the area should be monitored by a PhD Botanist during the construction period and for 3 years during the operation phase and ex situ measures should be taken. Before starting any activity, the seeds of the plant subject to ex-situ protection measures should be collected and the unrotted and fertile seeds should be given to the Seed Gene Bank. In addition, after the seeds are collected, the area within a radius of approximately 15 cm should be removed together with the soil and transplanted to suitable areas around the project area with similar soil and habitat structure. Transplantation activities should also be supported by seed propagation using various methods and the sustainability of the mentioned plant taxa in the region should be maintained by sowing/planting.

**FAUNA**

Since fauna species show seasonal changes and it may take several years to determine the fauna inventory of an area, the species given in the fauna lists were prepared by taking into consideration the observations and hearsay of the local people, the biotope characteristics of the region, the current distribution areas and the current biogeography rules. The fauna lists also include species that were not seen during the fieldwork but whose presence in the environment has been revealed by literature research.

**Bivalves (Amphibia)**

The name amphibians or bivalves means those with a bilateral life (amphi: bilateral, bios: life). This is because many species of amphibians spend their lives partly in water and partly on land. Bivalves have no scales, plates, hairs, etc. on their skin. In other words, their skin is bare and contains abundant glands that keep it moist. They usually undergo metamorphosis and turn into a juvenile individual with an adult appearance. Adults are carnivorous. They generally cannot tolerate drought and salinity.

There are 3 types of bivalves that are quite different from each other in terms of appearance; Tailless Frogs (Anura), Tailed Frogs (Salamanders) (Urodela) and Legless Frogs (Apoda), which at first glance look like snakes or worms.

Bivalves distributed in Turkey are divided into two groups: Tailless Frogs (Anura) and Salamanders (Tailed Frogs). All tailless frogs living in Turkey need water to reproduce. While those adapted to terrestrial environments leave the water after the breeding period (e.g. Bufo, Pseudepidalea), water-dependent species can always be observed in, on or near water (e.g. Rana, Pelophylax genera). Some salamanders are completely adapted to terrestrial life and do not even need water for reproduction. Species of the genus Lyciasalamandra are examples. The remaining salamanders mostly require water for reproduction. All of the two-lived animals are poikloterm (cold-blooded) animals and they spend the unsuitable season in hibernation (winter sleep) in various places such as crevices, cracks, under stones, under water, under soil. There are 31 species of bivalves living in Turkey. Of these, 14 species belong to salamanders and the remaining 17 species belong to tailless frogs. All salamanders living in our country are classified under a single family (Salamandridae), while tailless frogs are classified in 6 different families.

**Findings**

As a result of field and literature studies, it was determined that 3 bivalve species belonging to 2 families are distributed in the project area and its immediate vicinity (see Table II.2.9.5). According to IUCN endangerment criteria, 2 species are categorized as "LC" (Low Risk) and 1 species as "DD" (Data Deficient). Among the bivalves identified in the Project area and its immediate surroundings, 3 species are not endemic. According to the Bern Convention, all 3 species distributed in the area are on the Annex-III list. They are not included in the additional lists of the Central Hunting Commission Decisions. According to the CITES Convention; 3 species are not included in the additional lists of the CITES Convention.

**Table II.2.9.5.** Two-Life (Amphibia) Species and Threat Categories Detected in the Project Area and its Vicinity

| FAMILY | SCIENTIFIC NAME | TURKISH NAME | ENDEMISM | IUCN | CITES | BERN | DEGREE OF RELATIVE ABUNDANCE | TYPE OF DETECTION |
|---|---|---|---|---|---|---|---|---|
| Bufonidae (true toads) | *Bufotes variabilis* | Variable Patterned Night Frog | Not Endemic | DD | Off List | ANNEX III | | Literature |
| Ranidae (True water frogs) | *Pelophylax ridibundus* | Lowland Frog, Swamp Frog | Not Endemic | LC | Off List | ANNEX III | sparse | Field+Literature |
| Ranidae (True water frogs) | *Rana macrocnemis* | Uludag Frog | Not Endemic | LC | Off List | ANNEX III | | Literature |

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**Reptilia (Reptiles)**

The class of reptiles (Reptilia) is composed of six groups, namely the calachians (Rhynchocephalia), turtles (Chelonia, Testudinata), crocodiles (Crocodilia), lizards (Sauria), blind lizards (Amphisbaenia) and snakes (Ophidia, Serpentes). Three of these, lizards, blind lizards and snakes, form the order Squamata. Reptiles are included in the Tetrapoda or "land vertebrates" group of vertebrates, but snakes and some lizards lack feet. Reptiles reproduce by laying eggs, although some are viviparous. Some lizards and snakes also reproduce parthenogenetically.

According to current records, 145 reptile species live within the borders of our country. These reptiles, which include terrestrial and aquatic species, include turtles, lizards, blind lizards and snakes. All species included in these groups are poikilotherms (cold-blooded) and spend the inactive season in wintering (hibernation) in order to survive.

**Findings**

As a result of field and literature studies, it was determined that 20 reptile species belonging to 8 families are distributed in and around the project area (see Table II.2.9.6). There is no endemic species among the reptiles identified in the project area and its immediate vicinity. According to IUCN endangerment criteria, 13 species are categorized as "LC" (Low Risk), 6 species as "NE" (Not Evaluated), 1 species as "VU" (Vulnerable). According to the Bern Convention, 4 species are in the Annex-II list and 16 species are in the Annex-III list. It is not included in the additional lists of the Central Hunting Commission Decisions. According to the CITES Convention, 2 species are on the Appendix-II list. The remaining 18 species are not included in the additional lists of the CITES Convention.

The tortoise (*Testudo graeca*) is found in areas where the habitat is "forests, forest openings, roadsides, water edges, stony, rocky areas, meadows, maquis, fields, vineyards, gardens and steppes" in our country, except for the Eastern Black Sea, and has a wide distribution. Although the IUCN threat category is "VU (Vulnerable)" on a global scale, it can be added to a lower risk category considering the population status in our country.

**Table II.2.9.6**. Reptile (Reptilia) Species and Threat Categories Detected in the Project Area and its Vicinity

| FAMILY | SCIENTIFIC NAME | TURKISH NAME | ENDEMISM | IUCN | CITES | BERN | DEGREE OF RELATIVE ABUNDANCE | TYPE OF DETECTION |
|---|---|---|---|---|---|---|---|---|
| Testudinidae (land turtles) | *Testudo graeca* | Turtle | Not Endemic | VU | ANNEX II | ANNEX II | middle | Field+Literature |
| Agamidae (Rock skunks) | *Paralaudakia caucasia* | Caucasian Cats | Not Endemic | NE | Off List | ANNEX III | | Literature |
| Agamidae (Rock skunks) | *Trapelus lessonae* | Steppe Celeriac | Not Endemic | LC | Off List | ANNEX III | | Literature |
| Lacertidae (Old World common lizards) | *Darevskia raddei* | Radde's Lizard | Not Endemic | LC | Off List | ANNEX III | | Literature |
| Lacertidae (Old World common lizards) | *Darevskia valentini* | Valentin's Lizard | Not Endemic | LC | Off List | ANNEX III | | Literature |
| Lacertidae (Old World common lizards) | *Lacerta media* | Eastern Green Lizard | Not Endemic | LC | Off List | ANNEX III | sparse | Field+Literature |
| Lacertidae (Old World common lizards) | *Ophisops elegans* | Field Lizard | Not Endemic | NE | Off List | ANNEX II | sparse | Field+Literature |
| Scincidae (Glossy Lizards) | *Ablepharus chernovi* | Chernov slender lizard | Not Endemic | LC | Off List | ANNEX III | | Literature |
| Scincidae (Glossy Lizards) | *Eumeces schneideri* | Yellow Lizard, Feltemen | Not Endemic | NE | Off List | ANNEX III | | Literature |
| Scincidae (Glossy Lizards) | *Heremites auratus* | Chunky Lizard | Not Endemic | LC | Off List | ANNEX III | | Literature |
| Boidae (Boa constrictors and Pythons) | *Eryx jaculus* | Spurred Snake, Two-Headed Snake | Not Endemic | NE | ANNEX II | ANNEX III | | Literature |
| Colubridae (Whip snakes) | *Dolichophis jugularis* | Black Snake | Not Endemic | LC | Off List | ANNEX II | | Literature |
| Colubridae (Whip snakes) | *Dolichophis schmidti* | Red Snake | Not Endemic | LC | Off List | ANNEX III | | Literature |
| Colubridae (Whip snakes) | *Eirenis modestus* | Tame Snake | Not Endemic | LC | Off List | ANNEX III | | Literature |
| Colubridae (Whip snakes) | *Elaphe sauromates* | Yellow Snake | Not Endemic | LC | Off List | ANNEX III | | Literature |
| Colubridae (Whip snakes) | *Hemorrhois ravergieri* | Kocabas Snake | Not Endemic | LC | Off List | ANNEX III | | Literature |
| Colubridae (Whip snakes) | *Malpolon insignitus* | Pit Head Snake | Not Endemic | NE | Off List | ANNEX III | | Literature |
| Colubridae (Whip snakes) | *Platyceps najadum* | Slender Snake, Arrow Snake | Not Endemic | LC | Off List | ANNEX III | | Literature |
| Typhlopidae (Blind snakes) | *Xerotyphlops vermicularis* | Blind Snake | Not Endemic | LC | Off List | ANNEX III | | Literature |
| Viperidae (Viper family) | *Macrovipera lebetina* | Big Viper | Not Endemic | NE | Off List | ANNEX II | | Literature |

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**Birds (Aves)**

Birds belong to the class of vertebrates between reptiles and mammals. Their most characteristic feature is that their front limbs are transformed into wings for flight. They are also warm-blooded (constant temperature) and their bodies are covered with feathers. They have a light skeletal structure because their bones are hollow.

It is known that 9916 bird species live in the world (Green and Moorhouse, 1995). According to the International Union for Conservation of Wildlife and Natural Resources (IUCN), there are 10,064 bird species in the world (Anonymous, 2012). According to some records, there are 10,052 bird species in the world (Anonymous, 2013). According to Newton and Dale (2001), the Palearctic region covers 14% of the world's bird genera and 10% of bird species. Cox (2010) stated that there are 9930 bird species belonging to 204 families in the world, 2600 species from at least 141 families migrate and this number constitutes approximately 26.2 percent of all species.

Although the number of bird species in our country varies according to different sources, it is 474 according to Kuşbank records and 484 according to the updated Turkey's Anonymous Birds (Trakuş) 2015 October records. With the latest updates, this number has increased to 513 (Kiziroğlu, 2015).

**Findings**

As a result of field and literature studies, 205 bird species were identified in and around the Project area (see Table II.2.9.7). There are no endemic species among the ornithofauna identified in the Project area and its immediate vicinity. According to IUCN (International Union for Conservation of Nature - Red List Species), out of 205 bird species identified in the project area and its immediate vicinity, 1 species is in the "CR" (Critical) category, 2 species are in the "EN" (Endangered) category, 186 species are in the "LC" (Low Risk) category, 2 species are in the "NE" (Not Evaluated) category, 4 species are in the "VU" (Vulnerable) category and 10 species are in the "NT" (Near Threatened) category. According to the Bern Convention, 119 species are in the Annex-II list, 78 species are in the Annex-III list and 8 species are out of scope. According to the CITES Convention; 2 species are in Appendix list I, 29 species are in Appendix list II and 174 species are out of scope. According to the MAKK 2022-2023 Appendix lists, 30 species are included in Appendix list I, 24 species are included in Appendix list II and 151 species are out of scope. The identified 205 species have been taken under protection by the Ministry of Agriculture and Forestry.

**Table II.2.9.7.** Bird (Aves) Species and Threat Categories Detected in the Project Area and its Vicinity

| FAMILY | SCIENTIFIC NAME | TURKISH NAME | ENDEMISM | IUCN | CITES | BERN | TOB | MAKK | STATUS | DEGREE OF RELATIVE ABUNDANCE | TYPE OF DETECT ION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Accipitridae (Eagle family) | *Accipiter brevipes* | Summer Hawk | Endemic | LC | II | ANNEX III | Protection | Off List | Indigenous | | Literature |
| Accipitridae (Eagle family) | *Accipiter nisus* | Sparrowhawk | Endemic | LC | II | ANNEX III | Protection | Off List | Indigenous | sparse | Land+ |
| Accipitridae (Eagle family) | *Aegypius monachus* | Black Vulture | Endemic | NT | II | ANNEX III | Protection | Off List | Indigenous | sparse | Land+ |
| Accipitridae (Eagle family) | *Aquila chrysaetos* | Rock Eagle | Endemic | LC | II | ANNEX III | Protection | Off List | Indigenous | sparse | Land+ |
| Accipitridae (Eagle family) | *Aquila heliaca* | Shah Eagle | Endemic | VU | I | ANNEX III | Protection | Off List | Indigenous | | Literature |
| Accipitridae (Eagle family) | *Aquila nipalensis* | Steppe Eagle | Endemic | EN | II | ANNEX III | Protection | Off List | Indigenous | | Literature |
| Accipitridae (Eagle family) | *Buteo buteo* | Sahin | Endemic | LC | II | ANNEX III | Protection | Off List | Indigenous | sparse | Land+ |
| Accipitridae (Eagle family) | *Buteo rufinus* | Red Falcon | Endemic | LC | II | ANNEX III | Protection | Off List | Indigenous | sparse | Land+ |
| Accipitridae (Eagle family) | *Circaetus gallicus* | Snake Eagle | Endemic | LC | II | ANNEX III | Protection | Off List | Summer Visitor | sparse | Land+ |
| Accipitridae (Eagle family) | *Circus aeruginosus* | Reed Delicacy | Endemic | LC | II | ANNEX III | Protection | Off List | Indigenous | | Literature |
| Accipitridae (Eagle family) | *Circus cyaneus* | Gökçe Delice | Endemic | LC | II | ANNEX III | Protection | Off List | Winter Visitor | sparse | Land+ |
| Accipitridae (Eagle family) | *Circus macrourus* | Bozkir Delicacy | Endemic | NT | II | ANNEX III | Protection | Off List | Indigenous | | Literature |
| Accipitridae (Eagle family) | *Circus pygargus* | Meadow Delicacy | Endemic | LC | II | ANNEX III | Protection | Off List | Transit | | Literature |
| Accipitridae (Eagle family) | *Gypaetus barbatus* | Bearded Vulture | Endemic | NT | II | ANNEX III | Protection | Off List | Indigenous | | Literature |
| Accipitridae (Eagle family) | *Gyps fulvus* | Red Vulture | Endemic | LC | II | ANNEX III | Protection | Off List | Indigenous | sparse | Land+ |
| Accipitridae (Eagle family) | *Haliaeetus albicilla* | White-tailed Eagle | Endemic | LC | I | ANNEX III | Protection | Off List | Indigenous | sparse | Land+ |
| Accipitridae (Eagle family) | *Hieraaetus pennatus* | Little Eagle | Endemic | LC | II | ANNEX III | Protection | Off List | Indigenous | | Literature |
| Accipitridae (Eagle family) | *Milvus migrans* | Black Rookie | Endemic | LC | II | ANNEX III | Protection | Off List | Transit | sparse | Land+ |
| Accipitridae (Eagle family) | *Neophron* | Little Vulture | Endemic | EN | II | ANNEX III | Protection | Off List | Indigenous | sparse | Land+ |

| FAMILY | SCIENTIFIC NAME | TURKISH NAME | ENDEMISM | IUCN | CITES | BERN | TOB | MAKK | STATUS | DEGREE OF RELATIVE ABUNDANCE | TYPE OF DETECT ION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Acrocephalidae (whispers) Reedbuck, | *Acrocephalus* | Great Reedbuck | Endemic | LC | List | ANNEX III | Protection | Off List | Summer Visitor | | Literature |
| Acrocephalidae (whispers) Reedbuck, | *Acrocephalus palustris* | Bush Reedbuck | Endemic | LC | List | ANNEX III | Protection | Off List | Summer Visitor | | Literature |
| Acrocephalidae (whispers) Reedbuck, | *Acrocephalus* | Kındıra Reed | Endemic | LC | List | ANNEX III | Protection | Off List | Summer Visitor | | Literature |
| Acrocephalidae (whispers) Reedbuck, | *Iduna pallida* | White Mucallit | Endemic | LC | List | ANNEX III | Protection | Off List | Summer Visitor | sparse | Land+ |
| Aegithalidae (Longtails) | *Aegithalos caudatus* | Long-tailed | Endemic | LC | List | ANNEX III | Protection | Off List | Indigenous | sparse | Land+ |
| Alaudidae (Hooves) | *Alauda arvensis* | Skylark | Endemic | LC | List | ANNEX III | Protection | ANNEX I | Winter Visitor | sparse | Land+ |
| Alaudidae (Hooves) | *Eremophila alpestris* | Eared Hoofed Harrier | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | sparse | Land+ |
| Alaudidae (Hooves) | *Galerida cristata* | Crested Hoary | Endemic | LC | List | ANNEX III | Protection | ANNEX I | Indigenous | sparse | Land+ |
| Alaudidae (Hooves) | *Lullula arborea* | Forest Hoary | Endemic | LC | List | ANNEX III | Protection | ANNEX I | Winter Visitor | | Literature |
| Alaudidae (Hooves) | *Melanocorypha* | Small Strangled | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | sparse | Land+ |
| Alaudidae (Hooves) | *Melanocorypha* | Bullfinch Toygar | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | sparse | Land+ |
| Alcedinidae (Kingfisher family) | *Alcedo atthis* | Kingfisher | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | | Literature |
| Anatidae (Duck family) | *Anas acuta* | Bristletail | Endemic | LC | List | ANNEX III | Protection | ANNEX II | Indigenous | | Literature |
| Anatidae (Duck family) | *Anas crecca* | Çamurcun | Endemic | LC | List | ANNEX III | Protection | ANNEX II | Indigenous | | Literature |
| Anatidae (Duck family) | *Anas platyrhynchos* | Greenhead | Endemic | LC | List | ANNEX III | Protection | ANNEX II | Indigenous | sparse | Land+ |
| Anatidae (Duck family) | *Aythya ferina* | Elmabaş Patka | Endemic | VU | List | ANNEX III | Protection | ANNEX II | Indigenous | | Literature |
| Anatidae (Duck family) | *Aythya fuligula* | Crested Egret | Endemic | LC | List | ANNEX III | Protection | ANNEX II | Indigenous | | Literature |
| Anatidae (Duck family) | *Mareca penelope* | Fiyu | Endemic | LC | List | ANNEX III | Protection | ANNEX II | Indigenous | | Literature |
| Anatidae (Duck family) | *Spatula clypeata* | Spoonbill | Endemic | LC | List | ANNEX III | Protection | ANNEX II | Indigenous | | Literature |
| Anatidae (Duck family) | *Spatula querquedula* | Spinning wheel | Endemic | LC | List | ANNEX III | Protection | ANNEX II | Indigenous | | Literature |

| FAMILY | SCIENTIFIC NAME | TURKISH NAME | ENDEMISM | IUCN | CITES | BERN | TOB | MAKK | STATUS | DEGREE OF RELATIVE ABUNDANCE | TYPE OF DETECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Anatidae (Duck family) | *Tadorna ferruginea* | Angıt | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | sparse | Land+ |
| Anatidae (Duck family) | *Tadorna tadorna* | Suna | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | | Literature |
| Apodidae (Milking family, | *Apus apus* | Ebabil | Endemic | LC | List | ANNEX III | Protection | Off List | Transit | sparse | Land+ |
| Apodidae (Milking family, | *Tachymarptis melba* | White-breasted Swift | Endemic | LC | List | ANNEX II | Protection | Off List | Transit | sparse | Land+ |
| Ardeidae (Herons) | *Ardea alba* | Great Egret | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | sparse | Land+ |
| Ardeidae (Herons) | *Ardea cinerea* | Gray Heron | Endemic | LC | List | ANNEX III | Protection | ANNEX I | Indigenous | sparse | Land+ |
| Ardeidae (Herons) | *Ardea purpurea* | Gray Heron | Endemic | LC | List | ANNEX II | Protection | Off List | Transit | sparse | Land+ |
| Ardeidae (Herons) | *Ardeola ralloides* | Alaca Heron | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | sparse | Land+ |
| Ardeidae (Herons) | *Botaurus stellaris* | Balaban | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | | Literature |
| Ardeidae (Herons) | *Bubulcus ibis* | Cattle Fisher | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | sparse | Land+ |
| Ardeidae (Herons) | *Egretta garzetta* | Little Egret | Endemic | LC | List | ANNEX II | Protection | Off List | Winter Visitor | sparse | Land+Liter |
| Ardeidae (Herons) | *Ixobrychus minutus* | Little Balaban | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | | Literature |
| Ardeidae (Herons) | *Nycticorax nycticorax* | Night Fisherman | Endemic | LC | List | ANNEX II | Protection | Off List | Transit | sparse | Land+ |
| Burhinidae (Burhinidae) | *Burhinus oedicnemus* | Kocagöz | Endemic | LC | List | ANNEX II | Protection | Off List | Local, Summer | | Literature |
| Caprimulgidae | *Caprimulgus* | Shepherdwaldatan | Endemic | LC | List | ANNEX II | Protection | Off List | Transit | | Literature |
| Charadriidae (Rainbirds) | *Charadrius* | Maple Cılıbıt | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | | Literature |
| Charadriidae (Rainbirds) | *Charadrius dubius* | Halkali Small | Endemic | LC | List | ANNEX II | Protection | Off List | Transit | | Literature |
| Charadriidae (Rainbirds) | *Vanellus gregarius* | Vernacular Redbird | Endemic | CR | List | ANNEX III | Protection | Off List | Summer Visitor | | Literature |
| Charadriidae (Rainbirds) | *Vanellus spinosus* | Spurred Maidenbird | Endemic | LC | List | ANNEX II | Protection | Off List | Summer Visitor | | Literature |
| Charadriidae (Rainbirds) | *Vanellus vanellus* | Maidenbird | Endemic | NT | List | ANNEX III | Protection | ANNEX I | Winter Visitor | | Literature |

| FAMILY | SCIENTIFIC NAME | TURKISH NAME | ENDEMISM | IUCN | CITES | BERN | TOB | MAKK | STATUS | DEGREE OF RELATIVE ABUNDANCE | TYPE OF DETECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ciconiidae (Storks) | *Ciconia ciconia* | Stork | Endemic | LC | List | ANNEX II | Protection | Off List | Summer Visitor | sparse | Land+ |
| Ciconiidae (Storks) | *Ciconia nigra* | Black Stork | Endemic | LC | II | ANNEX II | Protection | Off List | Transit | sparse | Land+ |
| Cinclidae (Water-blackbirds) | *Cinclus cinclus* | Deerbird | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | sparse | Land+ |
| Columbidae (Pigeon family) | *Columba livia* | Rock Dove | Endemic | LC | List | ANNEX III | Protection | ANNEX II | Indigenous | sparse | Land+ |
| Columbidae (Pigeon family) | *Columba oenas* | Gökçe Güvercin | Endemic | LC | List | ANNEX III | Protection | ANNEX I | Indigenous | | Literature |
| Columbidae (Pigeon family) | *Columba palumbus* | Tahtalalı | Endemic | LC | List | List | Protection | ANNEX II | Winter Visitor | sparse | Land+ |
| Columbidae (Pigeon family) | *Spilopelia* | Little Dove | Endemic | LC | List | ANNEX III | Protection | ANNEX I | Indigenous | | Literature |
| Columbidae (Pigeon family) | *Streptopelia decaocto* | Kumru | Endemic | LC | List | ANNEX III | Protection | ANNEX I | Indigenous | sparse | Land+ |
| Columbidae (Pigeon family) | *Streptopelia turtur* | Steppe | Endemic | VU | List | ANNEX III | Protection | ANNEX II | Summer Visitor | sparse | Land+Liter |
| Coraciidae (Raven family) | *Coracias garrulus* | Skykuzgun | Endemic | LC | List | ANNEX II | Protection | Off List | Transit | | Literature |
| Corvidae (Crows) | *Corvus corax* | Raven | Endemic | LC | List | ANNEX III | Protection | ANNEX I | Indigenous | sparse | Land+ |
| Corvidae (Crows) | *Corvus cornix* | Carrion Crow | Endemic | NE | List | ANNEX III | Protection | Off List | Indigenous | sparse | Land+ |
| Corvidae (Crows) | *Corvus corone* | Carrion Crow | Endemic | LC | List | List | Protection | ANNEX II | Indigenous | sparse | Land+ |
| Corvidae (Crows) | *Corvus frugilegus* | Crop Crow | Endemic | LC | List | List | Protection | ANNEX II | Indigenous | sparse | Land+ |
| Corvidae (Crows) | *Corvus monedula* | Little Crow | Endemic | LC | List | List | Protection | ANNEX II | Indigenous | sparse | Land+ |
| Corvidae (Crows) | *Garrulus glandarius* | Alakarga | Endemic | LC | List | List | Protection | ANNEX II | Indigenous | | Literature |
| Corvidae (Crows) | *Pica pica* | Magpie | Endemic | LC | List | List | Protection | ANNEX II | Indigenous | sparse | Land+ |
| Corvidae (Crows) | *Pyrrhocorax graculus* | Sarigagali Mountain | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | | Literature |
| Cuculidae (Cuckoo family) | *Cuculus canorus* | Cuckoo | Endemic | LC | List | ANNEX III | Protection | Off List | Summer Visitor | | Literature |
| Emberizidae (Bunting) | *Emberiza buchanani* | Eastern bunting | Endemic | LC | List | ANNEX III | Protection | ANNEX I | Summer Visitor | | Literature |

| FAMILY | SCIENTIFIC NAME | TURKISH NAME | ENDEMISM | IUCN | CITES | BERN | TOB | MAKK | STATUS | DEGREE OF RELATIVE ABUNDANCE | TYPE OF DETECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Emberizidae (Bunting) | *Emberiza calandra* | Field Mint | Endemic | LC | List | ANNEX III | Protection | ANNEX I | Indigenous | sparse | Land+ |
| Emberizidae (Bunting) | *Emberiza cia* | Rock Mint | Endemic | LC | List | ANNEX II | Protection | Off List | Summer Visitor | sparse | Land+ |
| Emberizidae (Bunting) | *Emberiza citrinella* | Yellow Chinte | Endemic | LC | List | ANNEX II | Protection | Off List | Local, Summer | sparse | Land+ |
| Emberizidae (Bunting) | *Emberiza hortulana* | Cherrybird | Endemic | LC | List | ANNEX III | Protection | ANNEX I | Summer Visitor | sparse | Land+ |
| Emberizidae (Bunting) | *Emberiza* | Blackhead Chinte | Endemic | LC | List | ANNEX II | Protection | Off List | Summer Visitor | sparse | Land+ |
| Falconidae (Kestrel family) | *Falco naumanni* | Little Kestrel | Endemic | LC | II | ANNEX II | Protection | Off List | Transit | sparse | Land+ |
| Falconidae (Kestrel family) | *Falco subbuteo* | Delice Dogan | Endemic | LC | II | ANNEX II | Protection | Off List | Indigenous | sparse | Land+ |
| Falconidae (Kestrel family) | *Falco tinnunculus* | Kestrel | Endemic | LC | II | ANNEX II | Protection | Off List | Indigenous | sparse | Land+ |
| Fringillidae (Finches) | *Carduelis carduelis* | Saka | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | sparse | Land+ |
| Fringillidae (Finches) | *Carpodacus erythrinus* | Chutney | Endemic | LC | List | ANNEX II | Protection | Off List | Summer Visitor | | Literature |
| Fringillidae (Finches) | *Chloris chloris* | Florya | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | sparse | Land+ |
| Fringillidae (Finches) | *Fringilla coelebs* | Finch | Endemic | LC | List | ANNEX III | Protection | ANNEX I | Indigenous | sparse | Land+ |
| Fringillidae (Finches) | *Linaria cannabina* | Flaxbird | Endemic | LC | List | ANNEX II | Protection | Off List | Winter Visitor | sparse | Land+ |
| Fringillidae (Finches) | *Linaria flavirostris* | Sarigagali | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | | Literature |
| Fringillidae (Finches) | *Serinus pusillus* | Black Musketeer | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | sparse | Land+ |
| Fringillidae (Finches) | *Spinus spinus* | Blackheaded Musketeer | Endemic | LC | List | ANNEX II | Protection | Off List | Winter Visitor | sparse | Land+ |
| Glareolidae (Swamp | *Glareola nordmanni* | Blackbeard | Endemic | NT | List | ANNEX II | Protection | Off List | Transit, Summer | | Literature |
| Gruidae (Cranes) | *Grus grus* | Crane | Endemic | LC | II | ANNEX II | Protection | Off List | Transit | | Literature |
| Haematopodidae (Poyraz | *Haematopus* | Bluebird | Endemic | NT | List | ANNEX III | Protection | ANNEX I | Transit, Summer | | Literature |
| Hirundinidae (Swallow family) | *Delichon urbicum* | House Swallow | Endemic | LC | List | ANNEX II | Protection | Off List | Summer Visitor | sparse | Land+ |

| FAMILY | SCIENTIFIC NAME | TURKISH NAME | ENDEMISM | IUCN | CITES | BERN | TOB | MAKK | STATUS | DEGREE OF RELATIVE ABUNDANCE | TYPE OF DETECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Hirundinidae (Swallow family) | *Hirundo rustica* | Swallow | Endemic | LC | List | ANNEX II | Protection | Off List | Summer Visitor | sparse | Land+ |
| Hirundinidae (Swallow family) | *Ptyonoprogne* | Rock Swallow | Endemic | LC | List | ANNEX II | Protection | Off List | Winter Visitor | | Literature |
| Hirundinidae (Swallow family) | *Riparia riparia* | Sand Swallow | Endemic | LC | List | ANNEX II | Protection | Off List | Summer Visitor | sparse | Land+ |
| Laniidae (Spiderbirds) | *Lanius collurio* | Redback | Endemic | LC | List | ANNEX II | Protection | ANNEX I | Summer Visitor | sparse | Land+ |
| Laniidae (Spiderbirds) | *Lanius excubitor* | Big | Endemic | LC | List | ANNEX II | Protection | Off List | Summer Visitor | sparse | Land+ |
| Laniidae (Spiderbirds) | *Lanius minor* | Karaalınlı | Endemic | LC | List | ANNEX II | Protection | Off List | Transit | sparse | Land+ |
| Laniidae (Spiderbirds) | *Lanius senator* | Red-headed | Endemic | LC | List | ANNEX II | Protection | Off List | Transit | sparse | Land+ |
| Laridae (Gulls) | *Chlidonias leucopterus* | White-winged Tern | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | | Literature |
| Laridae (Gulls) | *Gelochelidon nilotica* | Smiling Sumru | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | | Literature |
| Laridae (Gulls) | *Hydroprogne caspia* | Caspian Tern | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | | Literature |
| Laridae (Gulls) | *Larus armenicus* | Lake Van Gull | Endemic | NT | List | ANNEX III | Protection | ANNEX I | Indigenous | sparse | Land+ |
| Laridae (Gulls) | *Larus ichthyaetus* | Big Karabash | Endemic | LC | List | ANNEX III | Protection | ANNEX I | Winter Visitor | sparse | Land+ |
| Laridae (Gulls) | *Larus ridibundus* | Blackheaded Seagull | Endemic | LC | List | ANNEX III | Protection | ANNEX I | Winter Visitor | sparse | Land+ |
| Laridae (Gulls) | *Sterna hirundo* | Sumru | Endemic | LC | List | ANNEX II | Protection | Off List | Transit | | Literature |
| Laridae (Gulls) | *Sternula albifrons* | Little Sumru | Endemic | LC | List | ANNEX II | Protection | Off List | Summer Visitor | | Literature |
| Meropidae (Bee-eater family) | *Merops apiaster* | Bee-eater | Endemic | LC | List | ANNEX II | Protection | Off List | Transit | sparse | Land+ |
| Motacillidae | *Anthus campestris* | Prairie Figbird | Endemic | LC | List | ANNEX II | Protection | Off List | Summer Visitor | sparse | Land+ |
| Motacillidae | *Anthus pratensis* | Meadow Fritillary | Endemic | NT | List | ANNEX II | Protection | Off List | Winter Visitor | sparse | Land+ |
| Motacillidae | *Anthus richardi* | Spurs | Endemic | LC | List | ANNEX II | Protection | Off List | Summer Visitor | | Literature |
| Motacillidae | *Anthus spinoletta* | Mountain Figbird | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | sparse | Land+ |

| FAMILY | SCIENTIFIC NAME | TURKISH NAME | ENDEMISM | IUCN | CITES | BERN | TOB | MAKK | STATUS | DEGREE OF RELATIVE ABUNDANCE | TYPE OF DETECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Motacillidae | *Anthus trivialis* | Tree Figbird | Endemic | LC | List | ANNEX II | Protection | Off List | Transit | | Literature |
| Motacillidae | *Motacilla alba* | Whitetail | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | sparse | Land+ |
| Motacillidae | *Motacilla cinerea* | Mountain | Endemic | LC | List | ANNEX II | Protection | Off List | Winter Visitor | | Literature |
| Motacillidae | *Motacilla citreola* | Saribaşlı | Endemic | LC | List | ANNEX II | Protection | Off List | Local, Summer | | Literature |
| Motacillidae | *Motacilla flava* | Yellow | Endemic | LC | List | ANNEX II | Protection | Off List | Summer Visitor | sparse | Land+ |
| Motacillidae | *Motacilla flava feldegg* | Yellow | Endemic | LC | List | ANNEX II | Protection | Off List | Summer Visitor | sparse | Land+ |
| Muscicapidae (Flycatchers) | *Cercotrichas* | Warbler | Endemic | LC | List | ANNEX II | Protection | Off List | Summer Visitor | | Literature |
| Muscicapidae (Flycatchers) | *Cyanecula svecica* | Mavigerdan | Endemic | LC | List | ANNEX II | Protection | Off List | Local, Summer | | Literature |
| Muscicapidae (Flycatchers) | *Erithacus rubecula* | Kizilgerdan | Endemic | LC | List | ANNEX II | Protection | Off List | Winter Visitor | sparse | Land+ |
| Muscicapidae (Flycatchers) | *Ficedula albicollis* | Halkali Flycatcher | Endemic | LC | List | ANNEX II | Protection | Off List | Summer Visitor | | Literature |
| Muscicapidae (Flycatchers) | *Ficedula semitorquata* | Alaca Flycatcher | Endemic | LC | List | ANNEX II | Protection | Off List | Transit | | Literature |
| Muscicapidae (Flycatchers) | *Irania gutturalis* | Stonebird | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | sparse | Land+ |
| Muscicapidae (Flycatchers) | *Luscinia luscinia* | Spotted Nightingale | Endemic | LC | List | ANNEX II | Protection | Off List | Transit, Summer | | Literature |
| Muscicapidae (Flycatchers) | *Luscinia* | Nightingale | Endemic | LC | List | ANNEX II | Protection | Off List | Summer Visitor | sparse | Land+ |
| Muscicapidae (Flycatchers) | *Monticola saxatilis* | Tashkizili | Endemic | LC | List | ANNEX II | Protection | Off List | Summer Visitor | | Literature |
| Muscicapidae (Flycatchers) | *Monticola solitarius* | Gokardic | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | | Literature |
| Muscicapidae (Flycatchers) | *Muscicapa striata* | Spotted Flycatcher | Endemic | LC | List | ANNEX II | Protection | Off List | Transit | | Literature |
| Muscicapidae (Flycatchers) | *Oenanthe finschii* | Accordion | Endemic | LC | List | ANNEX II | Protection | Off List | Local, Summer | sparse | Land+ |
| Muscicapidae (Flycatchers) | *Oenanthe hispanica* | Karakulakli | Endemic | LC | List | ANNEX II | Protection | Off List | Summer Visitor | sparse | Land+ |
| Muscicapidae (Flycatchers) | *Oenanthe isabellina* | Gray Wagtail | Endemic | LC | List | ANNEX II | Protection | ANNEX I | Summer Visitor | sparse | Land+ |

| FAMILY | SCIENTIFIC NAME | TURKISH NAME | ENDEMISM | IUCN | CITES | BERN | TOB | MAKK | STATUS | DEGREE OF RELATIVE ABUNDANCE | TYPE OF DETECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Muscicapidae (Flycatchers) | *Oenanthe oenanthe* | Wagtail | Endemic | LC | List | ANNEX II | Protection | ANNEX I | Transit | sparse | Land+ |
| Muscicapidae (Flycatchers) | *Phoenicurus ochruros* | Black Redtail | Endemic | LC | List | ANNEX II | Protection | Off List | Winter Visitor | sparse | Land+ |
| Muscicapidae (Flycatchers) | *Phoenicurus* | Redtail | Endemic | LC | List | ANNEX II | Protection | Off List | Summer Visitor | sparse | Land+ |
| Muscicapidae (Flycatchers) | *Saxicola maurus* | Siberian Stonechat | Endemic | NE | List | ANNEX II | Protection | Off List | Indigenous | | Literature |
| Muscicapidae (Flycatchers) | *Saxicola rubetra* | Meadow Stonechat | Endemic | LC | List | ANNEX II | Protection | Off List | Transit | sparse | Land+ |
| Muscicapidae (Flycatchers) | *Saxicola torquatus* | Stonechat | Endemic | LC | List | ANNEX II | Protection | Off List | Winter Visitor | sparse | Land+ |
| Oriolidae (Yellowasmaceae) | *Oriolus oriolus* | Clematis | Endemic | LC | List | ANNEX II | Protection | Off List | Summer Visitor | | Literature |
| Otididae (Toybirds) | *Otis tarda* | Toy | Endemic | VU | II | ANNEX II | Protection | Off List | Indigenous | | Literature |
| Otididae (Toybirds) | *Tetrax tetrax* | Mezgeldek | Endemic | NT | II | ANNEX II | Protection | Off List | Indigenous | | Literature |
| Paridae (Titmouse) | *Cyanistes caeruleus* | Blue Tit | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | sparse | Land+ |
| Paridae (Titmouse) | *Parus major* | Great Tit | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | sparse | Land+ |
| Passeridae (Sparrow family) | *Carpospiza* | Grey Sparrow | Endemic | LC | List | ANNEX III | Protection | Off List | Summer Visitor | | Literature |
| Passeridae (Sparrow family) | *Montifringilla nivalis* | Snow Sparrow | Endemic | LC | List | ANNEX III | Protection | Off List | Summer Visitor | | Literature |
| Passeridae (Sparrow family) | *Passer domesticus* | Sparrow | Endemic | LC | List | List | Protection | ANNEX II | Indigenous | sparse | Land+ |
| Passeridae (Sparrow family) | *Passer hispaniolensis* | Willow Sparrow | Endemic | LC | List | ANNEX III | Protection | ANNEX I | Indigenous | sparse | Land+ |
| Passeridae (Sparrow family) | *Passer montanus* | Tree Sparrow | Endemic | LC | List | ANNEX III | Protection | ANNEX I | Indigenous | sparse | Land+ |
| Passeridae (Sparrow family) | *Petronia petronia* | Rock Sparrow | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | sparse | Land+ |
| Phalacrocoracidae | *Phalacrocorax carbo* | Cormorant | Endemic | LC | List | ANNEX III | Protection | ANNEX I | Winter Visitor | | Literature |
| Phasianidae (Pheasant family) | *Alectoris chukar* | Partridge with Henna | Endemic | LC | List | ANNEX III | Protection | ANNEX II | Indigenous | | Literature |
| Phasianidae (Pheasant family) | *Coturnix coturnix* | Quail | Endemic | LC | List | ANNEX III | Protection | ANNEX II | Transit | | Literature |

| FAMILY | SCIENTIFIC NAME | TURKISH NAME | ENDEMISM | IUCN | CITES | BERN | TOB | MAKK | STATUS | DEGREE OF RELATIVE ABUNDANCE | TYPE OF DETECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Phasianidae (Pheasant family) | *Perdix perdix* | Strawberry cupcake | Endemic | LC | List | ANNEX III | Protection | ANNEX II | Indigenous | | Literature |
| Phylloscopidae (Willow warblers) | *Phylloscopus collybita* | Crazy | Endemic | LC | List | ANNEX III | Protection | Off List | Indigenous | sparse | Land+ |
| Picidae (Woodpeckers) | *Dendrocopos syriacus* | Alaca Woodpecker | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | | Literature |
| Picidae (Woodpeckers) | *Dryobates minor* | Little Woodpecker | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | | Literature |
| Picidae (Woodpeckers) | *Leiopicus medius* | Hydrangea Woodpecker | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | | Literature |
| Picidae (Woodpeckers) | *Picus viridis* | Green Woodpecker | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | | Literature |
| Podicipedidae (Swifts) | *Podiceps cristatus* | Bahri | Endemic | LC | List | ANNEX III | Protection | Off List | Indigenous | | Literature |
| Podicipedidae (Swifts) | *Podiceps grisegena* | Kizilboyunlu | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | | Literature |
| Podicipedidae (Swifts) | *Podiceps nigricollis* | Karaboyunlu | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | | Literature |
| Podicipedidae (Swifts) | *Tachybaptus ruficollis* | Little Grebe | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | | Literature |
| Rallidae (Waterfowl) | *Fulica atra* | Sakarmeke | Endemic | LC | List | ANNEX III | Protection | ANNEX II | Indigenous | sparse | Land+ |
| Rallidae (Waterfowl) | *Gallinula chloropus* | Waterfowl | Endemic | LC | List | ANNEX III | Protection | ANNEX I | Indigenous | | Literature |
| Rallidae (Waterfowl) | *Porphyrio porphyrio* | Reedbuck | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | | Literature |
| Recurvirostridae (Swordflies) | *Himantopus* | Longlegs | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | | Literature |
| Recurvirostridae (Swordflies) | *Recurvirostra avosetta* | Swordbeak | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | | Literature |
| Remizidae (Sandpipers) | *Remiz pendulinus* | Sowbird | Endemic | LC | List | ANNEX III | Protection | Off List | Indigenous | | Literature |
| Scolopacidae (Sandpiper family) | *Actitis hypoleucos* | Creek Whistleblower | Endemic | LC | List | ANNEX III | Protection | Off List | Summer Visitor | sparse | Land+ |
| Scolopacidae (Sandpiper family) | *Calidris alpina* | Karakarinli | Endemic | LC | List | ANNEX II | Protection | Off List | Winter Visitor | | Literature |
| Scolopacidae (Sandpiper family) | *Calidris minuta* | Little Sandpiper | Endemic | LC | List | ANNEX II | Protection | Off List | Winter Visitor | | Literature |
| Scolopacidae (Sandpiper family) | *Calidris pugnax* | Fightingbird | Endemic | LC | List | ANNEX III | Protection | ANNEX I | Transit | sparse | Land+ |

| FAMILY | SCIENTIFIC NAME | TURKISH NAME | ENDEMISM | IUCN | CITES | BERN | TOB | MAKK | STATUS | DEGREE OF RELATIVE ABUNDANCE | TYPE OF DETECT ION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Scolopacidae (Sandpiper family) | *Gallinago gallinago* | Criminality | Endemic | LC | List | ANNEX III | Protection | ANNEX II | Winter Visitor | | Literature |
| Scolopacidae (Sandpiper family) | *Gallinago media* | Great Criminality | Endemic | NT | List | ANNEX II | Protection | Off List | Summer Visitor | | Literature |
| Scolopacidae (Sandpiper family) | *Scolopax rusticola* | Sandpiper | Endemic | LC | List | ANNEX III | Protection | ANNEX II | Winter Visitor | | Literature |
| Scolopacidae (Sandpiper family) | *Tringa nebularia* | Greenlegs | Endemic | LC | List | ANNEX III | Protection | ANNEX I | Winter Visitor | | Literature |
| Scolopacidae (Sandpiper family) | *Tringa ochropus* | Green Whistleblower | Endemic | LC | List | ANNEX II | Protection | Off List | Winter Visitor | | Literature |
| Scolopacidae (Sandpiper family) | *Tringa totanus* | Kizilbacak | Endemic | LC | List | ANNEX III | Protection | ANNEX I | Winter Visitor | | Literature |
| Scotocercidae (Reed | *Cettia cetti* | Reedbuckthorn | Endemic | LC | List | ANNEX III | Protection | Off List | Indigenous | | Literature |
| Sittidae (Nuthatches) | *Sitta europaea* | Plasterer | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | | Literature |
| Sittidae (Nuthatches) | *Sitta neumayer* | Rock Plasterer | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | | Literature |
| Strigidae (Owl family) | *Asio otus* | Eared Forest | Endemic | LC | II | ANNEX II | Protection | Off List | Indigenous | | Literature |
| Strigidae (Owl family) | *Athene noctua* | Kukumav | Endemic | LC | II | ANNEX II | Protection | Off List | Indigenous | sparse | Land+ |
| Strigidae (Owl family) | *Bubo bubo* | Puhu | Endemic | LC | II | ANNEX II | Protection | Off List | Indigenous | | Literature |
| Strigidae (Owl family) | *Otus scops* | Ishakkush | Endemic | LC | II | ANNEX II | Protection | Off List | Summer Visitor | | Literature |
| Sturnidae (Starlings) | *Acridotheres tristis* | Çiğdeci | Endemic | LC | List | ANNEX III | Protection | ANNEX I | Indigenous | | Literature |
| Sturnidae (Starlings) | *Pastor roseus* | Starling | Endemic | LC | List | ANNEX II | Protection | Off List | Summer Visitor | | Literature |
| Sturnidae (Starlings) | *Sturnus vulgaris* | Starling | Endemic | LC | List | List | Protection | ANNEX I | Winter Visitor | sparse | Land+ |
| Sylviidae (Warblers) | *Sylvia communis* | Akgerdanli Warbler | Endemic | LC | List | ANNEX II | Protection | Off List | Transit | sparse | Land+ |
| Sylviidae (Warblers) | *Sylvia curruca* | Small Akgerdanli | Endemic | LC | List | ANNEX II | Protection | Off List | Summer Visitor | | Literature |
| Sylviidae (Warblers) | *Sylvia melanocephala* | Masked Warbler | Endemic | LC | List | ANNEX II | Protection | Off List | Winter Visitor | | Literature |
| Threskiornithidae | *Platalea leucorodia* | Khashoggi | Endemic | LC | II | ANNEX II | Protection | Off List | Indigenous | | Literature |

| FAMILY | SCIENTIFIC NAME | TURKISH NAME | ENDEMISM | IUCN | CITES | BERN | TOB | MAKK | STATUS | DEGREE OF RELATIVE ABUNDANCE | TYPE OF DETECTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Threskiornithidae | *Plegadis falcinellus* | Çeltikçi | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | | Literature |
| Troglodytidae (Chickadees) | *Troglodytes* | Hedgehog | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | | Literature |
| Turdidae (Blackbirds) | *Turdus merula* | Blackbird | Endemic | LC | List | ANNEX III | Protection | ANNEX II | Indigenous | | Literature |
| Turdidae (Blackbirds) | *Turdus torquatus* | Stifled Juniper | Endemic | LC | List | ANNEX II | Protection | Off List | Indigenous | | Literature |
| Turdidae (Blackbirds) | *Turdus viscivorus* | Mistletoe Thrush | Endemic | LC | List | ANNEX III | Protection | ANNEX I | Indigenous | | Literature |
| Upupidae (Ibis) | *Upupa epops* | Ibibik | Endemic | LC | List | ANNEX II | Protection | Off List | Summer Visitor | sparse | Land+Liter |

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**Mammals (Mammalia)**

Mammals are considered the most advanced class of vertebrates. They are warm-blooded and have offspring care. They are a class of vertebrate animals distinguished by mammary glands in females and sweat glands in both male and female individuals, hair, three middle ear bones used in hearing and the neocortex region in the brain.

There are 5,416 mammal species in the world (Wilson and Reeder, 2005). In Turkey, there are approximately 161 species belonging to the mammal orders Eulypotyphla (Hedgehogs and Shrews), Chiroptera (Bats), Lagomorpha (Hares), Rodentia (Rodents), followed by Carnivora (Carnivores), Perissodactyla (Tectofauna), Artiodactyla (Bivalves) and Cetacea (Cetaceans) (Biodiversity Monitoring and Assessment Report-2012). However, there are no wild species representing the Perissodactyla order in Turkey today. Turkey has different mammal fauna in different geographical regions.

**Findings**

As a result of field and literature studies, 18 mammal species belonging to 12 families were identified in and around the project area (see Table II.2.9.8). There is no endemic species among the mammals identified in the project area and its immediate vicinity. According to IUCN endangerment criteria, 16 species are categorized as "LC" (Low Risk), 1 species as "NT" (Near Threatened) and 1 species as "DD" (Data Deficient). According to the Bern Convention, 3 species are in the Annex-II list and 8 species are in the Annex-III list. The remaining 7 species are not included in the additional lists of the Bern Convention. According to the CITES Convention, 1 species is listed in Appendix-I/2 and 1 species is listed in Appendix-III/NC. The remaining 16 species are not included in the additional lists of the CITES Convention. According to the Central Hunting Commission Decisions (MAKK), 1 species is listed in Appendix-I and 4 species are listed in Appendix-II. The remaining 13 species are not included in the additional lists of the Central Hunting Commission Decisions (MAKK).

**Table II.2.9.8.** Mammal Species and Threat Categories Detected in the Project Area and its Vicinity

| FAMILY | SCIENTIFIC NAME | TURKISH NAME | ENDEMISM | IUC | CITES | BERN | MAKK | DEGREE OF RELATIVE ABUNDANCE | TYPE OF DETECTION |
|---|---|---|---|---|---|---|---|---|---|
| Canidae (Canids) | *Canis lupus* | Kurt | Not Endemic | LC | ANNEX I/II | ANNEX II | Off List | | Literature |
| Canidae (Canids) | *Vulpes vulpes* | Red Fox | Not Endemic | LC | List | Off List | ANNEX II | middle | Field+Literature |
| Erinaceidae (Hedgehogs) | *Erinaceus concolor* | Hedgehog | Not Endemic | LC | List | Off List | Off List | | Literature |
| Leporidae (Rabbit, rabbit family) | *Lepus europaeus* | Hare | Not Endemic | LC | List | ANNEX III | ANNEX II | middle | Field+Literature |
| Muridae (Mouse family) | *Rattus rattus* | Rat | Not Endemic | LC | List | Off List | Off List | | Literature |
| Muridae (Mouse family) | *Mus musculus* | House Mouse | Not Endemic | LC | List | Off List | Off List | | Literature |
| Cricetidae (Hamsters) | *Arvicola amphibius* | Hush Bitch | Not Endemic | LC | List | Off List | UnlistedI | | Literature |
| Cricetidae (Hamsters) | *Apodemus slyvaticus* | Common Field Mouse | Not Endemic | LC | List | Off List | Off List | | Literature |
| Soricidae (Shrews) | *Crocidura leucodon* | Bipterous White-toothed Insectivore | Not Endemic | LC | List | ANNEX III | Off List | | Literature |
| Soricidae (Shrews) | *Crocidura suaveolens* | Small White-toothed Insectivore | Not Endemic | LC | List | ANNEX III | Off List | | Literature |
| Spalacidae (Blind mice) | *Nannospalax leucodon* | White-toothed Bay | Not Endemic | DD | List | ANNEX III | Off List | | Literature |
| Sciuridae (Squirrel family) | *Spermophilus* | Anatolian Ground Squirrel | Not Endemic | NT | List | ANNEX III | Off List | | Literature |
| Mustelidae (Martens) | *Martes foina* | Rock Marten | Not Endemic | LC | ANNEX- | ANNEX III | ANNEX II | | Literature |
| Mustelidae (Martens) | *Mustela nivalis* | Weasel | Not Endemic | LC | List | ANNEX III | ANNEX I | | Literature |
| Rhinolophidae (Horseshoe bats) | *Rhinolophus hipposideros* | Lesser Horseshoe Bat | Not Endemic | LC | List | ANNEX II | Off List | | Literature |
| Vespertilionidae (Flat-nosed bats) | *Myotis blythii* | Little Possum Bat | Not Endemic | LC | List | ANNEX II | Off List | | Literature |
| Vespertilionidae (Flat-nosed bats) | *Pipistrellus pipistrellus* | Pretty Dwarf Bat | Not Endemic | LC | List | ANNEX III | Off List | | Literature |
| Suidae (Pig family) | *Sus scrofa* | Boar | Not Endemic | LC | List | Off List | ANNEX II | middle | Field+Literature |

Literature List

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6. www.tramem.org
7. Kryštufek, B., Vohralík, B., 2009. Mammals of the Turkey and Cyprus
8. Biodiversity Inventory and Monitoring Project of Terrestrial and Inland Water Ecosystems of Muş Province, Republic of Turkey Ministry of Agriculture and Forestry.

**Fish (Pices)**

The fish species found in the MURAT NEHRİ within the Project Area are given in Table

**Table 2.9.9.** Fish Species and Threat Categories Detected in MURAT NEHRİ

| Family | Scientific Name | Turkish Name | Endemizm | IUCN | CITES | BERN | MAKK | Relative Abundance | Form of Detection |
|---|---|---|---|---|---|---|---|---|---|
| Cyprinidae (Carp family) | *Alburnus mossulensis* | Freshwater Silverfish | - | NE | Off List | Off List | Off List | sparse | Literature |
| Cyprinidae (Carp family) | *Acanthobrama marmid* | White Snapper | - | LC | Off List | Off List | Off List | sparse | Literature |
| Cyprinidae (Carp family) | *Capoeta umbla* | Siraz Fish | - | LC | Off List | Off List | Off List | sparse | Literature |
| Cyprinidae (Carp family) | *Chondrostoma regium* | Kababurun Fish | - | LC | Off List | Off List | Off List | sparse | Literature |

Literature

8. Biodiversity Inventory and Monitoring Project of Terrestrial and Inland Water Ecosystems of Muş Province, Republic of Turkey Ministry of Agriculture and Forestry.

**Measures to be taken on Flora and Fauna Flora**

There are endemic plants in the area, therefore, prior to construction and road opening activities, the project area should be examined by a PhD Botanist and ex situ measures should be taken. Before starting any activity, the seeds of the plant subject to ex situ protection measures should be collected and the unrotted and fertile seeds should be given to the Seed Gene Bank. In addition, after the seeds are collected, the area within a radius of approximately 15 cm should be removed together with the soil and transplanted to suitable areas around the project area with similar soil and habitat structure. Transplantation activities should also be supported by seed propagation using various methods and the sustainability of the mentioned plant taxa in the region should be maintained by sowing/planting.

During the field studies, it was observed that there are existing roads up to a certain point while providing transportation to the region. Existing roads should be used primarily for transportation to the project area. In addition, roads should not be opened except in cases of necessity (connection road).

Many scientific studies on plant physiology have shown that organic dust particles accumulated on the leaf surface negatively affect plant growth and development (Hitron and Zur, 1990; Cornish et al., 1991; Farmer 1993; Cleugh et al., 1998; Prajapati 2002; Zia-Khan et al., 2015). Dust deposits on leaves can alter the optical properties of light, especially the apparent surface reflectance, causing dust-covered leaves to receive less light, and can also negatively affect gas exchange (O2 and CO2) by blocking stomata (pores). For these reasons, if the leaf surface is covered with a dense layer of dust particles, the rate of direct photosynthesis may decrease, resulting in a significant decrease in the plant's biomass formation and crop yield. In order to eliminate this reduction in yield and to allow plants to photosynthesize in a healthy way, the leaf surface should not be allowed to be covered with dust particles as much as possible.

The material (vegetative soil, excavation material, etc.) that will be generated during the works within the scope of the Project must not be disposed of in the stream beds located outside the project area.

Within the scope of the Project, the protection measures of the Bern Convention and the provisions of Article 5 of this convention must be strictly complied with in relation to both flora and fauna species.

Article 5

1 shall take appropriate and necessary legislative and administrative measures to ensure the special protection of the wild flora species listed in Annex 1. The deliberate plucking, collecting, cutting or rooting of these plants shall be prohibited. Each Contracting Party shall, where appropriate, prohibit the possession or trade in these species].

In addition, the provisions of the CITES convention must be respected within the scope of the project.

**Fauna**

Prior to the work, nest surveys will be carried out under the control of a biologist, the detected species will be transferred to suitable habitats and no work will be carried out during the hibernation period between November and April. Prior to the field preparation-stripping phase, an expert biologist should check for nestlings in areas such as shrubs, trees, etc. where there is a possibility of finding a nest, and if a nest is found, the area should be marked and no intervention should be made until the nestlings leave the nest.

The transportation of the species taken out of the project area and the habitat where they will be released afterwards are very important. For example, releasing an aquatic form to a terrestrial area may reduce its chances of survival. Therefore, special attention should be paid to this issue.

The boundaries of the project area should be determined by precise GPS measuring devices and no one should go outside this area. In addition, the boundaries of the project area should be delimited with wire fences, warning strips, etc. Potential migration routes to streams and rivers should be taken into consideration.

During the works within the scope of the project, devices or applications that produce odor, light, heat and sound that fauna species perceive as a threat should be minimized.

According to IUCN (International Union for Conservation of Nature - Red List Species), 1 species (*Vanellus gregarius*) is categorized as "CR" (Critical), 2 species (Aquila nipalensis, Neophron percnopterus) as "EN" (Endangered), 4 species (*Aquila heliaca, Aythya ferina, Otis tarda, Streptopelia turtur*) as "VU" (Vulnerable).

The Bern Convention safeguards and the provisions of Articles 6 and 7 thereof must be strictly observed.

Article 6

II shall take appropriate and necessary legislative and administrative measures to ensure the special protection of the species of wild fauna listed in Annex No. In particular, the following shall be prohibited for these species.

a. All forms of intentional capture and detention, intentional killing;
b. Intentionally damaging or destroying breeding or resting places;
c. Intentionally disturbing wild fauna in a manner contrary to the object of this Convention, in particular during periods of breeding, development and hibernation;
d. Collecting or deliberately destroying eggs from the wild or retaining these eggs, even if empty;
e. The possession and internal trade in these animals, whether alive or inanimate, including taxidermied animals and any readily recognizable part derived from animals or the material from which it is derived, where such possession and internal trade would contribute to the effectiveness of the provisions of this Article.

Article 7

III Any management of the wild fauna listed in Annex No. 2 shall be organized so as not to jeopardize the survival of their populations, taking into account the requirements of Article 2.

In addition, within the scope of the project, the provisions of the CITES convention, Central Hunting Commission Decision, Land Hunting Law No. 4915 and Regulations and all protection measures in these agreements must be complied with.

Domestic solid wastes, domestic wastewater, packaging wastes, waste batteries, medical wastes, end-of-life tires, hazardous wastes, etc. that may be generated as a result of the activities within the scope of the project should not be thrown indiscriminately into the environment, and the Environmental Law No. 2872 and the National Park Law No. 2873 should be complied with the regulations issued in accordance with these laws. In addition, dry and wet stream beds outside the project area should not be interfered with and no waste, rubble, excavation, etc. should be dumped in these areas. In addition, all activities within the scope of the project should be carried out by considering the ecological structure, and the vegetation associated with the fauna habitat outside the project area should not be destroyed.

**Aquatic Fauna**

Care will be taken to prevent any damage to the aquatic ecosystem within the scope of the Project.
In this context, in particular, no waste or discharge will be made.

In accordance with the opinion of the General Directorate of Nature Conservation and National Parks dated 29.09.2023 and numbered E.11447820 given in Annex-22;

Murat Nehri Enerji Üretim will comply with the measures to be taken in order to eliminate and minimize the possible negative impacts, which are included in this Final EIA Report and the Ecosystem Assessment Report presented in Annex-12.
During the surface stripping and preparation phases, a fauna expert will check for nestlings in areas where there is a possibility of finding nests such as shrubs, trees, etc., and if there are nestlings, the area will be marked and no intervention will be made until the nestlings leave the nest.
Considering the hibernation period of the species using the area, it will be ensured that surface stripping operations are not carried out during this period.
Wild animals and water resources will not be harmed.
Training will be provided to the personnel who will work during the construction and operation phase, and it will be ensured that they show the necessary sensitivity to wildlife.
During the construction period, the fertile layer of the soil will be preserved by stripping and the seeds remaining in the stripped soil will be used after the construction works to ensure the continuity of the species by germinating the seeds in the soil.
Areas requiring repair in the project area will be rehabilitated or restored.
In case of any change in the project coordinates or capacity, the General Directorate of Nature Conservation and National Parks will be consulted again.

**II.2.10. Whether there are mines and fossil fuel resources in the EIA study area and impact area (if any, information on exploration, operation and licensed quarries, their current and planned operation status, annual production and its importance for the country or local uses and economic values),**

In the institutional opinion dated 09.12.2022 and numbered 2022487990 of the General Directorate of Mining and Petroleum Affairs of the Ministry of Energy and Natural Resources of the Republic of Turkey dated 09.12.2022 and numbered 2022487990, it is stated that *"...in the area inquiry made in the system records on 09.12.2022, it has been determined that there is no mining license in force interfering with the project area of 62.74 hectares, and it has been decided by our General Directorate that there is no objection to the construction of Alpaslan II Dam and Hydroelectric Power Plant Auxiliary Source Solar Power Plant project on a total area of 62.74 hectares within the attached coordinates."* (See Annex-2.14).

The project area does not overlap with any current mining area of the General Directorate of Mining and Petroleum Affairs.

**II.2.11. Places of high landscape value and recreation areas,**

As a result of the field investigations and literature studies carried out in the project area within the scope of the planned project, in order to determine the landscape elements that may be affected by the project, to determine the impacts that may occur on them and to reach the basic data to be used in the landscaping process, it was tried to obtain basic findings on flora-fauna, topography, geology, geomorphology, climate, soil properties, erosion status, property status, land use, socio-economic structure and cultural heritage elements, which are natural, cultural and visual landscape values of the project area.

In this context, the landscape values of the project area have been analyzed under three headings as "Natural Landscape", "Visual Landscape" and "Cultural Landscape" features.

*Natural Landscape Features*

The Project area is located within the borders of the Central District of Muş Province. The flora and fauna species in and around the Project area are discussed in detail in Section II.2.9.

*Visual Landscape Features*

Visual quality and landscape are important factors in people's physical and emotional well-being. What people see in the environment where they live, visit or spend time in any way has an impact on their satisfaction with the place and their sense of belonging.

The visual quality assessment is carried out by touring the project area and, if possible, by assessing comprehensive aerial impressions.

This assessment is based on the examination of many basic factors. Some of these are morphological structure, vegetation, water availability, color, neighboring landscape, rarity, cultural changes. When these criteria are taken into account, a numerical assessment can be made by awarding points.

In addition, another method for identifying and evaluating the components that make up the landscape character within the scope of visual analyses is to perform visibility analyses in GIS environment for each unit and land uses to be established within the scope of the project by using visibility analyses and visual simulation.

The predominant pattern in the project area and its immediate surroundings is natural landscape, and when considered independently of the project structures and together with the immediate surroundings of the study area; there are neighborhood settlements, pasture and agricultural areas and roads belonging to large and small rural settlements, which are generally concentrated on flat lands.

During the landscaping works to be carried out specifically for the project, it is aimed to make the visual landscape close to its current state and to shorten the repair process of possible impacts and damages by considering the area and its immediate surroundings together. In this way, the new spots and corridors to be formed will be harmonized with the natural structure and/or concealed within the sustainable landscape.

During the analysis of the visual function of the landscape within the scope of the project, the main elements that will affect the visual landscape are the solar energy panels and transformer structure to be constructed.

*Cultural Landscape Features*

Under Title I.4. of the EIA Report, the distances of the settlements in the project area and its immediate vicinity to the activity units are given in detail. The inhabitants of these settlements will be directly and indirectly affected.

There are no cultural, historical and natural areas that can be considered as cultural landscape elements within the project area, which have been given the status of "Cultural Heritage" and "Natural Heritage" protected in accordance with Articles 1 and 2 of the Convention on the Protection of the World Cultural and Natural Heritage.

In addition, it has been determined that there are no protected areas (National Park, Nature Reserve, Wildlife Development Area, Wildlife Settlement Area, Wild Animal Settlement Area, Nature Park, Nature Monument, Ramsar Area and Special Environmental Protection Area) that can be considered as cultural landscape elements in the project area and its immediate surroundings.

The distances of the protected areas around the project area and the satellite image showing the relationship between these areas and the project area are given in Figure II.2.8.1. The activities to be carried out within the scope of the Project are not expected to have any impact on these areas that need to be protected by national and international legislation.

**II.2.12. Lands that are under the rule and disposal of the competent organs of the State (military prohibited areas, areas allocated to public institutions and organizations for specific purposes, etc.);**

The Project area and its impact area do not include any lands under the jurisdiction and disposal of the competent organs of the state (military prohibited areas, areas allocated to public institutions and organizations for specific purposes, etc.).

**II.2.13. Existing pollution load of the EIA study area and impact area (determination of the existing pollution load in terms of air, water, soil and noise, what kind of studies were carried out between which dates, study methods, meteorological conditions during the study period)**

A series of environmental surveys, measurements and analyses have been carried out in order to create an Environmental Impact Assessment study for the planned project, to solve legal problems that may arise during the operation phase, to identify environmental impacts in the EIA Report, to identify and evaluate positive and negative impacts.

In this context, within the planned project area and the determined impact area;

- PM10 measurements at 3 locations,
- Measurements of settled dust at 3 locations,
- 3 noise measurements were carried out at the point,

The measurements and analysis of the samples taken were carried out by ÇINAR Environmental Measurement and Analysis Laboratory. The current environmental status report prepared for the analyzes is presented in Annex-11.

The satellite image showing the measurement points of the studies carried out for the determination of the current situation within the scope of the Project is given in Figure II.2.13.1 and the coordinates are given in Table II.2.13.1.

**Table II.2.13.1.** Measurement Points Coordinates

| Point Name | UTM / WGS84 / 6 degrees | |
|---|---|---|
| | East(m) | North(m) |
| **PM10 Measurement Points Coordinates** | | |
| PM10 - 1 | 719170 | 4322789 |
| PM10 - 2 | 719234 | 4322565 |
| PM10 - 3 | 719438 | 4321419 |
| **Settled Dust Measurement Coordinates** | | |
| CT-1 | 719170 | 4322845 |
| CT-2 | 719228 | 4322588 |
| CT-3 | 719479 | 4321494 |
| **Noise Measurement Points Coordinates** | | |
| G-1 | 719442 | 4321469 |
| G-2 | 718179 | 4321318 |
| G-3 | 719418 | 4324205 |

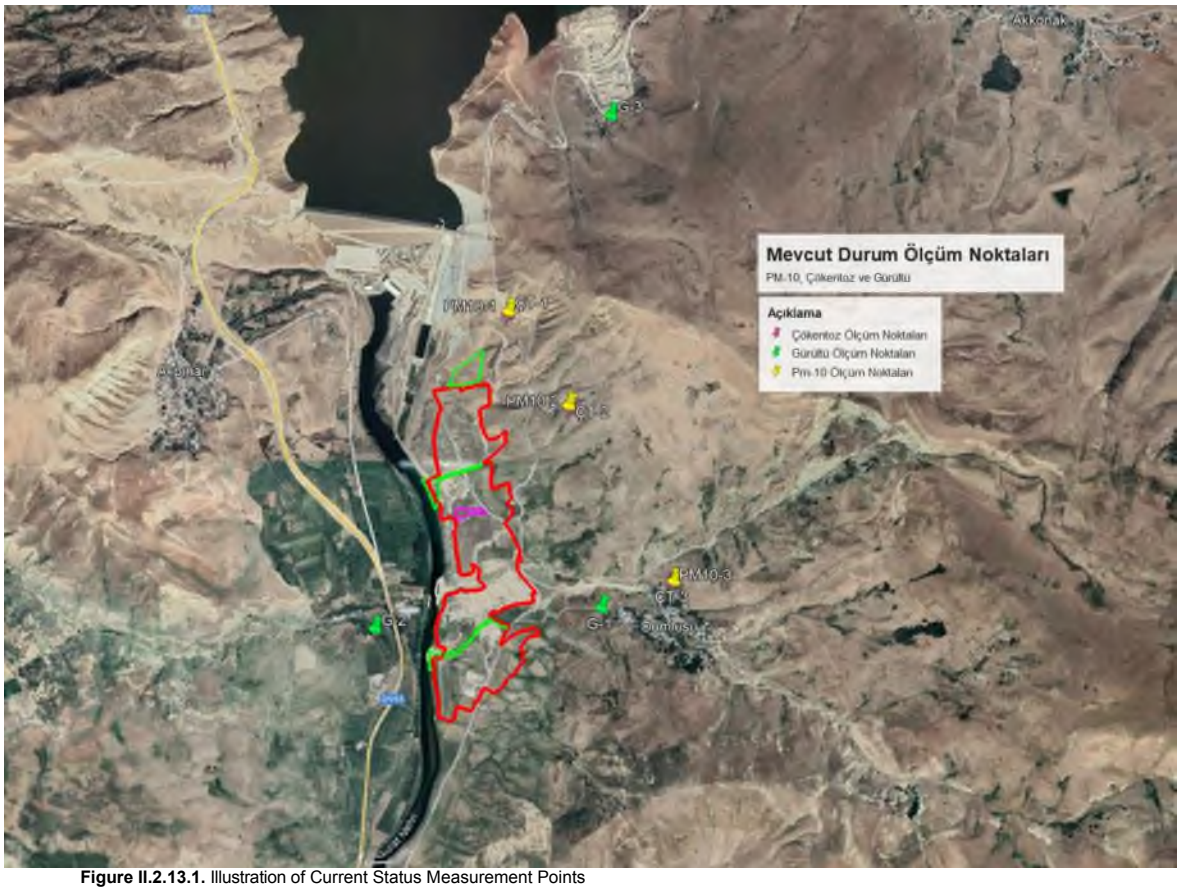


**Figure II.2.13.1.** Illustration of Current Status Measurement Points

### PM10 Measurements

PM10 measurements were carried out at 3 points within the scope of the Project. The analyzes were carried out by Çınar Çevre Laboratuvarı A.Ş. and PM10 measurement results are given in Table II.2.13.2.

PM10 sampling and calculation were carried out in accordance with TS EN 12341 standard. PM10 sampling was carried out with TECORA and ECO MARKA sampling device. Particles smaller than 10 microns in diameter were retained on filter paper in accordance with TS EN 12341 standard. TECORA and ECO MARKA sampling device is a pump controlled, time and volume adjustable, electrically operated device used for dust sampling in the environment.

When using the TECORA and ECO MARKA sampling device, the filter papers to be sampled were conditioned for 48 hours with the help of a special air conditioning cabinet in the laboratory at a temperature of 20 $^{oC}$ ($^{\pm 1oC}$) and a relative humidity of 50% (±5%) before going to the field. At the end of the conditioning, the filter papers were weighed on a precision balance and the results of the first weighing were recorded, the filter papers were placed in clean petri dishes and taken to the sampling point.

The sampling devices are transported to the sampling point, which is selected as a location that is easily accessible in all weather conditions. The device is placed in a smooth area at least 30 cm away from any obstacle that may obstruct the air flow and sampling is carried out as specified in the instructions for use of the device.

The filter paper obtained from the device using TECORA and ECO MARKA was conditioned in the laboratory under conditions of 20 $^{oC}$ ($^{\pm 1oC}$) temperature and 50% (±5%) relative humidity with the help of a special air conditioning cabinet for 48 hours, weighed on a precision balance and the final weighing results were recorded.

$PM_{10}$ concentration (C) was calculated as µg/m$^3$with the formula below and the results are shown in Table 3.1. is given in

C= 1000 ($M_{2-M1}$)/(V)
M1=Weight of filter paper before the experiment, (mg)
M2=Weight of filter paper after the experiment, (mg) V =
Withdrawn gas volume, ($m^3$)
V= 60 * Qact * t / 1000 t =
Time, hour
The draft flow rate for PM10 measurement is 2.3 $m^3$ /h.

**Table II.2.13.2.** PM10 Measurement Results

| Sampling Point | Sampling Location | Sampling Coordinate (37S) (UTM/WGS84) | | 20.12.2022 - 21.12.2022 Measurement Results (µg/Nm$^3$) | Limit Value (µg/Nm$^3$) |
|---|---|---|---|---|---|
| | | East | North | | |
| $PM_{10}$ - 1 | Point 1 | 719170 | 4322789 | 7,87 | 50* |
| $PM_{10}$ - 2 | Point 2 | 719234 | 4322565 | 8,96 | |
| $PM_{10}$ - 3 | Point 3 | 719438 | 4321419 | 8,77 | |

* Industrial Air Pollution Control Regulation Annex-2 Table.2.2

When the measurement results are analyzed, it is seen that particulate matter concentrations remain below the limit values in the SDGPLRM (for 2024 and beyond) in terms of the current situation.

**Settled Dust Measurements**

Settled dust measurements were carried out at 3 points within the scope of the Project. The analyzes were carried out by Çınar Çevre Laboratuvarı A.Ş. and the settling dust measurement results are given in Table II.2.13.3.

Determination of Precipitated Dust by Gravimetric Method with Four-Way Ambient Air Sampling Device. With the Four-Way Ambient Air Sampling Device, the determination of precipitated dust in the environment is measured in accordance with TS 2342 standard. The sampling system consists of 1 base plate, 1 tripod and 4 dust collection containers. Thus, the sampling system can collect settled dust from 4 main directions (North, South, East and West) and the source of dust at a certain point can be understood.

**Table II.2.13.3.** Settling Dust Measurement Results

| Sampling Point | Sampling Location | Sampling Coordinate (37S) (UTM/WGS84) | | Sampling Date | Measurement Results (mg/m$^{(3)}$·day) | | | Limit Value (mg/m$^{(3)}$·day) |
|---|---|---|---|---|---|---|---|---|
| | | East | North | | 1. Period | 2. .Period | Average | |
| CT - 1 | Point 1 | 719170 | 4322845 | 21.12.2022 - 18.02.2023 | 23 | 20 | 22 | 210* |
| CT-2 | Point 2 | 719228 | 4322588 | 21.12.2022 - 18.02.2023 | 13 | 40 | 27 | |
| CT-3 | Point 3 | 719479 | 4321494 | 21.12.2022 - 18.02.2023 | 37 | 59 | 48 | |

* Industrial Air Pollution Control Regulation Annex-2 Table.2.2

When the measurement results given in Table II.2.13.3 are analyzed, it is seen that the settling dust concentrations in terms of the current situation meet the limit values in the SDGPLR (for the period after 2024). It is seen that it is below the limit values in the SDGPLR (for 2024 and beyond).

**Noise Measurements**

Noise measurements were carried out at 3 points within the scope of the Project. The measurements were carried out by Çınar Çevre Laboratuvarı A.Ş.

Environmental noise measurements were carried out in accordance with TS ISO 1996-1 & TS ISO 1996-2 Standards. The TS ISO 1996-1 standard describes the basic quantities to be used for the description of noise in collective living environments and describes the basic determination procedures. And the TS ISO 1996-2 standard covers methods for how sound pressure levels can be measured directly, how the measurement results can be calculated by extrapolation (extrapolation) or how they can be determined by calculation only, in order to provide a basis for the assessment of environmental noise.

The evaluation of the measurements was carried out in accordance with the Environmental Noise Control Regulation (EGNDR).

Wind speed, direction and temperature values measured during noise measurements are given in Table III.2.13.4.

**Table II.2.13.4.** Meteorological conditions during noise measurement

| POINT NO | MEASUREMENT DATE | TEMPERATURE (°C) | RH (%) | PRESSURE (HPA) | WIND SPEED (M/S) | WEATHER |
|---|---|---|---|---|---|---|
| G-1 | 20.12.2022 | 3 | 58,7 | 862,7 | 0,5 | Open |
| G-2 | 20.12.2022 | 3 | 58,7 | 862,7 | 0,5 | Open |
| G-3 | 20.12.2022 | 3 | 58,7 | 862,7 | 0,5 | Open |

The limit values of noise measurements in the current EGNDPL and IFC are given in Table III.2.13.5.

**Table III.2.13.5.** Noise Limit Values

| CGDG | | |
|---|---|---|
| Day | Evening | Night |
| 65 dB | 60 dB | 55 dB |

Noise measurement results at 3 points are given in Table III.2.13.6.

**Table III.2.13.6.** Noise Measurement Results

| Point Name | Measurement Coordinate* | | Measurement Date | Time Zone | Leq (dBA) | EGCR Limit Value |
|---|---|---|---|---|---|---|
| | East | North | | | | |
| G1 | 719442 | 4321469 | 20.12.2022 | Day | 53,0 | 65 |
| | | | | Evening | 48,1 | 60 |
| | | | | Night | 38,4 | 55 |
| | | | 21.12.2022 | Day | 47,8 | 65 |
| | | | | Evening | | 60 |
| | | | | Night | | 55 |
| | | | 24-25.12.2022 | Day | 56,8 | 65 |
| | | | | Evening | 52,5 | 60 |
| | | | | Night | 49,2 | 55 |
| G2 | 718179 | 4321318 | 20.12.2022 | Day | 51,4 | 65 |
| | | | | Evening | 47,1 | 60 |
| | | | | Night | 39,9 | 55 |
| | | | 21.12.2022 | Day | 51,6 | 65 |
| | | | | Evening | | 60 |
| | | | | Night | | 55 |
| | | | 24-25.12.2022 | Day | 44,7 | 65 |
| | | | | Evening | 48,5 | 60 |
| | | | | Night | 44,2 | 55 |
| G3 | 719418 | 4324205 | 20-21.12.2022 | Day | 47,7 | 65 |
| | | | | Evening | 40,7 | 60 |
| | | | | Night | 44,7 | 55 |
| | | | 24-25.12.2022 | Day | 51,1 | 65 |
| | | | | Evening | 43,4 | 60 |
| | | | | Night | 42,3 | 55 |

Measurement Uncertainty: +/- 2.07 dB

These results are also below the limit values given in Annex-2 Table 1.1 of the Environmental Noise Control Regulation Annex-2, which entered into force after being published in the Official Gazette dated 30.11.2022 and numbered 32029.

During the construction and operation phases of the planned activity, the provisions of the Environmental Noise Control Regulation, which entered into force after being published in the Official Gazette dated 30.11.2022 and numbered 32029, will be complied with.

## II.3. Characteristics of the Socio - Economic Environment

### II.3.1. Economic characteristics and social infrastructure services of the EIA study area and impact area (information on the main sectors that constitute the economic structure of the region, the distribution of the local labor force in these sectors, the place and importance of the production of goods and services in the sectors in the local and national economy; information on education, health, cultural services and the utilization of these services); Income (distribution of income in the region by business sectors, maximum, min. and average income p e r capita by business sectors); Unemployment (unemployed population in the region and its ratio to the active population); Population information (for the EIA study area and impact area),

**Population**

Muş province is located in the Upper Murat-Van Department in the Eastern Anatolia Region of Turkey and is surrounded by Patnos and Tutak in Ağrı, Ahlat and Adilcevaz in Bitlis from the east, Karayazı, Hınıs, Tekman, Karaçoban in Erzurum from the north, Karlıova and Solhan in Bingöl from the west, Kulp in Diyarbakır, Sason in Siirt and Güroymak and Mutki in Bitlis from the south. The province, which consists of 6 districts in total, has a surface area of 8,196 $^{km24}$ and a total population of 405,228 according to the results of the Address Based Registration System.

According to the Address Based Population Registration System (ABPRS) 2021 TUIK data, population data for Muş districts are given in Table II.3.1.1.

**Table II.3.1.1.** Population Data for Muş Districts, 2021

| PROVINCE | POPULATION |
|---|---|
| Blurred | 77.592 |
| Haskovo | 25.827 |
| Korkut | 24.057 |
| Malazgirt | 48.192 |
| **Center** | **198..578** |
| Varto | 30982 |
| **Total** | **405.228** |

**Source:** Muş 2021 Address Based Population Registration System (ADNKS) Population Data

According to the 2021 census, the Central district where the project site is located has a population of 198,578 people.

Dumlusu Village, where the majority of the Project area parcels are located, has a population of 239 people in 2021, while Akkonak Village, where a small portion of the Project area parcels are located, has a population of 647 people in $^{20215}$.

With the planned project, it is planned to contribute to local employment. Local procurement from local supply sources, where possible, will also indirectly provide opportunities for the economic activities and employment opportunities of the enterprises in the supply chain.

It is planned to employ 40 personnel during the construction phase and 8 personnel during the operation phase of the project.

[4]**Source:** http://www.mus.gov.tr/
[5]**Source:** TurkStat Statistical Data Portal, https://data.tuik.gov.tr/

Local people will be prioritized as much as possible in the recruitment of personnel and it is aimed to contribute to local employment. Considering that each person to be employed will affect 4 people, it can be said that approximately 160 people will indirectly benefit from the project during the land preparation and construction phase and approximately 32 people during the operation phase.

**Economic Structure**

*Trade and Industry:*

Compared to agriculture and animal husbandry activities, trade and industrial activities remain in the background in Muş. There are major organizations in terms of industrial activities in Muş. Muş, which is one of the important provinces of the country in terms of agricultural production, ranks low in terms of manufacturing industry.

The provincial industry generally consists of micro and small-scale enterprises, with large-scale cement and sugar factories. The number of enterprises registered in the Industrial Registry Information System is 188 and 3,903 people are employed in these companies. According to SSI 2019 data, 2,026 people are employed in 43 enterprises operating in the textile and garment sector in 37 provinces, creating a significant cluster in the garment sector.[6]

According to the index values obtained, the development levels of provinces in Turkey are determined as six levels. The first and second development levels, which cover the most developed provinces, include provinces from the Marmara, Central Anatolia, Aegean and Mediterranean regions. In the third, fourth and fifth development levels, which represent moderate development, there are mainly provinces from Central Anatolia, Black Sea, Mediterranean and Eastern Anatolia Regions. The provinces in Eastern and Southeastern Anatolia are mostly located in the sixth development level (SEGE, 2017. p.38).

Muş ranks 79th in terms of socio-economic development level.

**Table II.3.1.2.** Socio-Economic Development Ranking of Muş

| Province Name | Sorting | Score | Tier |
|---|---|---|---|
| Mus | 79 | -1,704 | 6 |

***Source: SEGE,2017***

**Table II.3.1.3.** Socio-Economic Development Index and Level of Level-2 Regions

| Level-2 Code | Regional Provinces | Region Index Value | Region Tier | Region Ranking |
|---|---|---|---|---|
| TRB2 | Van, Muş, Bitlis, Hakkari | -1,506 | 4 | 26 |

***Source: SEGE,2017***

Bitlis, Van, Hakkâri and Muş from the same Level-2 region are ranked 76-79th in the SEGE-2017 Survey. Among these provinces with a total population of more than two million and ranking low in many socio-economic development variables, especially GDP per capita, it stands out that Bitlis and Van benefit relatively more from the incentive system compared to their surroundings and Hakkâri is the fortieth province with the highest exports in Turkey with approximately 400 million dollars of exports (SEGE, 2017. p.65).

*Agriculture and Livestock:*

The economic structure of Muş province is based on agriculture and animal husbandry.

The fallow agriculture method is generally used in the province. Fallow is practiced in all dry agricultural areas. If annual crops such as clover, sainfoin and vetch are planted, the fallow system is not applied. Dry agriculture is practiced in the majority of Muş's agricultural areas.

[6]**Source**: *TRB2 Region Industry Current Situation Analysis Report (2021)*

In these areas, wheat, barley, alfalfa, sainfoin, vetch, watermelon, chickpea and dry beans are mostly cultivated. In irrigated agricultural areas, vegetables, fruits, vineyards and field crops such as sugar beet, corn and sunflower are produced.

Muş province plays an important role in the production of sugar beet, wheat and barley in terms of our country's agricultural production potential.

**Table II.3.1.4.** Agricultural Areas in Muş Province

| Agriculture Areas | Alan |
|---|---|
| Fruit | 13,072 (ha) |
| Vegetable | 40,583 (ha) |
| Field | 1,634,483 (ha) |
| Fallow | 263,111 (decare) |
| **Total** | **2,556,367 (decare)** |

***Source:*** TURKSTAT, 2021

The majority of the land used for agricultural purposes in the province consists of areas where crops such as fruits, vegetables, alfalfa and sainfoin are cultivated.

Even in irrigated agricultural areas in Muş, crops are harvested once a year due to the climate and soil structure. Second crop harvesting is not practiced due to insufficient rainfall, temperature, number of sunny days and sunshine duration. The main crop cultivated in the province is mostly cereals. The cultivation of fodder crops has increased in recent years and ranks second among the cultivated crops. Industrial crops and legumes come next. In agricultural holdings, animal husbandry and crop production are generally carried out together, and the small scale and fragmented structure of the holdings leads to low levels of productivity.

The total number of bovine and ovine animals in Muş is 335,798 and 1,250,000, respectively. Muş province contributes to the total number of hives in Turkey with 52,636 hives. The livestock of Muş province is shown in Table II.3.1.5.

**Table II.3.1.5.** Mus Province Animal Assets

| Animal Type | Number of animals |
|---|---|
| Bovine | 335.798 |
| Winged | 467.007 |
| Small Bovine Total | 1.250.000 |
| At | 2.171 |
| Mule | 311 |
| Donkey | 2.091 |
| Number of Hives | 52.636 |

***Source:*** TURKSTAT, 2021

In 2021, the Provincial Directorate of Agriculture and Forestry of Muş aimed to expand and develop fisheries in the province by releasing a total of 1,781,300 baby carp fish into lakes and ponds in Muş within the scope of fishery activities.[7]

*Forestry and Mining:*

The ratio of forest area to the general area in Muş is 8.9%. This ratio is below the average of Turkey. Turkey's average ratio is 26.6%. Most of the forest areas in Muş Province are low or unproductive areas.

[7] **Source:** 2021 Muş Provincial Directorate of Agriculture and Forestry Briefing

**Table II.3.1.6.** Forest Characteristics in Muş Province

| Distribution by Forest Characteristics | | | | |
|---|---|---|---|---|
| | **Normal Forest** | **Degraded Forest** | **Forested Area** | **Total** |
| **Area (ha)** | 29.651 | 48.775 | 806.260 | 884.686 |

***Source:*** Muş Provincial Directorate of Agriculture and Forestry, 2021

The dominant tree species in forests in Muş is oak. The forests are oak coppice and 90% of them are unproductive oak coppice forests. The tree species of the forests growing within the provincial borders are acorn oak, thuja oak, aspen, eastern sycamore, walnut, alder, ash, elm and willow. The tree species are hawthorn, ahlat, mastic, wild apple and cranberry.

Muş province is located in a high and mountainous region. The mountains covering 34.9 percent of the provincial area are the extensions of the South Eastern Taurus Mountains. These mountains are young mountains formed together with the Alpine-Himalayan fold system. The altitude is generally above 1250 meters. Plains covered with young and fertile alluvium cover 27.2 percent of the province's surface area. The Murat valley divides the provincial territory in the east-west direction. Plateaus, generally 1500-1700 meters altitude, cover 37.9 percent of the provincial area.[8]

The region is very tectonically active. Since the provincial center and its surroundings are located in the part of the Northern Anatolian Fracture Zone extending towards Lake Van and in the first degree earthquake zone, there have been many earthquakes in this region. Muş and its surroundings do not have much richness in terms of metallic minerals. There are some economic formations in the region in terms of industrial raw materials. The main ones are gypsum, barite, brick-tile, quartzite and cement raw materials.

**Table II.3.1.7.** Mineral Assets of Muş Province

| Mineral Potential | Location Area |
|---|---|
| Gypsum | Bulanık-Huri Komu Village |
| Barite | Merkez-Bilir Village, Merkez-Kasar Village, Merkez-Kızılkilise Village |
| Cement Raw Materials | Around Moush province |
| Limestone | Pertah-Karaagacli |
| Quartzite | Merkez-Kepenek, Hasköy-Büvetli |
| Brick-Tile | Alican Village-Avak |

**Source:** Mineral Exploration (MTA)

Quartzite formations were identified within schists in the license areas in Merkez-Kepenek and Hasköy-Büvetli regions. There are quartzite formations with visible reserves suitable for use in the ceramic industry in Merkez-Kepenek field and reserves suitable for use in the ceramic and refractory industry in Hasköy-Büvetli field. Some of the barite deposits in and around Muş are still in operation and exports are made to Syria and Yemen. Important barite deposits in the province are Bilir Village, Kasar Village and Kızılkilise barite deposits located in the central district. In these deposits, a total of 755,000 tons of apparent and 2,490,000 probable+possible reserves with an average BaSO4 content of 94% were determined. In addition, there are limestone, clay and clay marl formations and brick-tile raw materials with great potentials that can be used as cement raw materials in the province and its vicinity.[9]

*Tourism:*

In addition to taking place in a geographical location, tourism activities also involve the cultural and social conditions of the place where they take place, as well as various communication and interaction activities. Therefore, it is important to understand the factors that attract tourists to a particular destination in addition to the attractiveness of the destination. The material and spiritual conditions that tourists need are at the top of the attraction factors.

[8] **Source:** *Muş Province State of Environment Report 2021*

[9] **Source:** *Mus Province Mineral and Energy Resources*

In this respect, nowadays, tourists are tried to be directed to touristic attraction places by determining material and spiritual factors in line with the wishes of tourists.

The city of is located on the north-facing slopes of Mount Kurtik, one of the most important peaks of the Mountains, an extension of the southeastern Taurus Mountains, between the valleys through which the Çat and Karni streams flow. which dates back to ancient times and has been home to many civilizations, is home to dozens of historical and cultural heritage that must be seen.[10]

is one of the provinces with few tourism activities in Turkey. There are suitable areas for winter tourism, mountain sports, eco-tourism and hunting tourism in In addition, there are opportunities for cultural and faith tourism.

The tourism opportunities of the province are churches, mosques, historical values and natural beauties. The Great Mosque of Alaaddin Bey Mosque, Alaaddin Bey Bath, Historical Murat Bridge, Çengilli Church, Castle and Hasbet Castle are historical monuments that increase the tourism brand value. Malazgirt and Varto districts contribute to the cultural tourism of the province.

**Characteristics of the Socio-Economic Environment of the Project Area and its Vicinity**

*Population and Demographic Structure*

In the Population and Demographic Structure section, general information about the settlements that may be affected by the Alpaslan II Dam and Hydroelectric Power Plant Auxiliary Source Solar Power Plant Project is given. The population, number of households and population growth in the last 5 years in these settlements that may be affected by the Project are shown in the table below according to the data received from Muhtars.

The closest settlements to the Project area are Dumlusu Village (333 meters), Village (358 meters), Village (1,166 meters) and Akkonak Village (1,330 meters).

When checked with population data by years, it is seen that the populations in these settlements vary. The interviewed mukhtars also stated that the population increases in summer and decreases in winter. The main reason for the increase in population in the summer months is that people come from the cities they live in for vacation purposes in the summer months.

**Table II.3.1.8.** Population Information of Settlements

| PROVINCE | NEIGHBORHOOD | HOUSEHOLD | POPULATION (TUIK) | Did it give outward migration? |
|---|---|---|---|---|
| CENTER | **Dumlusu** | 37 | 239 | Yes |
| | **Kıyıbaşı** | 33 | 243 | No. |
| | **Akpinar**** | - | 494 | - |
| | **Akkonak**** | - | 647 | - |

*TurkStat, Settlement Headman Survey*
**Indicates the approximate number of households according to the mukhtar declaration.*
***Doctors could not be reached by phone or face-to-face and therefore could not be interviewed.*
*-Data could not be accessed through TurkStat.*

**Table II.3.1.9.** Population Information of Settlements by Years

| PROVINCE | NEIGHBORHOOD | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|---|---|
| CENTER | **Dumlusu** | 305 | 304 | 316 | 296 | 289 | 239 |
| | **Kıyıbaşı** | 255 | 260 | 265 | 266 | 256 | 243 |
| | **Akpinar** | 452 | 473 | 524 | 497 | 505 | 494 |
| | **Akkonak** | 817 | 790 | 784 | 810 | 750 | 647 |

*TURKSTAT, ADNKS*

[10] **Source:** *https://mus.goturkiye.com/tr/gor*

The number of people living in households varies between 3 and 11 people. The proportion of 8-person households is the highest at 27.8%, while the proportion of 6-person households is
The proportion of households with 7 people ranks second with 22.2% and third with 16.7%.

**Table II.3.1.10.** Number of People Living in the Household

| Number of Inhabitants | Number | Percentage (%) |
|---|---|---|
| 3 Person | 2 | 11,1 |
| 4 Person | 1 | 5,6 |
| 5 Person | 1 | 5,6 |
| 6 Person | 4 | 22,2 |
| 7 Person | 3 | 16,7 |
| 8 Person | 5 | 27,8 |
| 9 Person | 1 | 5,6 |
| 11 Person | 1 | 5,6 |
| **TOTAL** | **18** | **100** |

***Source:*** *Household Survey*

While 16.7% of the interviewed households fall within the definition of nuclear family, 83.3% fall within the definition of extended family.

**Table II.3.1.11.** Household Structure

| Household Type | Number | Percentage (%) |
|---|---|---|
| Nuclear Family | 3 | 16,7 |
| Extended Family | 15 | 83,3 |
| **TOTAL** | **18** | **100** |

***Source:*** *Household Survey*

All of the interviewed households (100%) stated that they have been residing in their villages since birth.

*Employment Status, Income and Social Security*

Considering the number of employees in the households, 77.8% of the interviewed households have at least one employee. In 11.1% of the interviewed households, it was stated that there were no employees in the household. In 83.3% of the households, it was stated that there were no unemployed people. The rate of those who stated that there is no retired person in the household is 100%.

It is seen that the main source of livelihood in the project-affected settlements is agricultural production with 55.6%. While 22.2% of households say that livestock production is their main source of income, 11.1% say that labor (seasonal workers) is their main source of income.

Of the 11 households that stated that they have a side income source, 55.6% stated that this side income source is livestock breeding activities. Agricultural production income ranks second with 5.6%.

Since the area near the area where the project is planned to be built is within the pasture area, livestock activities, which are the current livelihood of the households, may be affected. In order not to affect the livestock activities, which is one of the main sources of livelihood of the households, the area where the project will be established will be surrounded by wire fences and "Animal Crossing Roads" will be opened for access to the MURAT NEHRİ.

The routes of the Animal Access Roads were clarified in consultation with Dumlusu Neighborhood and local people. Before entering the Animal Access Roads, consent was obtained from the owners of the private land to be used for transportation outside the project area.

*Livelihoods*

The 1/25.000 Scale Land Asset Map showing the Project area and its surroundings i s given in Annex-5. According to the Project 1/25.000 Scale Land Asset Map, although the SPP Area is within irrigated agriculture (insufficient) areas, it is currently within the **"Solar Energy Area qualified"** areas **with non-agricultural use permits**.

The main source of livelihood of the villages within the impact area is agricultural production. Afterwards, income from animal husbandry activities has an important place in livelihoods. According to the interviews with the mukhtars, the most important agricultural products are wheat and barley.

66.7% of the interviewed households stated that they own or use agricultural land. Of those who stated that they own agricultural land, 41.7% stated that the ownership of the land belongs to them, while 50% stated that it belongs to a relative/relative and that they use it without paying rent.

41.7% of the households who stated that they cultivate their own land stated that the productivity of agricultural production has not remained the same in the last 5 years and has changed from year to year. According to the survey results, the main crops cultivated are barley and wheat. 75% of the households engaged in agricultural production stated that they consume the products they produce at home.

*Housing Condition and Heating*

Among the sample, 61.1% of the interviewed households stated that they own the house they live in. All of the interviewed households (100%) stated that they use wood-coal for heating.

Households in the sample were also asked about the type of structure of their dwelling. When the responses are analyzed, it is seen that they live in adobe village houses. The rate of those living in mudbrick village houses 55.6%.

*Access to Infrastructure and Services*

Information on the infrastructure situation in the settlements affected by the Project is given in the table below. There is a sewerage system in Kıyıbaşı village but it is insufficient. There is no sewerage system in Dumlusu village.

There is no infrastructure system such as drinking water in Dumlusu neighborhood and they need to bring drinking water from the pasture to their village because drinking water is insufficient. In Kıyıbaşı village, drinking water comes from the mountain and the quality of the water is reported to be good.

**II.3.2. Urban and rural land uses in the EIA study area and impact area (distribution of settlement areas, existing and planned uses, industrial zones, housing, tourism areas, etc.).**

The Project area and its immediate surroundings consist of rural areas and settlements such as small neighborhoods/villages.

Part of the Project area was previously used as a construction site and administrative area for Alpaslan II Dam and Hydroelectric Power Plant. Land leveling works have been carried out in this area.

The 1/25.000 Scale Land Asset Map showing the Project area and its surroundings i s given in Annex-5. According to the Project 1/25.000 Scale Land Asset Map, although the SPP Area is within irrigated agriculture (insufficient) areas, it is currently within the **"Solar Energy Area qualified"** areas **with non-agricultural use permits**.

The planned project area is located in "Treeless Forest Areas" according to the stand map. In this context, there is no forest area utilization and tree felling specific to the activity (See Annex-6 1/50.000 Scale Stand Map of the Project Area and Surroundings).

The approved Environmental Plan, Legends and Relevant Plan Provisions for the Muş-Bitlis-Van Planning Region with a scale of 1/100.000, where the Project area is located, are given in Annex-3 and the EIA Area and SPP Area are defined as "Dam" in the Environmental Plan with a scale of 1/100.000. However, although the project area appears as "Dam" in the Environmental Plan, it is currently within the "Solar Energy Area qualified" areas **that have been granted non-agricultural use permits**.

For the agricultural lands in the project area; within the scope of the Soil Conservation and Land Use Law No. 5403, with the letter dated 20.02.2003 and numbered 2844-002375 of the General Directorate of Agricultural Production and Development of the Ministry of Agriculture and Rural Affairs, a total area of 5469 hectares including the Alparslan II Dam and HEPP project area was given permission for non-agricultural use within the scope of the Regulation on the Protection and Use of Agricultural Lands in force at that time.

The "Non-Agricultural Use Permit Opinion" received by Muş Provincial Directorate of Agriculture and Forestry from the Ministry of Agriculture and Forestry, General Directorate of Agricultural Reform, regarding whether this permit is valid for the planned SPP project is given in Annex-2.4. In the opinion of the General Directorate of Agricultural Reform given in Annex-2.4, it is stated that *"5469 hectares of land with a surface area of 5469 hectares, which was granted permission for non-agricultural use with the letter dated 20.02.2003 and numbered 2844-002375 of the abrogated Ministry of Agriculture and Rural Affairs General Directorate of Agricultural Production and Development, is outside the scope of Law No. 5403, and it is considered that no action can be taken within the scope of Articles 13, 14, 20 and 21 of Law No. 5403 within this area."* In this context, no additional permission, etc. will be obtained for land use.

## SECTION III. ENVIRONMENTAL IMPACT OF THE PROJECT DURING PRE-CONSTRUCTION, CONSTRUCTION AND OPERATION IMPACTS AND MEASURES TO BE TAKEN

*(In this section, the identification of potential problems that may affect the environment, the amount of pollutants, their interaction with the receiving environment, cumulative effects, the impact of the project on the climate (nature and magnitude of greenhouse gas emissions) and how the project will be affected by climate change, the risk of disaster or accident related to the project due to climate change, measures to be taken to mitigate the negative impacts of the project on the environment are explained separately and in detail for Section III.1 (construction) and III.2 (operation) sub-headings.(construction) and III.2 (operation)).*

### III.1. On the Physical and Biological Environment during Land Preparation, Construction and Installation Phase Impacts and Precautions

The activities to be carried out within the scope of the planned project and the possible impacts arising from these activities and the measures to be taken are explained in the sub-headings.

All necessary measures will be taken by the investor company for liquid wastes, emissions, noise, excavation wastes, solid wastes, hazardous and non-hazardous wastes that will be generated at all stages of the planned project in accordance with the relevant Regulations of the Ministry of Environment, Urbanization and Climate Change of the Republic of Turkey and the Environmental Law No. 2872. In addition, no damage will be caused to underground and surface water resources due to wastes and other pollution potentials, and natural resources and the natural environment will be protected. In addition, the works and procedures to be carried out during the construction and operation phase will be carried out by taking into consideration the proximity of the operations to settlements and agricultural lands.

#### III.1.1. Where and in how much area within the scope of works to be carried out for land preparation excavation will be made; the amount of excavated surplus material and vegetative soil; the amount of excavated surplus material and where the vegetable soil will be transported and stored, the volume of the storage area; excavation surplus for which purposes the material and vegetative soil will be used, possible environmental impacts identification of problems, interaction with the receiving environment, determination of cumulative impacts, environmental Measures to be taken to mitigate the negative impacts, regulation and restoration plan and -if any- temporary storage area information, (1/25.000 scale site plan of storage areas plan and 1/1.000 scaled state-of-the-art map separately),

***Vegetable Soil***

***Amount of Vegetable Soil to be Generated from SPP Areas***

In the 76,440 solar panels planned to be installed, 52 series connected panels will be used on each table. It is planned to use 12 legs for assembly on 1 table. Each foot base area is 50 cm x 50 cm.

Table quantity : 76,440 / 52= 1,470 units

Number of feet : 1.470 x 12= 17.640 pieces

Each foot base area : 0.25 $^{m2}$ (50 cm x 50 cm)

Vegetative soil stripping will be carried out at a depth of 10 cm in the footing areas and the density of the vegetative soil layer is assumed to be 1.75 $^{tons/m3}$ . In this scope,

17,640 x 0.25 $^{m2}$ =

4,410 $^{m2}$ x 0.1 m =

441 $^{m3}$ x 1.75 $^{tons/m3}$ =vegetative soil will be formed.

***Earthmoving***

***Amount of Excavation to be generated from SPP Areas***

In the 76,440 solar panels planned to be installed, 52 series connected panels will be used on each table. It is planned to use 12 legs for assembly on 1 table. Each foot base area is 50 cm x 50 cm.

Excavation will be made at a depth of 1 m for each foot and the excavation soil density is assumed to be 2.05 $^{tons/m3}$.

17,640 x 0.25 $^{m2}$ ≅

4,410 $^{m2}$ x 1 m ≅

4,410 $^{m3}$ x 2.05 $^{tons/m3}$ ≅

Within the scope of the planned project, vegetative soil stripping and excavation removal works will be carried out due to land preparation, road works and solar panel installation activities.

The dust emissions that will be generated as a result of these activities have been calculated using the "Emission Factors to be used in Dust Emission Mass Flow Calculations" given in the "Regulation on Control of Industrial Air Pollution" published in the Official Gazette dated 03.07.2009 and numbered 27277 (See Table III.1.1.1).

Emission Factors to be used in SDGCCR Dust Emission Mass Flow Calculations

| SOURCES | Emission Factors | |
|---|---|---|
| | Uncontrolled | Controlled |
| Removal (kg/ton) | 0,025 | 0,0125 |
| Loading (kg/ton) | 0,010 | 0,005 |
| Transportation (total round trip distance) (kg/ton) | 0,7 | 0,35 |
| Unloading (kg/ton) | 0,010 | 0,005 |
| Storage (kg/ha.day) | 5,8 | 2,9 |

***Vegetable Soil***

***Emission Resulting from Vegetative Soil Stripping from SPP Areas***

A total of 771.75 tons of vegetative soil will be formed as a result of the stripping process in the areas where SPP panels will be installed.

It is planned to remove 771.75 tons of vegetative soil in approximately 1 month (30 days) by working 10 hours a day. In this scope;

30 days x 10 hours/day = 300 hours all vegetative soil will be stripped. Accordingly, approximately 2.57 tons of vegetative soil will be stripped per hour.

1. *Dust Emission During Removal of Vegetative Soil*

Controlled : 2.57 tons/hour x 0.0125= 0.0321 kg/hour
Uncontrolled : 2.57 tons/hour x 0.025= 0.0642 kg/hour

2. *Dust Emission During Loading of Vegetable Soil*

| | |
|---|---|
| Controlled | : 2.57 tons/hour x 0.005= 0.0128 kg/hour |
| Uncontrolled | : 2.57 tons/hour x 0.010= 0.0257 kg/hour |

3. *Dust Emission During Transportation of Vegetable Soil*

Trucks with an average capacity of 30 tons will be used during transportation and it will be sufficient for 1 vehicle to make a single trip for approximately 25.7 tons/day (2.57 tons x 10 hours) of vegetable soil to be generated daily.

Vegetative soil to be stripped will be temporarily stored within the site and then used in landscaping works. For the vegetative soil storage area to be created, a common point will be determined within the licensed area boundaries and the average distance to the storage area is accepted as 2 km.

| | |
|---|---|
| Controlled | :0.35 kg/km/trip x (1 trip/10 hours) x 4 km = 0.14 kg/hour |
| Uncontrolled | :0.7 kg/km/trip x (1 trip/10 hours) x 4 km= 0.28 kg/hour |

4. *Dust Emission During Discharging of Vegetative Soil*

| | |
|---|---|
| Controlled | : 2.57 tons/hour x 0.005= 0.0128 kg/hour |
| Uncontrolled | : 2.57 tons/hour x 0.010= 0.0257 kg/hour |

5. *Dust Emission During Storage of Vegetable Soil*

It is planned to store the vegetative soil for a short period of time in an area of approximately 0.98 ha (9,845 $m^2$) within the site.

| | |
|---|---|
| Controlled | : (0.98 ha x 2.9 kg/ha.day)/24 hours/day= 0.1184 kg/hour Uncontrolled |
| | : (0.98 ha x 5.8 kg/ha.day)/24h/day= 0.2368 kg/hour |

***Earthmoving***

***Amount of Emissions from SPP Areas***

A total of 9,041 tons of excavation will be generated as a result of the excavation removal process in the areas where SPP panels will be installed.

It is planned to remove 9,041 tons of excavation in approximately 3 months (90 days) by working 10 hours a day. In this scope;

90 days x 10 hours/day = 900 hours for all excavation. Accordingly, 10,045 tons of excavation will be removed per hour.

1. *Dust Emission During Dismantling of Excavation*

| | |
|---|---|
| Controlled | : 10,045 tons/hour x 0.0125= 0.1255 kg/hour |
| Uncontrolled | : 10,045 tons/hour x 0.025= 0.2511 kg/hour |

2. *Dust Emission During Loading of Excavation*

| | |
|---|---|
| Controlled | : 10,045 tons/hour x 0.005= 0.0502 kg/hour |
| Uncontrolled | : 10,045 tons/hour x 0.010= 0.1004 kg/hour |

*3. Dust Emission During Transportation of Excavation*

Trucks with an average capacity of 30 tons will be used during transportation and it will be sufficient for 1 vehicle to make 4 trips per day for approximately 100.45 tons/day (10,045 tons x 10 hours) of excavation.

The excavation to be removed will be temporarily stored within the site and subsequently used in backfilling works. The excavated soil to be created is determined in the north of the license area and will be temporarily stored in an area of 1 ha and will be used for road leveling and backfilling. Considering the farthest distance of the excavation storage area to the license area, it has been determined as approximately 2 km.

Controlled : 0.35 kg/km/trip x (4 trips/10 hours) x 4 km = 0.56 kg/hour Uncontrolled
: 0.7 kg/km/trip x (4 trips/10 hours) x 4 km = 1.12 kg/hour

*4. Dust Emission During Dumping of Excavation*

Controlled : 10,045 tons/hour x 0.005= 0.0502 kg/hour
Uncontrolled : 10,045 tons/hour x 0.010= 0.1004 kg/hour

*5. Dust Emission During Storage of Excavation*

It is planned to store the excavation in an area of approximately 1 ha (10,000 $m^2$) within the project site.
Controlled : (1 ha x 2.9 kg/ha.day)/24 hours/day= 0.1208 kg/hour
Uncontrolled : (1 ha x 5.8 kg/ha.day)/24 hours/day = 0.241 kg/hour

Emission amounts and mass flow rates that may occur under controlled and uncontrolled conditions due to the vegetative soil to be stripped and excavation to be removed for the installation of SPP panel areas are given in Table III.1.1.2.

**Table III.1.1.2.** Potential Emissions from Vegetable Soil and Excavation

| No | Emission Source | Process | Controlled Emission (kg/hour) | Uncontrolled Emission (kg/hour) | Total Controlled Emissions (kg/hour) | Total Uncontrolled Emissions (kg/hour) |
|---|---|---|---|---|---|---|
| 1 | Vegetative soil stripping in SPP areas (514.5 tons) | Disassembly | 0,0321 | 0,0642 | **0,3161** | 0,6324 |
| 2 | | Loading | 0,0128 | 0,0257 | | |
| 3 | | Transportation | 0,14 | 0,28 | | |
| 4 | | Unloading | 0,0128 | 0,0257 | | |
| 5 | | Storage | 0,1184 | 0,2368 | | |
| 6 | Excavation removal process in SPP areas (6,027 tons) | Disassembly | 0,1255 | 0,2511 | **0,9067** | 1,8129 |
| 7 | | Loading | 0,0502 | 0,1004 | | |
| 8 | | Transportation | 0,56 | 1,12 | | |
| 9 | | Unloading | 0,0502 | 0,1004 | | |
| 10 | | Storage | 0,1208 | 0,241 | | |
| **TOTAL** | | | | | **1,2228** | 2,4453 |

03.07.2009 dated and 27277 numbered "Regulation on the Control of Industrial Air Pollution (SKHKKY)" which entered into force after being published in the Official Gazette dated 03.07.2009 and numbered 27277 Annex 2 states that *"it is not necessary to determine values representing air pollution, air quality values obtained by measurements, air pollution contribution values obtained by calculation and total pollution values constituted by these values, if the emissions from places other than stacks are less than 1 kg/hour".*

The calculations made for the dust emissions that will be generated as a result of land preparation and construction activities are above the limit value of 1 kg/hour in Table 2-1 of SDHCPD. Therefore, Air Quality Modeling was performed with AERMOD.

Vegetative soils and excavation soil to be generated within the scope of the Project will be temporarily stored in the approximately 19,845 $m^2$ Vegetative Soil and Excavation Storage Area located immediately north of the Project area. Afterwards, an assessment will be made regarding the beneficial use of the vegetative soil and excavation material for landscaping, filling, etc., and if it cannot be reused, it will be transported to the authorized dumping areas of the relevant administration.

A 1/25.000 scale topographic map showing all project areas including the Vegetative Soil and Excavation Storage Area is given in Annex-4 and the General Site Plan is given in Annex-10.

In all phases of the project; necessary measures will be taken to reduce dust emissions in the facilities to be established, nearby residential areas, agricultural lands and the provisions of the Regulation on the Control of Industrial Air Pollution will be complied with.

The roads to be used during construction works will be continuously wetted and the environment will be kept moist during excavation, leveling and transportation operations.

## AIR QUALITY MODELING STUDIES

### Legal Status

Improvements in air management policies in Turkey have gained significant momentum with Turkey's adoption of the European Union (EU) Integrated Environmental Strategy. Accordingly, Turkey's legislation is fully aligned with the EU Framework Directive on Air Quality (and related directives). The primary legislation in force in Turkey regarding air quality is the Regulation on the Control of Industrial Air Pollution (RG-06.11.2020-31296), which entered into force after being published in the Official Gazette No. 27277 dated 03.07.2009 (Amended: RG-06.11.2020-31296).

The SDGCCPR covers the principles and procedures for the establishment and operation of enterprises, the air emissions from the enterprise and the inspection and determination of the prevention of air pollution within the impact area of the enterprise, and the procedures and principles regarding the production, use, storage and transportation of fuels, raw materials and products.

As a result of the amendment of the SDGPLR by being published in the Official Gazette No. 29211 on 20.12.2014, the Regulation on the Control of Air Pollution from Industrial Facilities was repealed and the relevant provisions were included in the scope of the SDGPLR.

The SDGPLRR aims to control emissions in the form of soot, smoke, dust, gas, vapor and aerosol emitted into the atmosphere as a result of the activities of industrial and energy production facilities; to protect people and their environment from the dangers arising from pollution in the air receiving environment; to eliminate the negative effects that cause significant harm to the public and neighborhood relations arising in the environment due to air pollution and to prevent the emergence of these effects. Therefore, the regulation defines limit values for gaseous pollutants and particulate matter.

The limit values to be ensured in outdoor air defined in Table 2.2 of Annex-2 of SDGPLR are given in Table III.1.1.3.

**Table III.1.1.3.** Limit Values Specified in GDRWQRM

| Parameter | Period | Limit Value | Unit |
|---|---|---|---|
| PM10 | 24 Hours (Not more than 35 times in one year) | 50 | µg/m³ |
| | Annual | 40 | |
| Settling Dust | KVS | 390 | mg/m².day |
| | UVS | 210 | |

**Definition of Air Quality Dispersion Model**

The computer program used in the modeling study is an internationally recognized program called AERMOD (AMS/EPA Regulatory Model), developed by the United States Environmental Protection Agency (USEPA).

The AERMOD modeling system consists of three separate components: AERMOD (AERMIC Dispersion Model), AERMAP (AERMOD Terrain Preprocessor) and AERMET (AERMOD Meteorological Preprocessor).

The graphical modeling interface BREEZE (Trinity Consultants, latest version 9.0 19191 executable) was used to organize the modeling study. The model is one of the most advanced computer models capable of predicting hourly, daily and annual Ground Level Concentration (GLC) values based on time-varying real-time data. The model incorporates many different dispersion model calculations (point, volume, area) ranging from isolated stacks to fugitive pollutants, and also takes into account aerodynamic waves, turbulence and similar phenomena that may be experienced by pollutants from sources in any industrial area.

The AERMOD model works in a user-defined network system, and calculations are performed for the corner points of each receiving environment element of the network system. The network system in which the AERMOD model is used can be defined as polar or Cartesian, and more detailed calculations can be performed at these points by determining discrete receiver points outside the network system. "Atmospheric Boundary Layer" is used as the stability model in propagation calculations. The model also takes rough terrain into account.

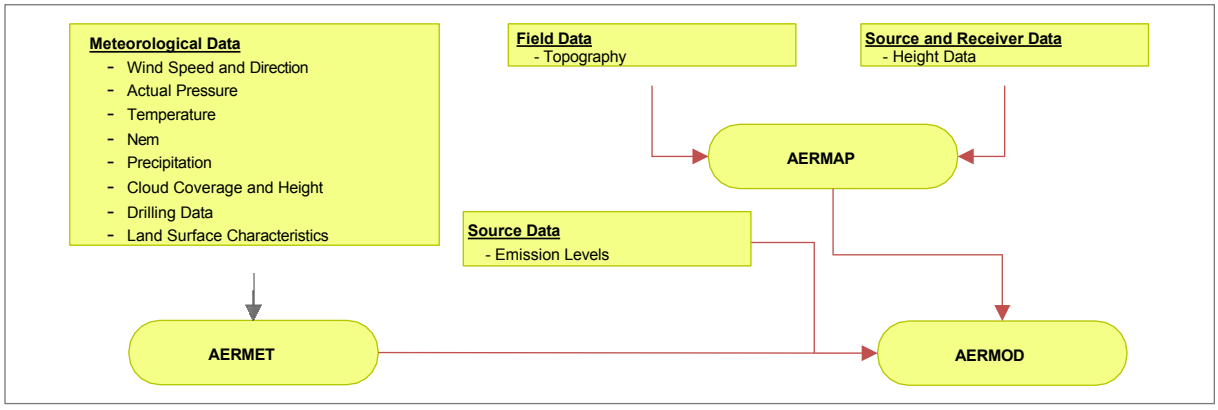


**Figure III.1.1.1.** Working Principle of AERMOD Air Quality Modeling Software

The AERMOD model uses the following different types of data:

- Topographic Data: Coordinates and elevations of each element in the network system defined as the receiving environment.

- Meteorological Data: Hourly meteorological data set including wind direction, wind speed, temperature, atmospheric stability class (Pasquill stability class), mixing height and wind profile exponent and potential vertical temperature difference.

- Source Parameters: Source data including pollutant source coordinates, height, diameter, pollutant exit velocity, temperature and emission flow rate determined relative to an identified starting point.

The outputs of the modeling program run in line with the data described above are in a structure that allows the preparation of dispersion maps for the entire study area. Thus, it is possible to evaluate the air quality of the region under different scenarios (e.g. different pollutant conditions or different seasonal conditions).

The modeling study, which allows the concentration of gaseous and dust pollutants in the ambient air to be estimated through mathematical calculations, consists of the following steps.

- Determination of the distribution region of the sources
- Providing latitude, longitude and altitude values of the determined distribution region by creating 250-meter grids
- Determination of information on Pollutant Sources
- Providing hourly meteorological data for a representative year
- Determination of hourly stability classes and calculation of mixing heights using meteorological data.

By running the modeling program after transferring the processes listed above to the program, hourly, daily and annual ground level concentration values of pollutants in the ambient air can be estimated.

EPA AERMET computer program (AERMOD Meteorological Preprocessor (AERMET) User's Guide, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. Emissions Surveillance and Analysis, Research Triangle Park, North Carolina, EPA-454/B-03-002, November 2004) was used to combine surface meteorological data from designated stations and upper-layer air data from ravinsonde stations for the years selected as the most appropriate years into AERMOD-ready surface and upper-air input files. The AERMET program is used as a meteorological pre-processor for AERMOD. AERMET is designed to combine surface and atmospheric weather data from field measurements and from the General Directorate of Meteorology for use in the AERMOD program. Site-specific parameters such as surface roughness coefficient, Bowen ratio and albedo are defined at this stage.

The model outputs allow the preparation of dispersion maps for the entire study area. Thus, it is possible to evaluate the air quality of the region under different scenarios (e.g. different treatment conditions, different pollutant sources or changing seasonal conditions).

In this framework, information on the methods and studies applied in the processing of meteorological data set and surface data, determination of emission sources and levels, and determination of the impact area are evaluated under the following headings.

**Meteorological Data Set Used**

Meteorological data required for the Air Quality Modeling study are hourly surface station data (Ground level) measured at air conditioning, synoptic or automatic type stations in any year and meteorological sounding (High Atmosphere) data measured at ravinsonde type stations where the vertical profile of the atmosphere is determined.

In the first stage, in line with the opinions of the General Directorate of Meteorology of the Ministry of Environment, Urbanization and Climate Change of the Republic of Turkey, monthly wind blowing data covering the last 10 years are obtained from the existing meteorological station located in the vicinity of the project area.

By examining the wind blowing numbers data with the long years bulletin provided, in the same way
In line with the opinions of the Republic of Turkey Ministry of Environment, Urbanization and Climate Change, General Directorate of Meteorology, the appropriate year for the hourly data to be used in the Air Quality Modeling study is determined and ground level and sounding data for that year are obtained.

In this Air Quality Modeling study, in accordance with the opinion of the Republic of Turkey Ministry of Environment, Urbanization and Climate Change, General Directorate of Meteorology given in Annex-2.10, Varto Meteorological Station data with station number 17778 for ground level data and Erzurum Ravinsonde data provided by Erzurum Regional Meteorological Station with station number 17095 for upper level data were used.

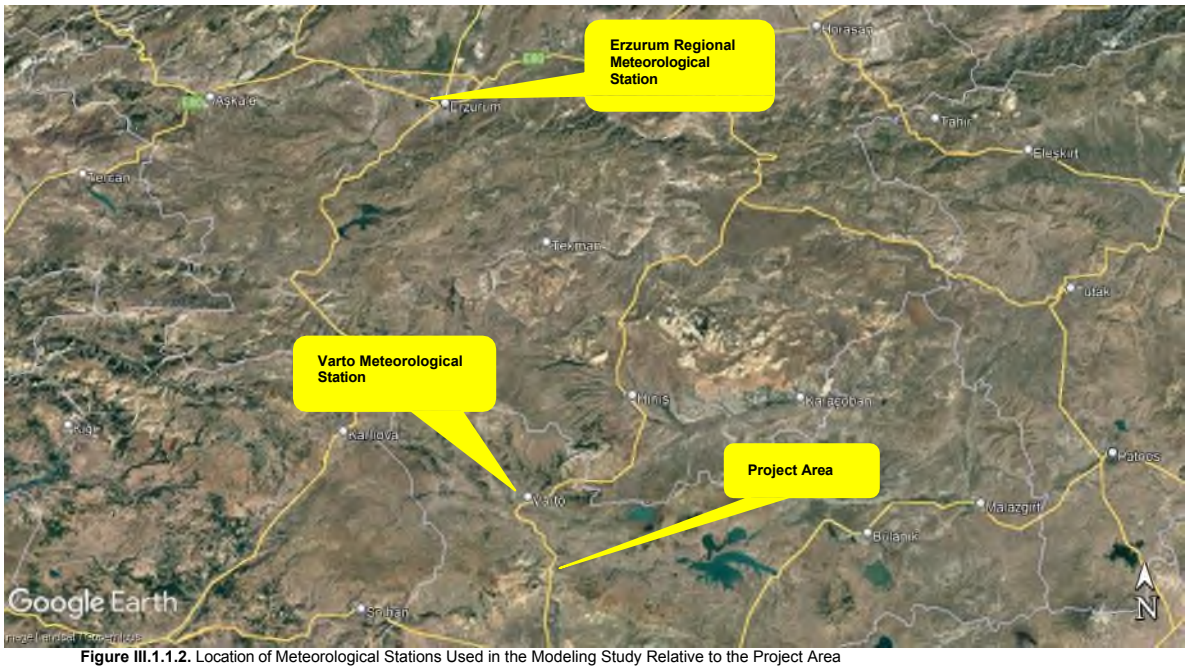


**Figure III.1.1.2.** Location of Meteorological Stations Used in the Modeling Study Relative to the Project Area

While determining the year in which hourly data will be used in the Air Quality Modeling study; 1977-2021 Meteorological Bulletin of Varto Meteorological Station with Station Number 17778 and 2012- 2022 Monthly Blowing Number Total Values by Direction were compared. As a result of the comparison, **2020** was determined as the appropriate year in line with the opinion of the General Directorate of Meteorology of the Republic of Turkey Ministry of Environment, Urbanization and Climate Change given in Annex-2.10.

**Table III.1.1.4.** Comparison of Long-Term, 10-Year and 2020 Wind Blowing Data

| Directions | Long Years | 10 Years | Year 2020 |
|---|---|---|---|
| **N** | 18678 | 8913 | 1253 |
| **NNE** | 12945 | 8117 | 926 |
| **NE** | 20145 | 6809 | 848 |
| **ENE** | 16173 | 5843 | 667 |
| **E** | 12673 | 4050 | 336 |
| **ESE** | 8661 | 2611 | 226 |
| **SE** | 8717 | 2306 | 200 |
| **SSE** | 12141 | 2282 | 180 |
| **S** | 12715 | 3277 | 219 |
| **SSW** | 23686 | 3662 | 264 |
| **SW** | 32496 | 4125 | 363 |
| **WSW** | 39560 | 4983 | 404 |
| **W** | 29546 | 4732 | 384 |
| **WNW** | 25141 | 4417 | 385 |
| **NW** | 16004 | 3821 | 375 |
| **NNW** | 8851 | 4049 | 475 |
| **Prevailing Wind Directions** | **Long Years** | **10 Years** | **Year 2020** |
| **Grade 1** | WSW | N | N |
| **2nd Degree** | SW | NNE | NNE |
| **Grade 3** | W | NE | NE |
| **Grade 4** | WNW | ENE | ENE |
| **Blowing Numbers According to Prevailing Directions** | **Long Years** | **10 Years** | **Year 2020** |
| **Grade 1** | 39560 | 8913 | 1253 |

| Directions | Long Years | 10 Years | Year 2020 |
|---|---|---|---|
| **2nd Degree** | 32496 | 8117 | 926 |
| **Grade 3** | 29546 | 6809 | 848 |
| **Grade 4** | 25141 | 5843 | 667 |

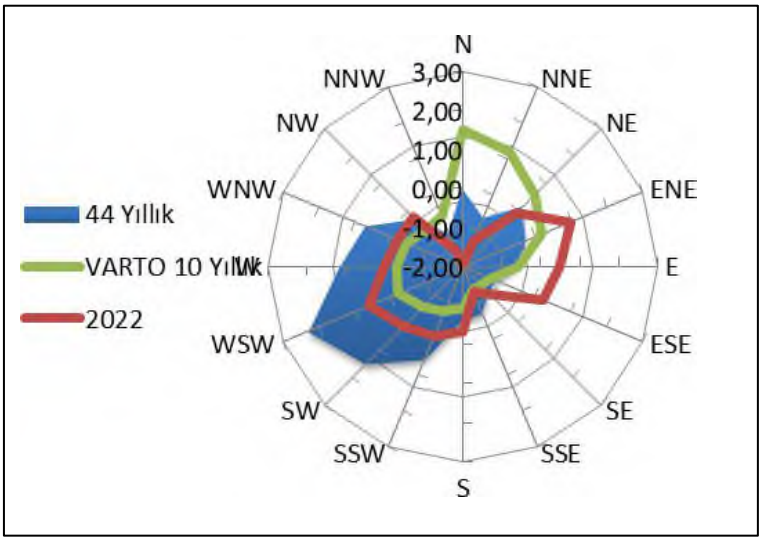


**Figure III.1.1.3.** Varto Meteorological Station Long Years (1977-2021), 10 Years (2012-2022) and 2020 Comparison of Breeze Numbers

Long Term Meteorological Bulletin of Varto Meteorological Station with Station Number 17778 covering the years 1977-2021 and Monthly Wind Blasts by Direction Total Values for the years 2012-2022 were obtained. By comparing the data of Varto Meteorological Station Long Years (1977-2021) Bulletin and the last 10 years of Total Wind Blasts by Direction of the same station, the experts of the General Directorate of Meteorology of the Ministry of Environment, Urbanization and Climate Change of the Republic of Turkey determined the appropriate year for Varto Station to be used in Air Quality Modeling and the Meteorological station information to be used by Ravinsonde data.

Varto Meteorological Station with Station Number 17778, which was used to create the meteorological data set for the air quality modeling study, All Parameters Long Term Meteorological Bulletin for 1977-2021 is presented in Annex-2.10.

The high atmosphere data to be used in the modeling studies were obtained from Erzurum Regional Meteorological Station with station number 17095, which is located in the ravinsonde observation group closest to the project area. Information about these stations is given in Table III.1.1.5.

**Table III.1.1.5.** Ground Level and High Atmosphere Meteorological Stations

| Hourly Data for 2020 | | |
|---|---|---|
| **Ground Level Data** | Pressure | Varto Meteorological Station (17778) |
| | Wind speed and direction | |
| | Nem | |
| | Precipitation | |
| | Temperature | |
| | Cloudiness | |
| | Cloud Coverage | |
| **High Atmosphere Data (10 hPa intervals between 0-5000 m)** | Pressure | Erzurum Regional Meteorological Station (17095) |
| | Height | |
| | Temperature | |
| | Nem | |
| | Working Temperature (Dew point) | |
| | Wind Direction | |
| | Wind Speed | |

2020 high atmosphere and ground level atmospheric data have been converted from xls format to txt format to be used by the pre-processor AERMET. These txt files were converted into sfc (surface/ground level data) and pfl (profile/high atmosphere data) file extensions that the Breeze AERMOD Model program can use meteorological data through AERMET. The files with sfc and pfl extensions were used in the Air Quality Modeling study.

**Determination of Facility Impact Area in Air Quality Modeling**

*Land Preparation and Construction Phase*

In case there are areal sources in the Air Quality Modeling Study; circles with a radius of 1 km are drawn with the corners coming to the center of the circle. Then, the impact area is determined by creating grids to cover the circle drawn for each corner of the sources. A representative photograph of the method followed in determining the facility impact area is presented in Figure III.1.1.4.

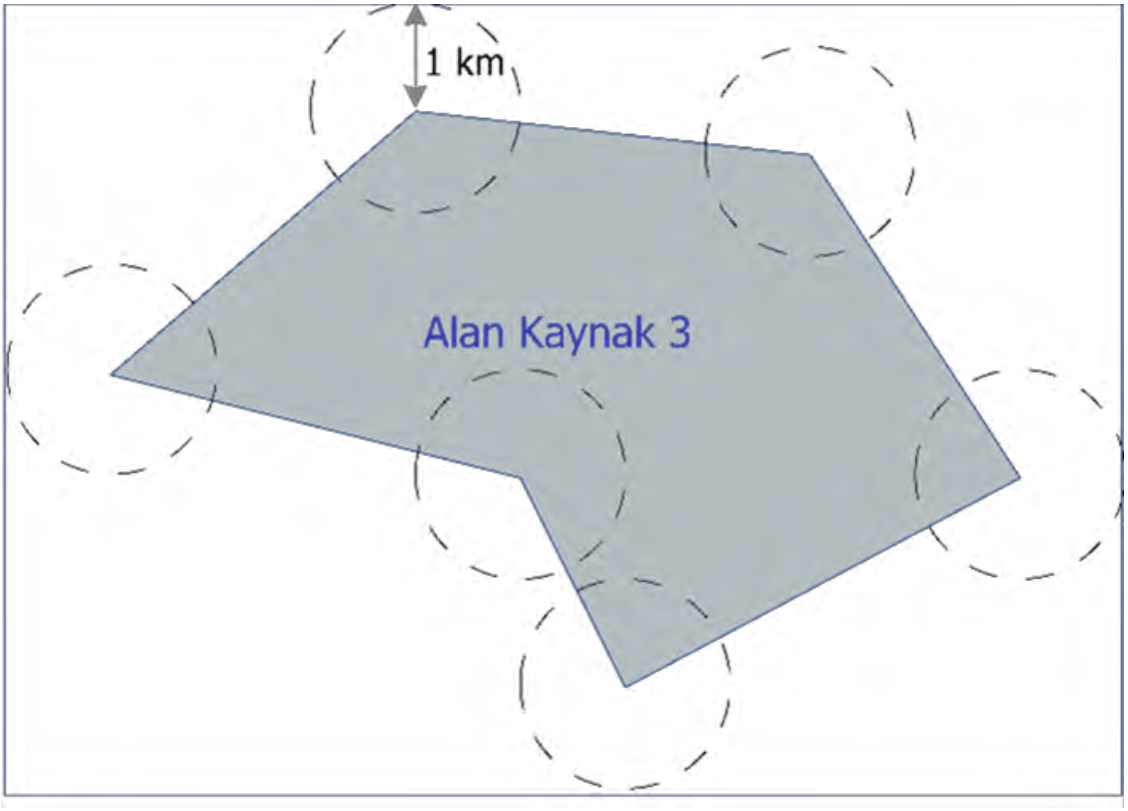


**Figure III.1.1.4.** Method for Determining the Facility Impact Area

After determining the facility impact area, the receiving environment system is created where the modeling distribution will be provided. Although the receiving environment system in question is a circle surrounding the facility impact area, data entry was made through the Uniform Polar Grid option in the modeling study.

**Receiving Media System**

The receiving environment system created within the scope of the Project is sized to include both the impact area and the EIA Areas.

The Grid system created within the scope of the Air Quality Modeling study is circular in structure covering the plant impact area. The grid system determined for the construction phase; It consists of 288 receptors, i.e. receivers, intersected by 8 rings with a radius of 2,000 meters and 250 meters intervals and radii drawn at 10 degree angles.

In addition to the receptors in the air quality modeling study for the land preparation and construction phase, the baseline measurement points were also included as sensitive receptors in order to see the cumulative impact. A visualization of the receiving environment system is given in Figure III.1.1.5.

**Figure III.1.1.5.** Land Preparation and Construction Phase Receiving Environment System

**AERMOD INPUT PARAMETERS**

Three types of data sets were used to run the AERMOD model. These are;

- Topographic information (DEM File created with the help of AERMAP)
- Meteorological data (Profile and Surface Files created with the help of AERMET)
- Emission data

**Emission Data Used in Modeling**

The model considers the worst case scenario (based on the assumption that simultaneous excavation works are started in all units); Annex-2.e.4 "*4) The calculations are made by assuming that the emissions generated within the plant impact area do not undergo any chemical or physical change*." and *5) "When calculating the dispersion of emissions, it is assumed that the dispersion conditions are constant for each case."* in Annex-2.e.5.

During the model run, emission data for the extraction, loading, unloading, transportation and storage of vegetative soil and excavation surplus material (excavation) within the scope of land preparation and construction works of the project were used as emission source.

***Topographic Data Used in Modeling:*** The topographic structure of the region is another factor that will affect the distribution of pollutants. The environment of the planned SPP investment has a complex structure.

Through the AERMAP software, which is the pre-processor of the AERMOD model, the data file of the modeling area was created by creating reference points for the area to be modeled, as specified in the SDHCRM. Thus, a physical relationship between the characteristics of the terrain and the distribution of air pollution is provided. As a result, AERMAP generates elevation data for each receiver location (grid points). The dispersion model also provides data to continue dispersion around elevations or to sustain the effects of air flowing over the baffle.

03.07.2009 dated and 27277 numbered Official Gazette (Amendment: 20.12.2014 dated and 29211 numbered R.G.) published in the Official Gazette (Amendment: 20.12.2014 dated and 29211 numbered R.G.) "Regulation on the Control of Industrial Air Pollution" (SKHKKY) Annex-2 "For facilities with an effective height (h + h) of less than 30 m from the ground, the facility impact area is a square area with a side length of 2 km.", the construction phase facility impact area was selected as a square area with one side of 4 km.

The Grid system created within the scope of the Air Quality Modeling study is circular in structure covering the plant impact area. The grid system determined for the construction phase; It consists of 288 receptors, i.e. receptors, where the radii intersect the radii drawn at 10 degree angles with 8 nested rings with a radius of 2,000 meters and 250 meters intervals. In the air quality modeling study, in addition to 288 receptors, 6 points (3 PM10, 3 Settling Dust) belonging to the measurements made within the scope of the current situation measurements were added as receptors. The study area was digitized with this method and used as model input.

***Meteorological Data Used in Modeling:*** Meteorology is the most important factor affecting the atmospheric distribution of pollutants. In order to obtain the meteorological information required for the modeling studies, "Varto and Erzurum Regional Meteorological Station" data obtained from the General Directorate of Meteorology were used.

Republic of Turkey Ministry of Environment, Urbanization and Climate Change, General Directorate of Meteorology's Annex-
According to the opinion given in 2.9, Varto Meteorological Station with station number 17778 was used for ground level data and Erzurum Ravinsonde data from Erzurum Regional Meteorological Station with station number 17095 was used for upper level data.

While determining the year in which hourly data will be used in the Air Quality Modeling study; 1977-2021 Meteorological Bulletin of Varto Meteorological Station with Station Number 17778 and 2012- 2022 Monthly Blowing Number Total Values by Direction were compared. As a result of the comparison, **2020** was determined as the appropriate year in line with the opinion of the General Directorate of Meteorology of the Republic of Turkey Ministry of Environment, Urbanization and Climate Change given in Annex-2.10.

Varto Meteorological Station with Station Number 17778, which was used to create the meteorological data set for the air quality modeling study, All Parameters Long Term Meteorological Bulletin for 1977-2021 is presented in Annex-2.10.

The AERMOD Model accepts wind speed and direction, temperature, stability class, main level sounding data on an hourly basis. Therefore, some adjustments need to be made in order to use the data in the model. At this stage, the AERMET Program, which is a pre-processor that edits the meteorological data to be used in AERMOD, was used to create meteorological files to be entered into the model.

## AIR QUALITY DISPERSION MODELING RESULTS

The modeling results for the parameters that cumulatively exceed the threshold values specified in Table 2.1 of the GDRAP are evaluated according to Table 2.2. In this table, the threshold values specified for "2024 and beyond" are taken into consideration.

The maximum Ground Level Concentration (GLC) values obtained as a result of the air quality modeling studies and the limit values in Table 2.2 of the GWQCDM are given in Table III.1.1.6.

**Table III.1.1.6.** Comparison of Construction Phase Modeling Results with Limit Values

| POLLUTANT | PERIOD SPECIFIED IN SKHKKY TABLE 2.2 | Projected Max YSK Values | 2024 and Beyond SDGCRG CVS and UVS LIMIT VALUES SPECIFIED IN TABLE 2.2 [1] |
|---|---|---|---|
| PM10 (Air Suspended Particulate Matter) (µg/m³) | 24 Hours[2] | 20,28 (35. VALUE) | 50 µg/m³ (not exceeded more than 35 times in one year) |
| | Annual[2] | 5,00 | 40 µg/m³ |
| Total Settled Dust (mg/m²-day) | KVS | 26,07 | 390 mg/m²-day |
| | UVS | 2,95 | 210 mg/m²-day |

1: Limit values in 2024 and beyond, when the construction of the facility will start

The values calculated as a result of the modeling study are below the limit values given in Table 2.2 of the Regulation on Industrial Air Pollution Control.

The inputs and outputs of the AERMOD Air Dispersion Model and the satellite image representation of dispersion profiles are given in Annex-13.

## Cumulative Evaluation of Air Dispersion Modeling

During the operation phase of the planned project, there will be emissions from vehicle movements during maintenance times. However, since these emissions will be very low, they are not included in the calculations.

The cumulative assessment of PM10 and Sedimentosis emissions that will occur during the land preparation and construction phase of the Project was made by collecting the baseline measurements.

***PM10 and Precipitate Measurements***

At 3 points, settled dust measurements and analyzes were carried out for 60 days for one season, and PM10 measurements and analyzes were carried out at 3 points for 30 days for one season.

**Total pollution values** (TKD) were determined by evaluating the ground level concentration values (GLCV) at the points defined in the study areas with the highest GLCV within the scope of Annex-2 of the SDGCC Regulation and in areas with different land use types such as forests, industrial facilities and settlements, and the **total pollution values** (TKD) were determined by evaluating the current status measurement results representing the background and the load on the air quality **of the facilities currently in operation, and** the cumulative evaluation was made separately for each emission parameter below.

**PM10 Concentrations at Ground Level**

The daily and annual PM10 concentrations calculated for the evaluation of the possible impacts of the emissions of the facility planned within the scope of the project on air quality were compared with the limit values defined in the SDGPLR.

The 24-hour maximum and annual maximum values of the annual and 24hour maximum CCC values of PM10 emissions in the model study area are 20.28 µg/m3 and 5.00 µg/m3, respectively. The values obtained as a result of modeling studies are below the relevant limit values to be complied with as of 2024.

Within the scope of Annex-2 of the GESCR Regulation, TCDD was calculated for the scenario in which the emissions from the planned projects were modeled at the measurement points with different land use types such as forest areas, agricultural areas and settlements, which were determined in the study areas with the highest HKKD within the scope of Annex-2 of the GESCR Regulation, and the estimates for long-term PM10 concentrations are given in Table III.1.1.7.

**Table III1.1.7.** Cumulative Evaluation of Modeling Results and Current Status Measurement Results in terms of PM10 Parameter and Comparison with the SDGPLR Limit Value

| Receiving Media Code | 2024 and Beyond SDGCRG Table 2.2 Limit Value | LONG TERM | | |
|---|---|---|---|---|
| | | Annual Average $_{PM10}$ (Limit Value: 40 µg/m³) | | |
| | | HKKD (µg/m³) | Current Status** (µg/m³) | TKD (µg/m³) |
| | | Modeling Result | | Cumulative Value |
| PM-1 | 40 | 0,016 | 7,87 | 7,886 |
| PM-2 | 40 | 0,011 | 8,96 | 8,971 |
| PM-3 | 40 | 0,006 | 8,77 | 8,776 |

*UVD values: Refers to the arithmetic average of all measurement results.
**UVD values: Refers to the arithmetic mean of the measurement results.

In the sensitive areas examined, no limit exceedance is observed according to the current situation. Emissions of the planned plant are below the annual legal limit value in these regions.

**Concentrations of Settled Dust at Ground Level**

In order to assess the possible impacts of the emissions of the plant planned within the scope of the Project on air quality, the calculated daily and annual settled dust concentrations were compared with the limit values defined in the SDGCCPR.

The maximum 24-hour and annual maximum values of the CCC that will be generated by settled dust emissions in the model study area are 26.07 $^{mg/m2}$ -day and 2.95 $^{mg/m2}$ -day, respectively. The values obtained as a result of modeling studies are below the relevant limit values to be complied with as of 2024.

For the scenario in which the emissions from the planned projects are modeled at the measurement points with different land use types such as forest areas, agricultural areas and settlements, which are determined in the study areas with the highest HKKD within the scope of Annex-2 of the SDGCC Regulation, TCDD calculation has been made and the estimates for long-term Settling Dust concentrations are given in Table III.1.1.8.

**Table III.1.1.8.** Cumulative Evaluation of Modeling Results and Current Status Measurement Results in terms of Settling Dust Parameter and Comparison with the Limit Value of SDGCCPR

| Receiving Media Code | 2024 and Beyond SDGCRG Table 2.2 Limit Value | LONG TERM | | |
|---|---|---|---|---|
| | | Annual Average Sedimentosis (Limit Value: 210 mg/m²-day) | | |
| | | HKKD (mg/m²-day) | Current Status** (mg/m²-day) | TKD (mg/m²-day) |
| | | Modeling Result | | Cumulative Value |
| CT-1 | 210 | 0,005 | 22 | 22,005 |
| CT-2 | 210 | 0,004 | 27 | 27,004 |
| CT-3 | 210 | 0,001 | 48 | 48,001 |

*UVD values: Refers to the arithmetic average of all measurement results.
**UVD values: Refers to the arithmetic mean of the measurement results.

**Modeling Results and Recommendations**

As a result of the modeling study, it is seen that PM10 and Settling Dust parameters meet the limit values determined for the years 2024 and beyond in Annex-2 Table 2.2 of the Regulation on the Control of Industrial Air Pollution.

During the operation phase of the project, the Air Quality Assessment Regulation published in the Official Gazette dated 06.06.2008 and numbered 26898 and the Regulation on the Control of Industrial Air Pollution published in the Official Gazette dated 03.07.2009 and numbered 27277 will be complied with.

Accordingly, emission mitigation measures are presented below:

- Irrigation at the source of emission to minimize the dusting that may occur on the land, filling and unloading operations without wasting, rehabilitation of roads,
  During material transportation, it will be ensured that the upper part of the material is kept at 10% humidity.
- In the transportation of combustion and production residues that cause dust, closed transportation systems will be used if the material transported is not moist enough to prevent dusting.
- In-plant roads will be cleaned regularly, and all precautions against dusting (irrigation, sweeping, treatment with dust-binding substances, etc.) will be taken.
- In addition, minimizing dusting that may occur on the land Dusty masonry stored in the open, as specified in the "Emission Limits for Facilities Subject to Permit" annex (Annex-1) of the SDGPLRM
  meeting air quality standards for materials will be complied with.
- In accordance with the provisions of the "Regulation on Exhaust Gas Emission Control" published in the Official Gazette dated 11.03.2017 and numbered 30004 for the exhaust gases of vehicles
  will be complied with. In this context, the fuel systems of the vehicles to be used in the project will be continuously checked. In addition, in order to minimize the emissions from the vehicles, all vehicles and equipment to be used will be routinely checked and the vehicles that need maintenance will be taken into maintenance. In addition, they will be warned to work in accordance with the Traffic Law and attention will be paid to loading in accordance with the loading standards.

There are no limit values for emissions from vehicles within the scope of the legislation. Considering that not all of the vehicles will operate in the same place and at the same time, it is predicted that the pollution caused by these emissions in the project area will not adversely affect the existing air quality.

**III.1.2. Maximum quantities, transportation, storage and use of flammable, explosive, hazardous, toxic and chemical substances to be used during the preparation of the land and also during the construction of the units, tools and machinery to be used for these works, types and properties of fuels to be used in these tools and machinery, emissions to be generated, measures to be taken to mitigate any adverse effects,**

Within the scope of the Project, no flammable, explosive, hazardous, toxic and chemical substances will be used during the land preparation works and the process will be carried out in accordance with the provisions of the "Regulation on the Control of Excavation Soil, Construction and Demolition Wastes", which entered into force after being published in the Official Gazette dated 18.03.2004 and numbered 25406.

The machinery and equipment to be used in land preparation and construction works are given in Table III.1.2.1.

**Table III.1.2.1** Machinery and Equipment to be used during the Construction Phase

| Machinery/Equipment | Quantity |
|---|---|
| Truck | 5 |
| Grader | 1 |
| JCB | 3 |
| Loader | 1 |
| Fastening Machine | 6 |

| Machinery/Equipment | Quantity |
|---|---|
| Digger | 2 |
| Service | 4 |
| Passenger Car | 3 |

The general properties of diesel fuel to be used as fuel in the machinery and equipment in question are given in Table III.1.2.2 and the mass flow limit values given in Table 2.1 of the Regulation on the Control of Industrial Air Pollution, which entered into force after being published in the Official Gazette dated 03.07.2009 and numbered 27277, are given in Table III.1.2.3.

**Table III.1.2.2** Characteristics of diesel fuel to be used in vehicles

| FEATURES | MOTORIN |
|---|---|
| Consistency | Very Fluent |
| Tip | Distilled |
| Color | Amber |
| Density (15 $^0$C-gr/cm$^3$) | 0,8654 |
| Viscosity (38 $^{(0)}$C) | 2,68 |
| Pour Point (0 $^{(0)}$C) | -18 |
| Atomization Temperature (0 $^{(0)}$C) | Atmospheric |
| Pumping Temperature (0 $^{(0)}$C) | Atmospheric |
| Carbon Residuals (%) | Limited |
| Sulfur (%) | 0,4-0,7 |
| Oxygen-Nitrogen (%) | 0,2 |
| Hydrogen (%) | 12,7 |
| Carbon (%) | 86,4 |
| Water and Sediment (%) | Artwork |
| Ash (%) | Artwork |
| Heat Value (Kcal /lt) | 9,387 |

**Source:** Air Pollution Control and Audit, Chamber of Chemical Engineers, 1991

**Table III.1.2.3** Mass Flow Limit Values

| Emissions | Mass flow rates (kg/hour) for operating hours under normal operating conditions and weekly working days | |
|---|---|---|
| | Through the chimney | From Places Other Than Chimney |
| Dust | 10 | 1 |
| Lead | 0,5 | 0,05 |
| Cadmium | 0,01 | 0,001 |
| Thallium | 0,01 | 0,001 |
| Chlorine | 20 | 2 |
| Hydrogen chloride and gaseous Inorganic Chloride Compounds | 20 | 2 |
| Hydrogen fluoride and gas Inorganic Fluoride Compounds | 2 | 0,2 |
| Hydrogen Sulfide | 4 | 0,4 |
| Carbon Monoxide | 500 | 50 |
| Sulfur Dioxide | 60 | 6 |
| Nitrogen Dioxide [$_{NOx}$ (in $_{NO2}$)] | 40 | 4 |
| Total Organic Compounds | 30 | 3 |
| **Note:** The emissions in the table are the hourly mass flow rates emitted from the entire plant (total of stacks). | | |

**Source:** Regulation on Control of Industrial Air Pollution

With the assumption that the amount of fuel to be consumed in one hour by the vehicles to be used in the activities to be carried out in the field during the construction and operation period within the scope of the planned project will be 30 L on average; the emission amounts calculated with these emission factors determined by EPA are given in Table III.1.2.4.

**Table III.1.2.4** Emissions from Vehicles

| Emission | Fouling Factor* (gr/L) | Emission Amount (kg/hour) |
|---|---|---|
| Carbon Monoxide | 9,7 | 9.70 g/l X 30 l/h / 1000 g/kg= ***0.291*** |
| Sulfur Dioxide | 6,5 | 6.50 g/l X 30 l/h / 1000 g/kg= ***0.195*** |
| Nitrogen Dioxide | 36,0 | 36.0 g/l X 30 l/h / 1000 g/kg= ***1.08*** |
| Dust | 18,0 | 18.0 g/l X 30 l/h / 1000 g/kg= ***0.54*** |

When Table III.1.2.4 is evaluated, it is seen that the limit values given in Table III.1.2.3 are not exceeded and even far below the limit values.

The emissions from the vehicles to be used in the land preparation and construction works will be very low and it is anticipated that the emissions from the equipment will not have a negative impact on the existing air quality. In order to minimize the emissions from the vehicles that will be used during the land preparation and construction phase, all vehicles and equipment will be routinely inspected, the vehicles that require maintenance will be serviced and other vehicles will be used for the works until the maintenance is completed.

**III.1.3. Transportation infrastructure plan within the scope of the Project; (Tabulation of the distance of the EIA study area to which highway / motorway and the expropriation limit, connection roads to the highway, which roads will be used for transportation and calculation of the vehicle load that may come as a % increase; Measures to be taken to prevent damage to existing roads to be used and measures to be taken in terms of traffic safety; maintenance and repairs of roads to be used; procedures related to the construction of transportation infrastructure, characteristics of new roads to be built and permits to be obtained; materials, chemicals, vehicles, machinery to be used; vehicle load, type and number, calculation of increase, showing roads on site plans (1/25.000 and 1/1.000 scales, evaluation of the Traffic Management Plan under relevant headings)**

Within the scope of the Project, no additional connection road to the highway will be constructed and it is foreseen that the existing roads will be able to meet the traffic load that may arise from the activities.

Access to the highway from the project site will be provided primarily through existing intersections, and if this is not possible, if it is foreseen to build a connection road, the road project will be approved by applying to the 11th Regional Directorate for the Access Road Permit Certificate and/or to the Provincial Special Administration if that part of the road is under the jurisdiction of the Provincial Special Administration.

Within the scope of the Project, access to the SPP area will be provided by using existing roads (See Figure III.1.3.1) and in-plant roads that will be created by scraping method with construction equipment (grader).

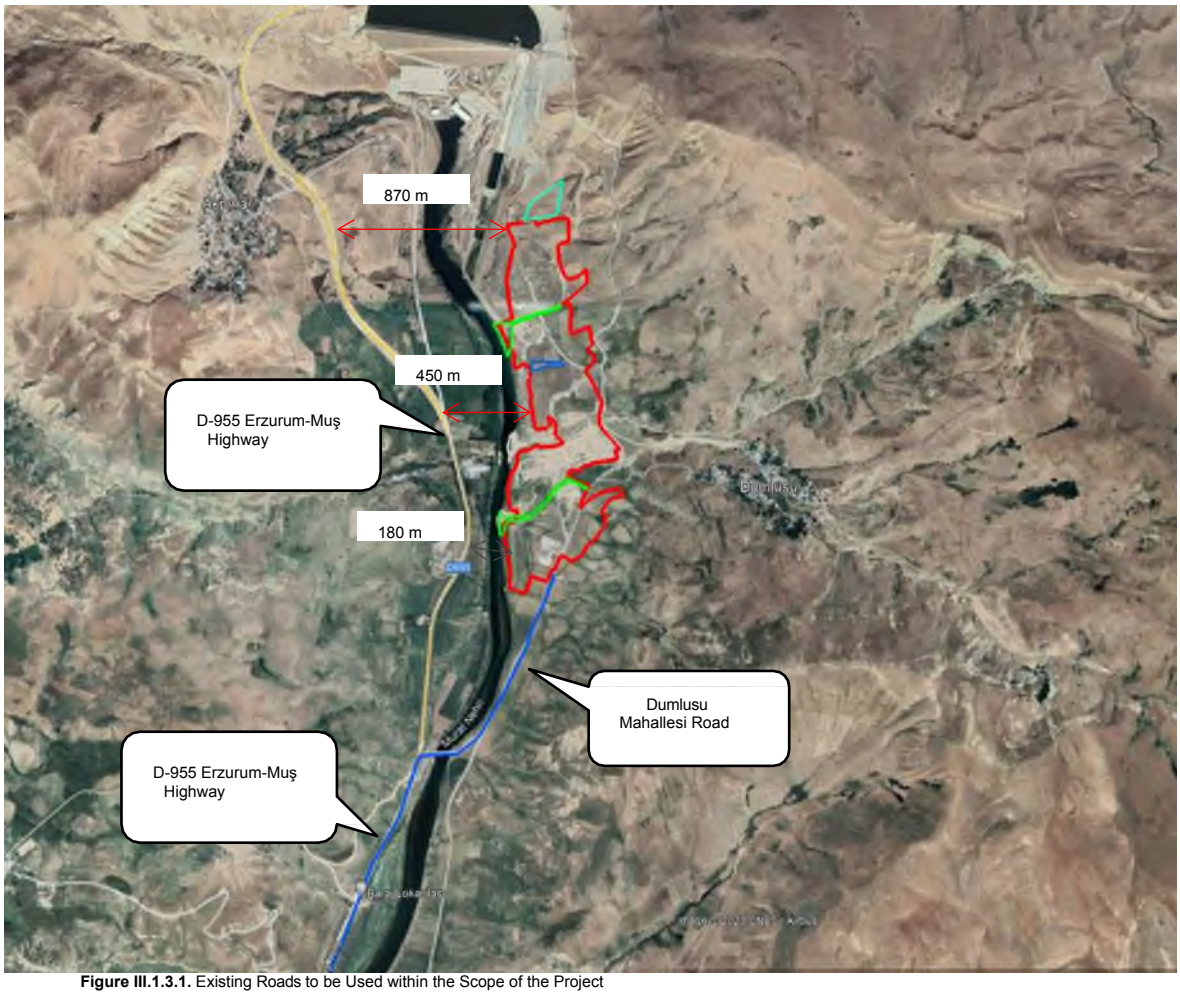


**Figure III.1.3.1.** Existing Roads to be Used within the Scope of the Project

The highway in the vicinity of the Project area is D-955 Erzurum-Muş Highway. The location of the Project area in relation to this highway is shown in Figure III.1.3.2.

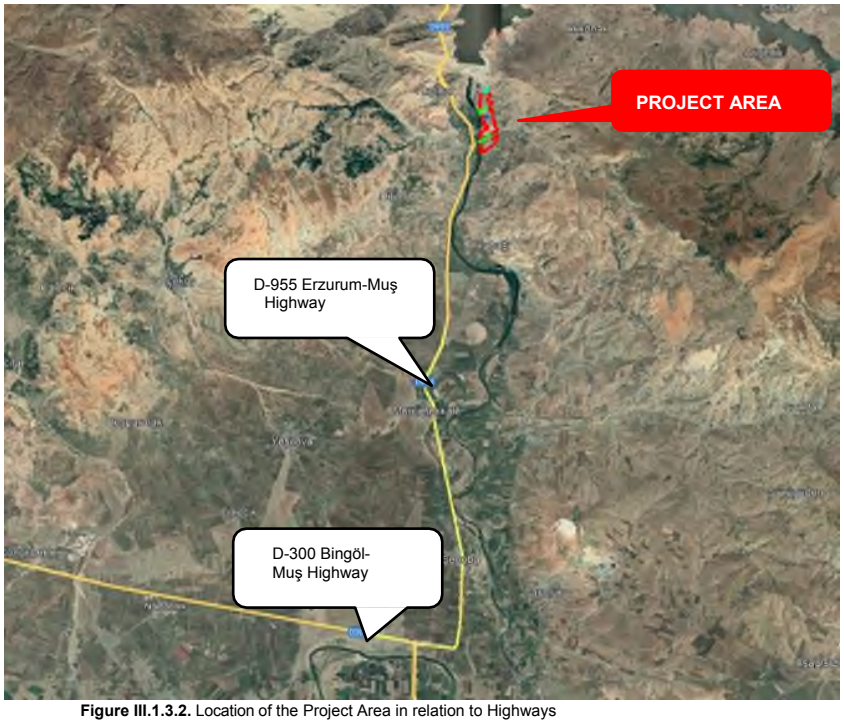


**Figure III.1.3.2.** Location of the Project Area in relation to Highways

Access to the project area is provided via Erzurum-Muş (D955) highway. Access to the project area will be provided by crossing the MURAT NEHRİ bridge from Erzurum-Muş (D955) highway and entering the Dumlusu Village road, which is in the responsibility area of Muş Special Provincial Special Administration.

Dumlusu Village road, which will provide access to the project area, currently has a highway coating standard (concrete or surface coating).

Since the existing stabilized road will be used at the exit from Dumlusu Village road to Erzurum-Muş (D955) highway, negative ground material (mud, shaft, etc.) will be prevented from coming from the site to the road at the connection of the access road to the highway. Necessary measures (cleaning the connection road at certain intervals, etc.) will be taken by the investor company at the connection of the access road to the highway in order to prevent the negative materials from being carried to the highway.

The current status satellite photographs of Erzurum-Muş (D955) highway, MURAT NEHRİ Crossing and Dumlusu Village roads are given in Figure III.1.3.3- Figure III.1.3.8.

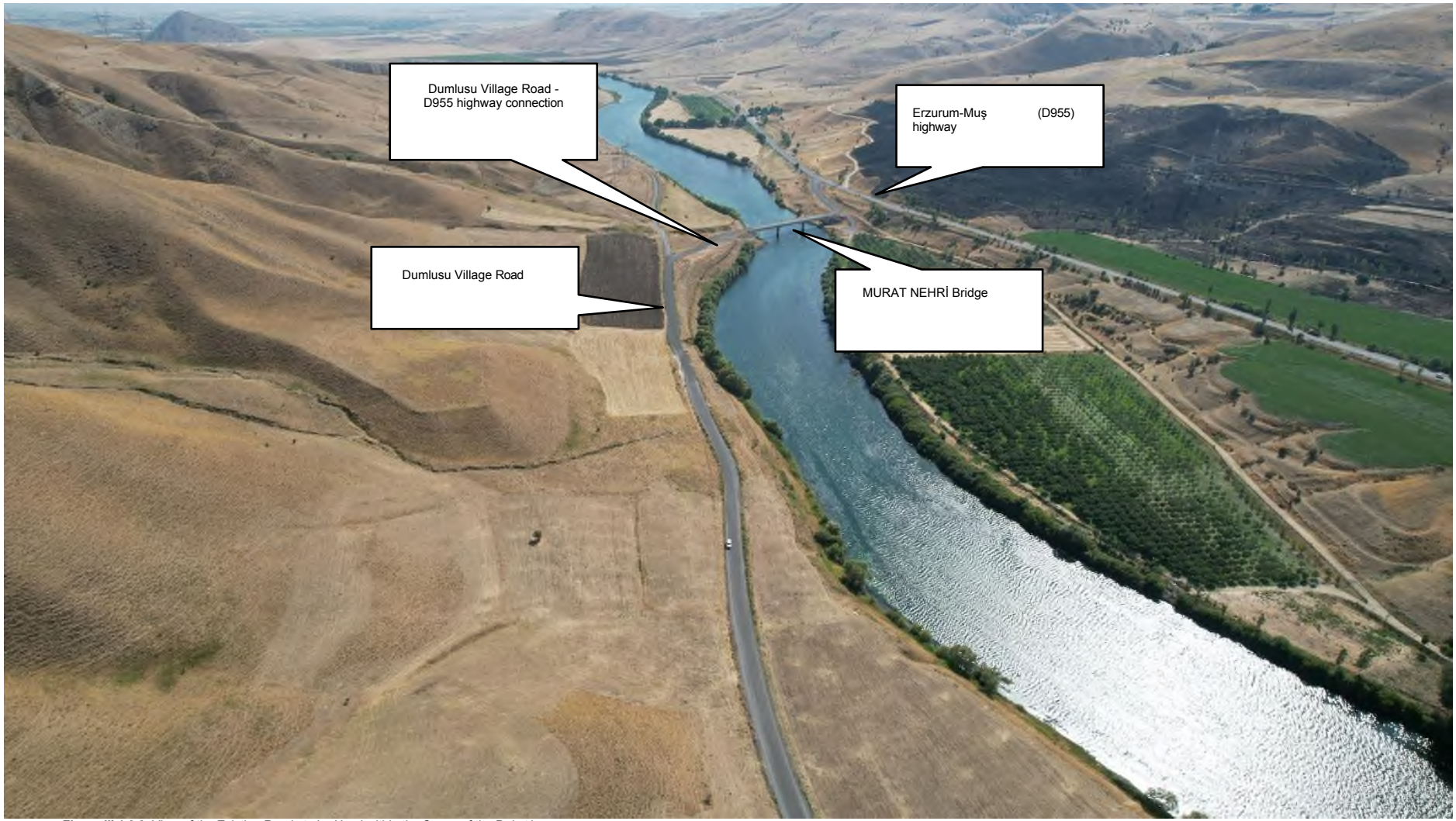


**Figure III.1.3.3.** View of the Existing Roads to be Used within the Scope of the Project-I


**Figure III.1.3.4.** View of Existing Roads to be Used within the Scope of the Project-II

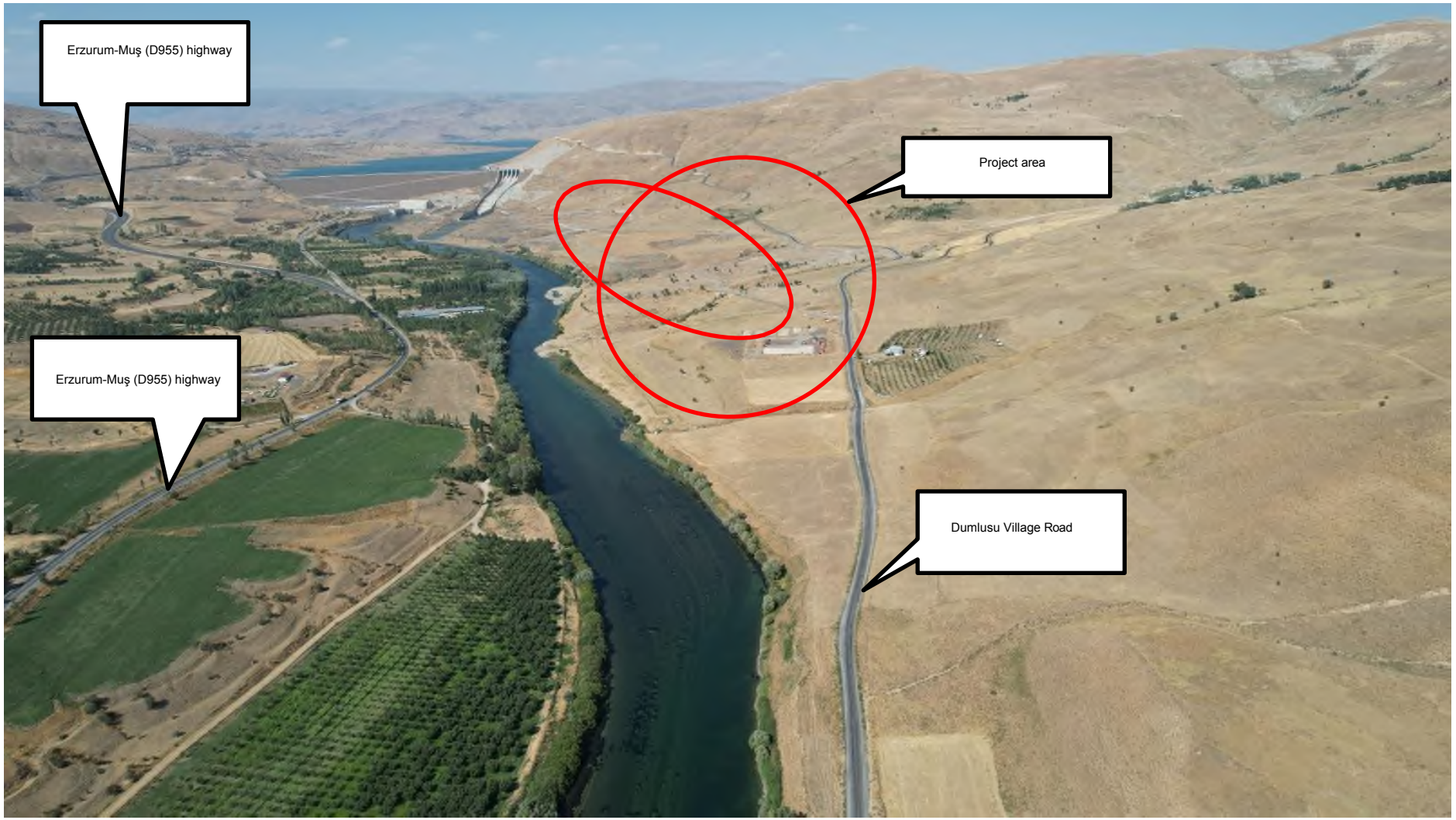


**Figure III.1.3.5.** View of Existing Roads to be Used within the Scope of the Project-III

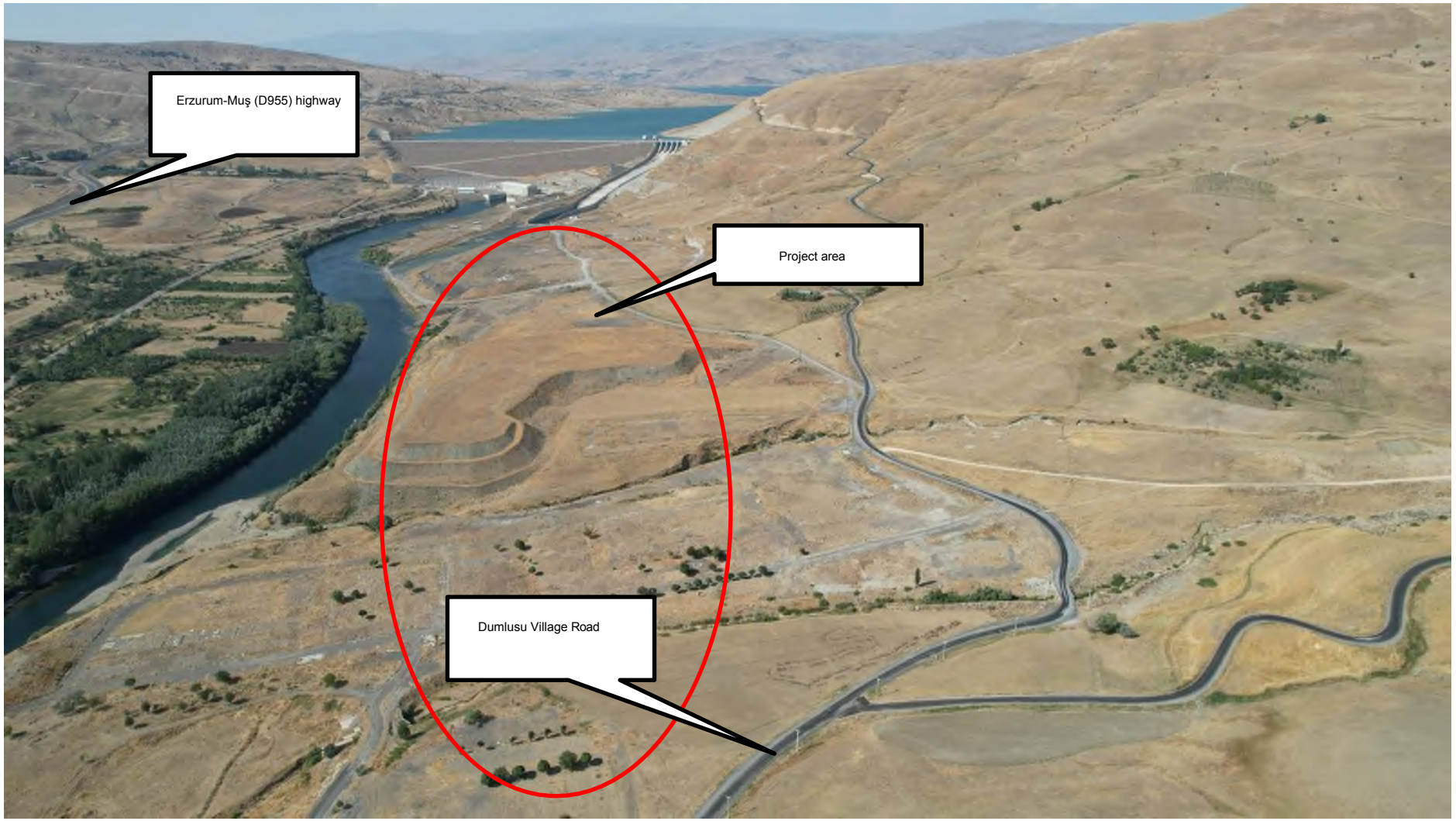


**Figure III.1.3.6.** View of Existing Roads to be Used within the Scope of the Project-IV


**Figure III.1.3.7.** View of Existing Roads to be Used within the Scope of the Project-V


**Figure III.1.3.8.** View of Existing Roads to be used within the Scope of the Project-VI

Machinery and equipment will only be used during the land preparation and construction phase of the Project and these machinery and equipment will only move within the Project area. During the land preparation and construction phase of the Project, road will be used for the transportation of materials and supplies such as solar panels, cables, concrete to the Project area and for the transportation of personnel.

During the operation phase of the Project, no construction equipment will be used and only 1 passenger car will be used for transportation within the facility, maintenance, repair and control works, 1 JCB and 1 tractor will be kept for snow plowing, opening/repairing service roads and panel cleaning. The vehicles and equipment to be used during the land preparation, construction and operation phases of the Project are given in Table III.1.3.1.

**Table III.1.3.1.** Tools and Equipment to be Used in the Project

| **Machinery/Equipment** | **Quantity** |
|---|---|
| Land Preparation and Construction Phase | |
| Truck | 5 |
| Grader | 1 |
| JCB | 3 |
| Loader | 1 |
| Fastening Machine | 6 |
| Digger | 2 |
| Service | 4 |
| Passenger Car | 3 |
| Operation Phase | |
| Passenger Car | 1 |
| JCB | 1 |
| Tractor | 1 |

In the latest published report of the "Annual Average Daily Traffic Values and Transportation Information of Motorways and State Roads by Traffic Segments" published annually by the General Directorate of Highways, Department of Strategy Development, Transportation and Cost Studies Branch Directorate under the Ministry of Transport and Infrastructure, the annual average daily traffic values on the E-955 Highway, which is the closest highway to the project area and will be used during the project, are as follows; automobile 1.155, medium loaded commercial vehicles 288, buses 2, trucks 140, trucks + trailers, tractor trucks + semi-trailers 95, and a total of 1,680 vehicle crossings are observed (See Figure III.1.3.9).

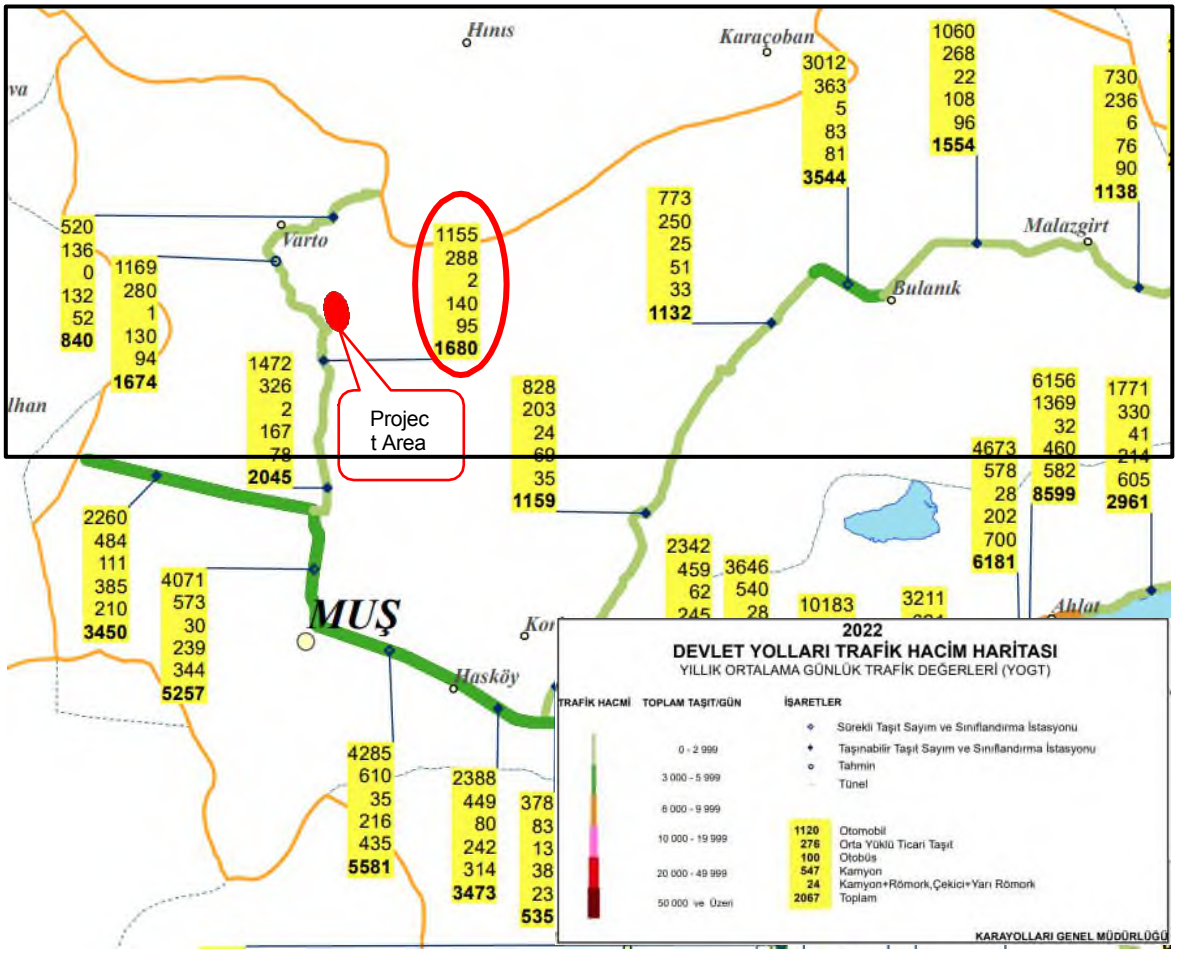


**Figure III.1.3.9.** Traffic Volume Map of State Roads of 11th Regional Directorate of Highways in 2021
**Source:** KGM, Traffic Safety Department, 2022 Traffic and Transportation Information

**Traffic Load Increase Calculation**

During the land preparation-assembly phase of the planned project, the highway will be used by 4 service vehicles, 3 passenger cars and 5 trucks.

Considering the round-trip situations, the number of vehicles in the calculations was taken as 8 for shuttle (medium-loaded commercial vehicles), 6 for passenger vehicles (cars), and 10 for trucks (truck + trailer, tractor + semi-trailer).

The traffic load of the highway to be used is 1,680 in total, including 1,115 cars, 288 medium-loaded commercial vehicles, 2 buses, 140 trucks and 95 trucks + trailers, tow trucks + semi-trailers.

*Percentage of medium-load commercial vehicles (service) on the existing roadway approx;*

[(Existing medium-load commercial vehicles+ Facility sourced) / (Total number of vehicles+ Facility sourced)] x 100

= [(288+ 8) / (1680+ 8)] x 100= Calculated as 17.5%.

*Percentage of medium-loaded commercial vehicles (services) on the existing road prior to the activity;*

= (288/ 1680) x 100= 17.1%.

Accordingly, the services to be used during the land preparation and construction phase of the project will reduce the traffic load on existing highways;

17.5% - 17.1%= would increase by 0.4%.

*The percentage of cars (passenger cars) on the existing roadway is approx;*

[(Percentage of existing cars+ Facility sourced) / (Total number of vehicles+ Facility sourced)] x 100

= [(1115+ 6) / (1680+ 6)] x 100= Calculated as 66.49%.

*Percentage of cars (passenger cars) on the road existing before the activity;*

= (1115/ 1680) x 100= 66.37%.

Accordingly, the cars that will be used during the land preparation and construction phase of the project will reduce the traffic load on existing highways;

66.49% - 66.37%= will increase by 0.12%.

*The percentage of trucks on the existing highway is approx;*

[(Percentage of existing trucks+ Facility sourced) / (Total number of vehicles+ Facility sourced)] x 100

= [(140+ 10) / (1680+ 10)] x 100= Calculated as 8.88%.

*Percentage of trucks on the existing road before the activity;*

= (140/ 1680) x 100= 8.33%.

Accordingly, the trucks to be used during the land preparation and construction phase of the project will reduce the traffic load on existing highways;

8.88% - 8.33%= will increase by 0.55%.

The calculation given in Table III.1.3.2. has been made by considering the worst case scenario and assuming that E-955 Highway will be used. When these vehicle numbers are considered, it is concluded that the planned activity will not bring a significant increase in the traffic load with a rate of 1.07%, even during the construction phase when the maximum number of vehicles is available, taking into account the average daily traffic values for 2022.

**Table III.1.3.2.** Impact of the Project on Road Traffic Load

| Vehicle Type | Number of Available Vehicles (vehicle/day) | Total number of vehicles to be used within the scope of the activity (round trip) | Current Traffic Load (%) | Traffic Load After Operations (%) | Operational Traffic Load Increase (%) |
|---|---|---|---|---|---|
| Automobile | 1.155 | 6 | 66,49 | 66,37 | 0,12 |
| Medium-load commercial vehicle | 288 | 8 | 17,5 | 17,1 | 0,40 |
| Bus | 2 | - | - | - | - |
| Truck | 140 | 10 | 8,88 | 8,33 | 0,55 |
| Truck+Trailer, Tow Truck+Semi-trailer | 95 | - | - | - | - |
| **TOTAL** | **1.680** | **14** | | | **1,07** |

As stated in the opinion of the General Directorate of Highways dated 08.12.2022 given at the EIA Special Format stage, Article 9.1 of the "Regulation on the Technical Evaluation of Solar Energy Based Electricity Generation Applications" published in the Official Gazette dated 30.06.2017 and numbered 30110 states "Glare analysis *ARTICLE 9 - (1) If deemed necessary, the General Directorate of Highways and the General Directorate of State Airports Authority may request a glare analysis from the General Directorate in order to minimize the possible negative effects of solar energy systems planned to be installed in the vicinity of existing and planned highways and airports. The General Directorate shall complete the analysis and forward it to the relevant institutions and organizations. The measures to be taken against the possible risks included in the glare analysis are specified in the report.*" In accordance with the provision, it is necessary to determine whether the facility will cause any inconvenience in terms of glare and luminescence according to the planned design within the General Directorate of Energy Affairs of the Ministry of Energy and Natural Resources in order to ensure that the SPPs do not pose a negative situation in terms of road safety and traffic safety on the existing and/or planned roads in the road network of the General Directorate of Highways.

In this context, an official letter was sent to the General Directorate of Highways Traffic Safety Department and it was asked whether there is a need for a glare analysis. In the opinion of the General Directorate of Highways Traffic Safety Department dated 17.05.2023 and numbered E.1176023, it was requested to have a glare analysis with the statements *"It is understood that the solar power plant to be built ..... is close to the highway and it is deemed necessary by our administration to have a glare analysis to determine whether it will adversely affect traffic safety and to submit the result to our administration as a report."* (See Annex-2.18).

In this context, "Reflection and Glare Impact Analysis Report" dated 07.06.2023 was prepared by Macom Environment and Energy (See Annex-14). Within the scope of the aforementioned report, the study area was determined for the evaluation of the reflection and glare impact (See Figure III.1.3.10).

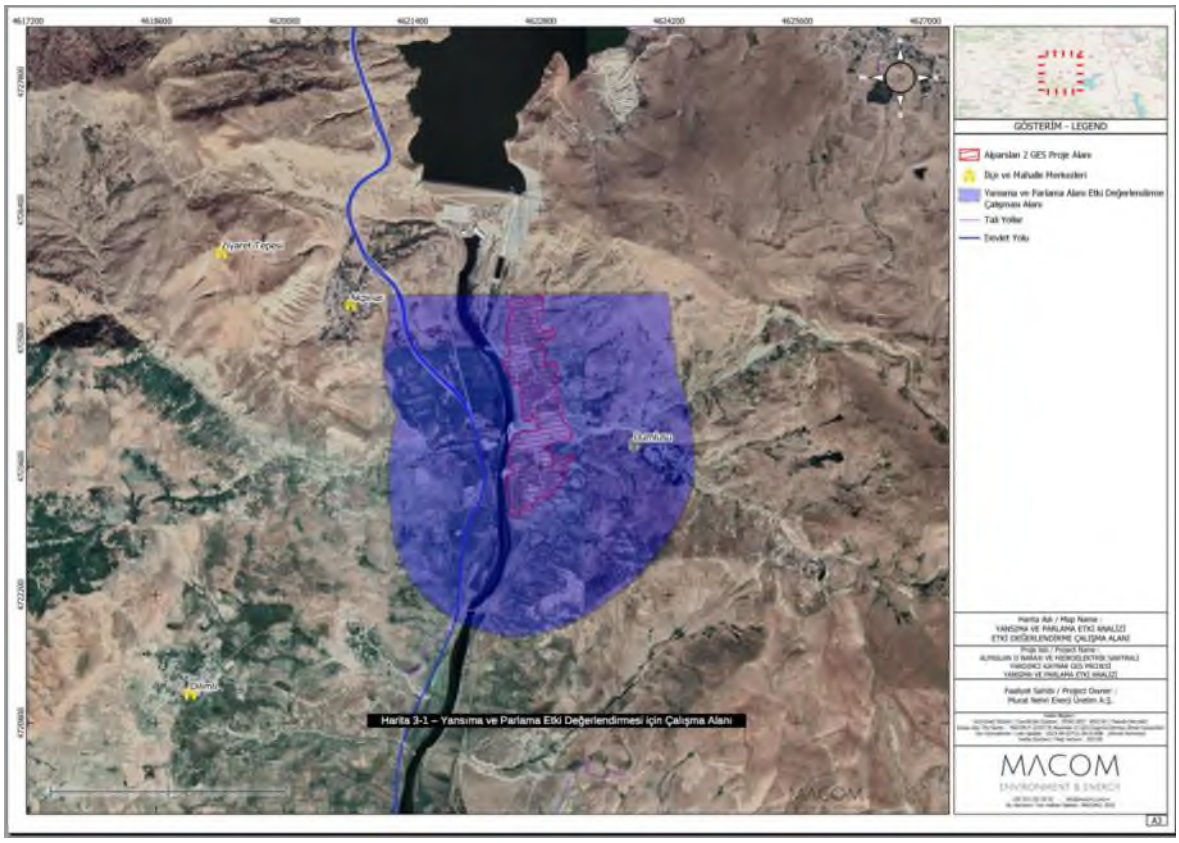


**Figure III.1.3.10.** Study Area for Reflection and Glare Impact Assessment
**Source:** Annex-14 Macom Environment and Energy, Reflection and Glare Impact Analysis Report.

As a result of the modeling performed within the scope of the report, the annual green and annual yellow glare was found to be 0 minutes, and it was determined that this would not cause reflection and glare at any of the glare receptors. In addition, since there are no structures with glass and reflective surfaces around the project area, a cumulative reflection and glare effect is not expected in the topography of the region. As a result of the glare analysis, the receptors located closest to the solar panels where people or living beings are constantly present were evaluated. As a result of the assessment of the selected risks, no permanent and significant reflection and glare impacts are expected due to the Project. Therefore, no mitigation measures are considered necessary at the receptors.

The Reflection and Glare Impact Analysis Report was submitted to KGM, Traffic Safety Department on 06.07.2023 and as a result of the review, the opinion of KGM, Traffic Safety Department dated 11.07.2023 and numbered E.1226002, which is presented in Annex-2.19, was received. It was stated by the Traffic Safety Department that there is no objection to the realization of the project in the area.

In addition, the investor company will ensure that the measures deemed necessary by the General Directorate of Energy Affairs are implemented in coordination with the 11th Regional Directorate of Highways during the implementation phase.

In the event that roads are used during the construction and operation phases, "Traffic Law No. 2918" and all laws and regulations issued in relation to Highways will be complied with.

Article 65 of the Highway Traffic Law No. 2918;

- Exceeding the maximum loaded weight or the maximum permissible loaded weight shall be avoided during transport operations.
- Loading shall not be carried out in a manner that may be dangerous in terms of road structure and capacity and traffic safety.

- Necessary permits will be obtained if it is necessary to transport hazardous and/or harmful material.
- Passengers will be prevented from boarding on or outside the vehicle.
- It will be ensured that the load to be loaded is loaded safely against situations that may disturb the balance due to the road slope.
- It shall be ensured that it is loaded in such a way as to obstruct the driver's vision, impair the driving safety of the vehicle and cover the registration plates, separation signs, stop and turn lights and reflectors.

Law No. 4925 on Highways Transportation;

- In terms of traffic, life and property safety, the necessary sensitivity will be shown by the investor company to ensure that the vehicles are transported within the capacity limit and that the high tonnage vehicle and load characteristics that may damage the road structure comply with the relevant laws and regulations.
- Agricultural lands, greenhouses and related transportation routes around the licensed site and SPP polygon area subject to the project will not be damaged.
- In case of deterioration and destruction of the sub/superstructures of the roads by heavy tonnage vehicles, it will be ensured that they are repaired by the project owner, and that the traffic signs and safety of the facility entrances and exits and the internal operation roads of the SPP area meet the conditions specified in the highway marking standards.

In planning the location of all facilities and structures to be established within the scope of the Project, the provisions of the "Regulation on Facilities to be Built and Opened on the Side of the Highway" will be complied with and attention will be paid to the Highway Expropriation Limit Setbacks.

The provisions of the "Regulation on the Transportation of Dangerous Goods by Road" shall be complied with during the transportation of all materials classified as dangerous goods.

The approval received from the 11th Regional Directorate of Highways at this stage of the project is given in Annex 2.20.

During the transportation of materials during the construction and operation phase, the highways and related facilities will not be damaged, and in case of damage, the damage will be covered by the investor company within the framework of the protocol to be made with the 11th Regional Directorate of Highways.

During the construction phase, the opinion of the 11th Regional Directorate of Highways will be obtained regarding the transportation routes of the materials to be used in the construction works and will be acted in accordance with the specified issues.

During the construction and operation phases, all kinds of measures in terms of traffic safety at the entrances and exits to and from the road will be taken by the investor company in line with the opinions of the 11th Regional Directorate of Highways.

In all transportation to be carried out during the construction and operation phases, transportation will be made according to the maximum loads per axle of the vehicles carrying loads and materials, and the load limit will not be exceeded, and the load will be covered with tarpaulin, and all kinds of measures will be taken by the investor company to prevent material from being thrown onto the highway during transportation.

The Project does not plan to use stone filling and other filling materials. However, in case of the use of stone filling and other filling materials, the opinion of the 11th Regional Directorate of Highways will be obtained after finalizing the quarry areas and transportation route where the material to be used for filling will be supplied.

In order to prevent future problems that may arise in relation to the Project and to prevent public damage, all kinds of additional and existing preliminary study projects, application (application) projects, draft type sections, etc. to be made in the sections close to the existing, project and construction highway routes will be sent to the 11th Regional Directorate of Highways and the appropriate opinions of the 11th Regional Directorate of Highways will be obtained.

A Sustainable Traffic Management Plan has been prepared within the scope of the format announced by the Republic of Turkey Ministry of Environment, Urbanization and Climate Change on 04.08.2022 and is given in Annex-20.

**Animal Passageways**

In the Public Participation Meeting held within the scope of the Project, local people requested that a road be left to pass their animals to the MURAT NEHRİ from the planned SPP area within the scope of animal husbandry activities. In this context, the investor has planned to leave two "Animal Passage Roads" within the boundaries of the SPP area. The North Animal Passage Road will be approximately 350 m long and have an area of 14.151 $^{m2}$ and the South Animal Passage Road will be approximately 525 m long and have an area of 9.971 $^{m2}$. The animal passage roads and the entire SPP site boundaries will be surrounded by wire fences, and upon the request of the local people at the Public Participation Meeting, no structure such as barbed wire etc. will be added to the wire fences that will harm the animals. Animal Access Roads are shown on all maps and their coordinates are given in Annex-1. The satellite image showing the Animal Access Roads is given in Figure III.1.3.11.


**Figure III.1.3.11.** Representation of Animal Passage Routes on Satellite Image

The routes of the Animal Access Roads were clarified in consultation with Dumlusu Neighborhood and local people. Before entering the Animal Access Roads, consent was obtained from the owners of the private land to be used for transportation outside the project area.

**III.1.4. Where, how much and how the material to be used during the construction phase of the Project will be procured, information on material procurement (if any), production maps, marking of the quarry and facility on the 1/25.000 scale topographic map, distances to settlements and transportation route,**

Within the scope of the planned project, the installation of the panels will be carried out after the land preparation works (vegetative soil stripping and excavation removal) are completed.

During the construction phase, only material (concrete) will be used for panel foundations. Concrete requirement will be met from the relevant companies for a fee.

Other basic materials to be used within the scope of the Project are solar panels and electrical cables. Technical information on the solar panels to be used is given in Section I.1.

In addition, the introductory document containing the technical specifications of the panels planned to be supplied is given in the annexes section (See Annex-2.3).

According to the calculations made during the design phase of the planned project, the cables to be used in the wiring activities of the project such as electrical installation, grounding, etc. will be provided from the supplier companies for a fee.

No quarry material supply, transportation and utilization is planned during the land preparation and construction phase of the Project. However, existing roads will be used for material supply, especially during the construction phase, in case materials are brought from the nearest authorized quarry/concrete plant.

High tonnage vehicles to be used in construction and transportation activities will be prevented from passing through settlements.

A 1/25.000 Scale Topographic Map showing the Project area and its immediate surroundings is provided in the appendices (See Annex-4).

**III.1.5. Actions to be taken for ground safety, measures to be taken; flood and landslide risk; impact on surface (including dry stream beds) and groundwater resources and measures to be taken; Making assessments within the scope of the Prime Ministry Circular No. 2006/27 on "Stream Beds and Floods" and the relevant provisions of other relevant legislation (such as the Regulation on Flood and Sediment Control), identification of potential problems that may affect the environment, interaction with the receiving environment, determination of cumulative impacts, measures to be taken to mitigate possible negative impacts, (Within the scope of the Project, measures should be taken against possible flood disasters in areas bordering the MURAT NEHRİ.)**

*Actions to be Taken to Ensure Ground Safety*

There is a Geological Geotechnical Survey Report based on the Zoning Plan for the project area and this report was approved by the Provincial Directorate of Environment, Urbanization and Climate Change on 01.12.2022 in accordance with the circular dated 28.09.2011 and numbered 102732 (See Annex-18). In this context, in order to determine the geological-geotechnical properties of the ground in the activity area, 10 exploration pits with a depth of 5.00 m and a total of 40 geotechnical boreholes with a depth of 15.00 m were drilled. Sandy gravelly clay units belonging to the Zırnak formation were identified in the foundation boreholes and exploration pits in the activity area.

In the project area, the soft vegetated soil forming the backfill soil will be removed and the foundations of the buildings will be placed and supported on homogeneous units of the Zırnak Formation. No groundwater has been encountered in the Project area and liquefaction is not expected. The project area is located on sandy gravelly clay units belonging to the Zırnak Formation and detailed studies will be carried out if necessary against engineering problems in these units and ground improvement methods will be determined. Existing and construction slopes will not be left exposed and will be supported by appropriately designed retaining structures.

The Project area is planned as an auxiliary source to the operational Alpaslan II Dam, which is an asphalt core rock-alluvial embankment for electricity generation. Alpaslan II Dam is located 1 km north of the planned SPP area.

The SPP area is planned on the eastern border of the MURAT NEHRİ, which drains the region. There is one stream (Köy Dere) with a continuous flow through the planned area, entering from the eastern border of the area and exiting from the western border and discharging into the MURAT NEHRİ. Apart from this, there are no continuous streams passing through the planned activity areas, 2 streams pass through the northern part of the SPP Area, 1 stream passes just north of the construction site, 1 stream passes through the south of the construction site (Beyaz D.) and 1 seasonal dry stream passes through the southern part.

The Hydrology Map of the Project area is given in Figure II.2.4.1.

The SPP area is not located within the absolute and short-distance protection areas of any in-continental surface water source from which drinking and utility water is supplied. In addition, there are no swamps, wetlands or lakes within the SPP area.

The provisions of the Water Pollution Control Regulation and the Regulation on the Protection of Drinking and Potable Water Basins will be complied with.

All measures against environmental surface and flood waters that may occur in possible excessive rainfall will be taken by the owner of the activity, the flood level of the structures will be applied at a sufficient height from the natural ground level, DSİwill not be requested for damages and DSİwill not be held responsible for flood damages.

In the event that a road crossing is provided on the flowing and dry streams in the project area and its neighborhood, the necessary project design will be made in accordance with the principles of the Disaster Regulation for Highway Roadside Engineering Structures, and will be constructed in accordance with the scientific procedures and principles after obtaining a hydraulically appropriate opinion from the DSİ17th Regional Directorate. The minimum culvert size applied in the flood control facilities constructed by DSİ is determined as 2 m x 2 m. The passage structures constructed in the form of multi compartment culverts are blocked due to the sediment and plant roots and branches dragged during floods, causing loss of life and property. For this reason, all works related to the streams will be within the permission of DSİ17th Regional Directorate.

No waste material, solid or liquid waste, including those with seasonal flow, will be poured into the existing stream beds in the vicinity of the project site, the cross-sections will not be narrowed, the existing and cadastral width of the stream beds will be preserved, no excavation and filling will be carried out in the strip-like area of at least 20 meters from the slope tops on both banks of the streams, no waste, production waste, etc. from production activities will be placed in the stream beds and on the banks. The excavation residue material to be released in the area in question during the project activities and the transfer of the erosion residue to the stream beds will be prevented by the measures to be taken within the site.

For the streams in and around the project area, the provisions of the Prime Ministry Circular No. 2006/27 on "Stream Beds and Floods" published in the Official Gazette dated September 09, 2006 and numbered 26284 and the Flood and Sediment Control Regulation published in the Official Gazette dated 03.05.2019 and numbered 30763 shall be complied with.

The project area is located within the borders of Varto Plain within the plain areas divided by DSİwithin the Murat Stream Sub-Basin. The drainage area of Varto Plain is 2824 $km^2$ and there is no significant plain opening. There is no significant groundwater use in the plain (DSİ,2017).

The SPP Area is generally located on the Bezan Member of the Upper Miocene aged Zırnak Formation, the Zırnak Formation is observed in the vegetative soil storage area and east of the SPP Area, and the Lower Miocene aged Adilcevaz Formation is observed in the south.

"Geological-Geotechnical Investigation Report Based on Zoning Plan for Alpaslan II Dam and HEPP Auxiliary Source SPP Project in Dumlusu Village, Central District of Muş Province" has been prepared for the SPP Area and within the scope of the said report, 10 exploration pits, each 5.00 m deep, and 40 soil boring wells, each 15.00 m deep, have been drilled. Clay units were observed in these wells. It was stated that no groundwater was encountered at a depth of 15 m in the geotechnical borings carried out in the Project area.

There are no groundwater reserves defined for this sub-basin in the DSİrecords, and the Quaternary aged alluvial units located to the west of the project area, as in the plain, are considered as units providing moderate local groundwater. Kahkale Tepe Lava of Upper Miocene age consisting of basalt and andesite, Zırnak Formation consisting of marl, sandstone, pebble, limestone, tuffite, calcarenite, agglomerate and lava, limestone, calcarenite, Adilcevaz Formation consisting of sandstone and pebbles and Mollakulaç Dere Formation consisting of marl, sandstone, pebble, mudstone, tuffite, agglomerate, andesite and gypsum, and fracture-crack with its permeable levels

The structures are evaluated as moderately productive local groundwater supplying units. Bezan member consisting of marl, claystone and tuffite was evaluated as impermeable.

There are no groundwater wells or springs in the Project area, and there are low-flow springs with seasonal flow in the region.

The 1/25.000 scale Hydrogeology Map of the Project area is given in Figure II.2.4.2. Hydrogeologic sections are also given in Figure II.2.4.3.

When the operation phase is started in the activity area, water samples will be taken from the nearest groundwater; water sources, water boreholes, fountains, capacities, etc. in the project impact area and necessary analyzes will be made, the results of the analysis will be accepted as reference and will be repeated for control purposes in 3-month periods and any changes in groundwater quality will be monitored and reported to the relevant Van DSİ 17th Regional Directorate. All measures will be taken to ensure that groundwater resources (springs, boreholes, etc.) are not adversely affected in terms of quantity and quality.

Within the scope of the Project, the Law No. 167 on Groundwater and the "Regulation on the Protection of Groundwater against Pollution and Degradation" published in the Official Gazette dated April 07, 2012 and numbered 28257 are in force within the framework of the protection of groundwater and resources,
The provisions of the "Communiqué on Determination of Protection Areas of Aquifers and Springs for Drinking Water Supply" dated October 10, 2012 and numbered 28437 and all applicable legislation within the framework of groundwater protection will be complied with.

In case of any negativity towards water resources, boreholes, fountains, capacities, etc., operation activities will be stopped, all damages will be covered by the company and all necessary actions will be taken in line with DSİ directives.

The Project will comply with the provisions of the "Law on Groundwater" and the "Regulation on the Protection of Groundwater against Pollution and Degradation".

**III.1.6. Dust emitting operations such as crushing, grinding, transportation, storage and blasting from the works to be carried out from the preparation of the land to the construction of the facilities and the effects on vegetation, agricultural lands, settlements, etc. due to these works, determination of possible problems that may affect the environment, interaction with the receiving environment, determination of cumulative effects, measures to be taken to reduce possible negative effects,**

Within the scope of the planned project, vegetative soil stripping and excavation removal works will be carried out due to land preparation, road works and solar panel installation activities.

Amounts of vegetative soil and excavation to be generated as a result of the mentioned activities Section Calculated in III.1.1.

The dust emissions that will be generated as a result of these activities have been calculated using the "Emission Factors to be used in Dust Emission Mass Flow Calculations" given in the "Regulation on Control of Industrial Air Pollution" published in the Official Gazette dated 03.07.2009 and numbered 27277 (See Table III.1.1.1).

03.07.2009 dated and 27277 numbered "Regulation on the Control of Industrial Air Pollution (SKHKKY)" which entered into force after being published in the Official Gazette dated 03.07.2009 and numbered 27277 Annex 2 states that *"it is not necessary to determine values representing air pollution, air quality values obtained by measurements, air pollution contribution values obtained by calculation and total pollution values constituted by these values, if the emissions from places other than stacks are less than 1 kg/hour".*

Since the calculated value for total dust emission during the excavation works to be carried out during the land preparation and construction phase of the Project is **1.2228 kg/h** for the controlled case and **2.4453 kg/h** for the uncontrolled case, an air quality modeling study was carried out.

Air Quality Modeling studies were carried out with Breeze AERMOD modeling program and the Air Quality Modeling Report is given in Annex-13 and the related calculations and measures to be taken are given in Section III.1.1.

In Section III.1.1, Cumulative Impact Assessment was made by calculating the cumulative additional loads coming from the modeling to the PM10 and sedimentosis measurement points realized within the scope of baseline measurements. As a result of the studies, it has been observed that the dust and sedimentosis emissions that will be generated from the project during the land preparation and construction phase will remain below the SDGPLRM limit values.

The emissions (CO, HC and NOx) from the vehicles to be used in land preparation and construction works will be very low and the emissions from the equipment will not have a negative impact on the existing air quality. In order to minimize the emissions from vehicles, in accordance with the Regulation on Exhaust Gas Emission Control, which entered into force after being published in the Official Gazette dated 11.03.2017 and numbered 30004; routine checks of all vehicles and equipment to be used will be carried out, vehicles that require maintenance will be serviced and other vehicles will be used in the works until the maintenance is completed. In addition, they will be warned to work in accordance with the Traffic Law and attention will be paid to loading in accordance with the loading standards.

### III.1.7. Land operations to be carried out for panel installation, grounding and lightning rod installation, Panel Installation

After the design works of Alpaslan II Dam and HEPP Auxiliary Source SPP project are completed, the field installation stages will be as follows:

- First of all, vertical and horizontal cable ducts in which DC and AC cables will be laid in accordance with the project are opened and polyethylene pipes through which the cables will be passed are placed in the ducts and covered (See Figure III.1.7.1).

**Figure III.1.7.1** Opening of DC and AC Cable Trays Representative Photograph

- Following the closure of the cable ducts, the legs of the carrier system are fixed to the ground. For this purpose, a corrugated pipe is first lowered into a hole of approximately 1 meter depth drilled with a drilling machine and the carrier system foot is placed in this pipe. Stability of the leg is ensured by pouring concrete into the corrugated pipe (See Figure III.1.7.2).

**Figure III.1.7.2** Representative Photograph of the Placement of the Carrier System

- Upon completion of the foot assemblies, the construction top assembly starts (See Figure III.1.7.3).

**Figure III.1.7.3** Representative Photograph of Carrier System Top Assembly

- With the end of the carrier system assembly, the stage of fixing the solar panels to the carrier system is started (See Figure III.1.7.4).

**Figure III.1.7.4** Representative Photograph of Placement of Solar Panels on the Carrier System

- After the fixing and adjustment of the solar panels are completed, electrical connections are started (See Figure III.1.7.5).


**Figure III.1.7.5** Installation of Electrical Connection Equipment Representative Photograph

- Test production is carried out and commissioning operations are realized (See Figure III.1.7.6).

**Figure III.1.7.6** Representative Photograph of Test Production and Commissioning of Solar Power Plant

Following the completion of the installation works within the scope of the project, de-energized and energized tests are carried out and the conformity of the system in terms of operational safety is checked. Subsequently, commercial production starts with the acceptance procedures in accordance with the legislation.

**Grounding and Lightning Rod Installation**

The positioning of solar energy systems in open areas poses a danger due to events that can cause high voltage impulses such as lightning. The use of lightning rods in photovoltaic systems may cause the lightning strike generated by cumulus clouds to be directed to the power plant by attracting the lightning strike to the system. For this reason, the use of lightning rods in solar energy systems is not considered appropriate. The necessary protection will be provided by grounding. The main purposes of grounding in power plants producing electrical energy;

- Minimizing the possibility of damage to workers and surrounding animals by electric current,
- Prevention of high and sudden voltages and protection against lightning,
- Prevention of damage and material losses that may occur in the system due to high voltage and energy potential differences.

Since the application areas of photovoltaic systems are always designed to cover the entire available surface, they need to be integrated with a TT grounding system. TT grounding system will be used within the scope of the project.

In the TT system, there is a direct earthed point, the exposed conductive sections of the installation are connected to earthing devices which are electrically independent from the power system earthing [device11]. In the TT earthing system, the neutral point of the system source (transformer) is connected to earth and the metal bodies of all units in the system are connected to the earthing line by means of a conductor. The schematic representation of this system is given in Figure III.1.7.7.

Solar panels are grounded with solid copper and flexible copper conductors according to the installation location (See Figure III.1.7.7).

[11]**Source:** 21.08.2001 dated and 24500 numbered Regulation on Grounding in Electrical Installations

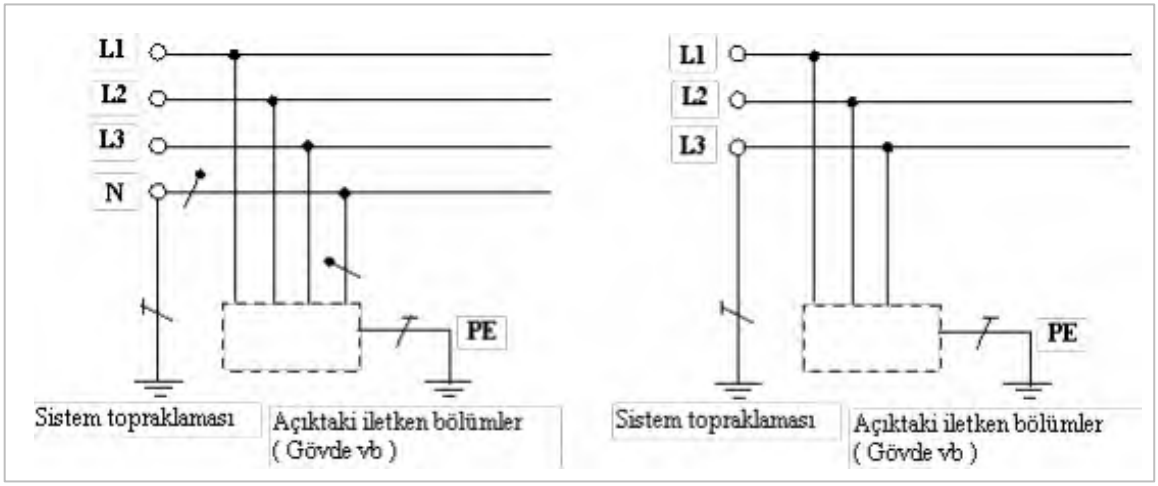


**Figure III.1.7.7.** Schematic Representation of TT Grounding System
**Source:** 21.08.2001 dated and 24500 numbered Regulation on Grounding in Electrical Installations

**Figure III.1.7.8.** Grounding in Solar Panels (Sample View)
**Source:** Grounding and Lightning Protection Systems in Solar Panels, M.Kemal AVŞAROĞLU, Radsan A.Ş. https://www.emo.org.tr/ekler/0caa3a57b0b9aeb_ek.pdf

The panels will be protected against lightning by means of catching tips, the length of which will be determined and placed according to the "protection angle" to be created based on the placement angle of the solar panels (See Figure III.1.7.9).

**Figure III.1.7.9.** Lightning Protection in Solar Panels with Protection Angle Method (Sample View)
**Source:** Grounding and Lightning Protection Systems in Solar Panels, M.Kemal AVŞAROĞLU, Radsan A.Ş. https://www.emo.org.tr/ekler/0caa3a57b0b9aeb_ek.pdf

**III.1.8. Sources and level of noise due to the works to be carried out during the preparation of the land and construction of the facilities, determination of possible problems that may affect the environment, interaction with the receiving environment, determination of cumulative effects, measures to be taken to reduce possible negative effects,**

Within the scope of the planned project, there will be noise generation due to construction and installation works and vehicle traffic. No noise generation is foreseen during the operation phase due to SPP panels.

The closest settlement to the area where the project is planned is Dumlusu Village, which is 75 meters away as the crow flies.

**Background Noise Measurements**

In the planned project, environmental noise measurements were carried out at 3 points on 20-25.12.2022 in order to determine the existing noise pollution load of the SPP area and its surroundings.

The measurements made were taken into consideration the limit values given in Annex-2 Table-1 of the Environmental Noise Control Regulation No. 32029 dated 30.11.2022 and the limit values are given in Table III.1.8.1.

**Table III.1.8.1.** Environmental Noise Limit Values for the Land Preparation and Construction Phase of the Project

| Environmental Noise Control Regulation | | |
|---|---|---|
| Day | Evening | Night |
| 65 dB | 60 dB | 55 dB |

**Source:** Environmental Noise Control Regulation published in the Official Gazette dated 30.11.2022 and numbered 32029

In this context, the existing noise measurement results calculated at the receptor points are given in Table III.1.8.2 and the representation of the measurement points on the satellite image is given in Figure III.1.8.1.

**Table III.1.8.2.** Existing Noise Measurement Results at the Nearest Receiving Points to the Project Area

| Point Name | Measurement Coordinate* | | Measurement Date | Time Zone | Leq (dBA) | EGCR Limit Value |
|---|---|---|---|---|---|---|
| | East | North | | | | |
| G1 | 719442 | 4321469 | 20.12.2022 | Day | 53,0 | 65 |
| | | | | Evening | 48,1 | 60 |
| | | | | Night | 38,4 | 55 |
| | | | 21.12.2022 | Day | 47,8 | 65 |
| | | | | Evening | | 60 |
| | | | | Night | | 55 |
| | | | 24-25.12.2022 | Day | 56,8 | 65 |
| | | | | Evening | 52,5 | 60 |
| | | | | Night | 49,2 | 55 |
| G2 | 718179 | 4321318 | 20.12.2022 | Day | 51,4 | 65 |
| | | | | Evening | 47,1 | 60 |
| | | | | Night | 39,9 | 55 |
| | | | 21.12.2022 | Day | 51,6 | 65 |
| | | | | Evening | | 60 |
| | | | | Night | | 55 |
| | | | 24-25.12.2022 | Day | 44,7 | 65 |
| | | | | Evening | 48,5 | 60 |
| | | | | Night | 44,2 | 55 |
| G3 | 719418 | 4324205 | 20-21.12.2022 | Day | 47,7 | 65 |
| | | | | Evening | 40,7 | 60 |
| | | | | Night | 44,7 | 55 |
| | | | 24-25.12.2022 | Day | 51,1 | 65 |
| | | | | Evening | 43,4 | 60 |
| | | | | Night | 42,3 | 55 |

* Datum and System: WGS84-UTM Zone 37 S


**Figure III.1.8.1.** Illustration of Noise Measurement Points on Satellite Image

These measurement results are below the limit values given in Table 1.1 of Annex-2 of the Environmental Noise Control Regulation, which entered into force after being published in the Official Gazette dated 30.11.2022 and numbered 32029.

During the construction and operation phases of the planned activity, the provisions of the Environmental Noise Control Regulation, which entered into force after being published in the Official Gazette dated 30.11.2022 and numbered 32029, will be complied with.

**Construction Phase Noise Modeling Studies**

For the Noise Level Distribution Modeling during the construction phase of the project, calculations were made taking into account the sensitive structures in Dumlusu Village and the calculated results were evaluated according to the Environmental Noise Control Regulation, which entered into force after being published in the Official Gazette dated 30.11.2022 and numbered 32029.

SoundPLAN 8.1 program was used to determine the total noise level that will occur during the construction works of the Project.

First, the elevation model of the natural ground, which directly affects the noise distribution, was created in the program. Topographical data from the Google Earth program were digitized during the projection of the natural ground to the program. Information about the noise levels of the vehicles and equipment selected as noise sources in the calculations was obtained from the database in the library of the same program.

After digitizing the elevations, SZM (digital ground modeling) was created in order for the program to detect the digitized elevation. After the creation of the SZM, the noise source was drawn by entering the data in the software in accordance with the standard.

As a result of these studies, the calculation area where the noise level will be calculated was defined and the noise levels caused by the machinery and equipment that will operate in this area were calculated for the receiving points after the receiving points were defined.

The machinery and equipment to be used during construction will operate in a certain order and it is very unlikely that all of them will operate at the same time. However, within the scope of the Acoustic Report, the worst case scenario has been evaluated by assuming that all machinery and equipment that will be needed during construction activities are operated at the same time.

The assessments were made within the scope of the limit values given in Annex-2 Table 1.1 of the Environmental Noise Control Regulation, which entered into force after being published in the Official Gazette dated 30.11.2022 and numbered 32029 (See Table III.1.8.3).

**Table III.1.8.3.** Environmental Noise Limit Values for Industrial Plants

| Noise Source | Measured Parameter | Environmental Noise Level | | |
|---|---|---|---|---|
| | | Day | Evening | Night |
| Industrial facilities, transport ation resources | $LAeq_{,5min.}$ | 65 dB(A) | 60 dB(A) | 55 dB(A) |
| Workplaces broadcasting music | 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) | | |

**Source:** Environmental Noise Control Regulation published in the Official Gazette dated 30.11.2022 and numbered 32029, Annex-2 Table 1.1 Environmental Noise Limit Values

The evaluation of the calculated results within the framework of the Environmental Noise Control Regulation published in the Official Gazette dated 30.11.2022 and numbered 32029 is presented in Table III.1.8.4.

**Table III.1.8.4.** Evaluation of Sound Power Levels Calculated at Receiver Points in the Scope of EGCRM

| Buyers | $L_{Day}$ (dBA) | Limit Value (dBA) | Evaluation |
|---|---|---|---|
| AKPINAR-1 | 39,7 | 65 | **Suitable** |
| AKPINAR-2 | 39,2 | 65 | **Suitable** |
| AKPINAR-3 | 40,1 | 65 | **Suitable** |
| AKPINAR-4 | 38,0 | 65 | **Suitable** |
| DUMLUSU-1 | 40,6 | 65 | **Suitable** |
| DUMLUSU-2 | 40,6 | 65 | **Suitable** |
| DUMLUSU-3 | 39,4 | 65 | **Suitable** |
| DUMLUSU-4 | 44,1 | 65 | **Suitable** |
| G-1 | 42,2 | 65 | **Suitable** |
| G-2 | 43,6 | 65 | **Suitable** |
| G-3 | 30,0 | 65 | **Suitable** |

The Acoustic Report including single point noise series information calculated for the construction phase, noise source information and noise maps and current environmental noise measurement results are provided in the appendices (See Annex 15).

**Cumulative Evaluation**

The cumulative noise values calculated for the construction phase of the planned project with the current situation measurement results were evaluated and the cumulative noise values calculated for points G-1, G-2, G-3 are given in Table III.1.8.5.

**Table III.1.8.5.** Cumulative Assessment of Planned Project Construction Phase and Current Situation

| Buyers | Modeling Value $L_{Day}$ (dBA) | Measurement Value Average. $L_{Day}$ (dBA) | Cumulative Value $L_{Day}$ (dBA | Limit Value (dBA) | Evaluation |
|---|---|---|---|---|---|
| G-1 | 42,2 | 58,7 | 58,8 | 65 | Suitable |
| G-2 | 43,6 | 54,9 | 55,2 | 65 | Suitable |
| G-3 | 30,0 | 52,7 | 52,7 | 65 | Suitable |

As can be seen from the table above, residential areas are not adversely affected by the possible noise levels during the land preparation and construction works, and the limit value is not exceeded at any point.

The values calculated as a result of the cumulative evaluation of the planned project construction phase and the current situation within the scope of Noise Modeling are below the limit values given in Annex-2 Table 1.1 of the Environmental Noise Control Regulation, which entered into force after being published in the Official Gazette dated 30.11.2022 and numbered 32029, for the nearest settlements.

Noise Modeling maps, results and measures to be taken for the land preparation and construction phases of the Project are detailed in the Acoustic Report presented in Annex-15.

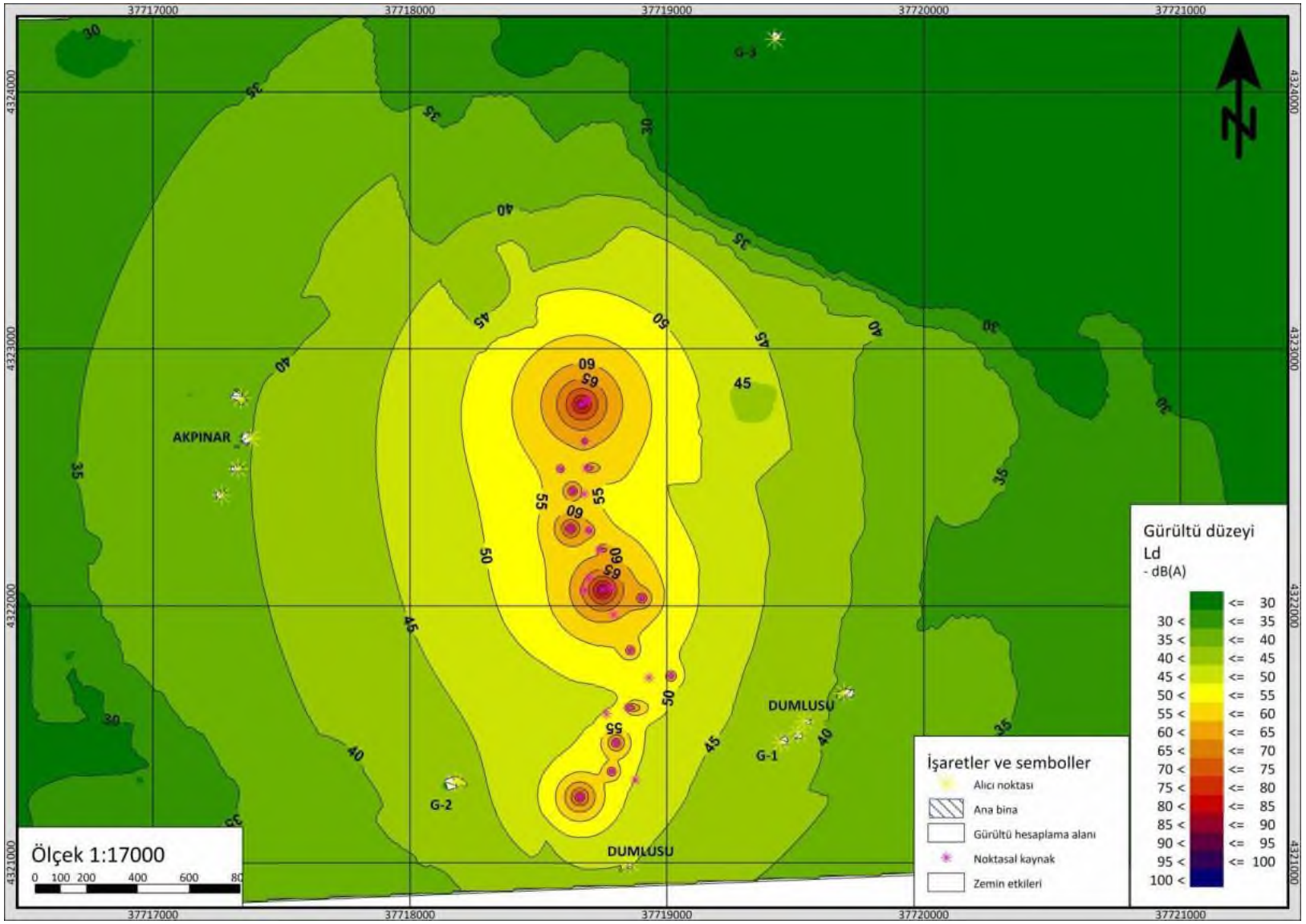


**Figure III.1.8.2** Mapping of the Noise Model

**Control Measures**

During the construction phase, it is not possible for all machinery and equipment to operate simultaneously and continuously. During the operation phase of the planned project, the noise that will be generated from the activities to be carried out during the day, evening and night time periods remains well below the limit value, although the calculation is made assuming that all equipment is operating at the same time. All necessary measures to prevent noise pollution from exceeding the limit value will be taken by the investor company.

Noise will vary throughout the day during the works, but since the works will generally be carried out during the day, noise generation will be limited. In addition, since the project area is far from residential areas, the surrounding community will not be adversely affected by construction noise. Employees will be provided with the protective equipment specified in the "Occupational Health and Safety Law" No. 6331.

In all stages of the project; the provisions specified in the Environmental Noise Control Regulation, which entered into force after being published in the Official Gazette dated 30.11.2022 and numbered 32029, will be complied with. In this direction, in order to reduce noise and minimize its effects, importance will be given to the selection of structures, building materials and noise insulation during architectural design in order to keep the noise level at a minimum level during the operation of the facility.

Especially during the operation phase, in order to reduce the noise level that will occur in the nearby residences, the movements of the machines and trucks will be limited and regular maintenance will be carried out, all necessary measures will be taken and the limit values in terms of environmental noise will be strictly complied with. Based on noise complaints, works and procedures will be carried out to take all necessary noise preventive measures (using noise barriers, etc.) in appropriate areas (activities causing the complaint, working areas close to residences, etc.) to reduce the negative effects of environmental noise in order to cover the operation period.

**III.1.9. Solid waste plan, quantity and characteristics of solid wastes to be generated within the scope of the Project, where the wastes will be transported or for which purposes they will be used, disposal methods, identification of possible problems that may affect the environment, interaction with the receiving environment, determination of cumulative impacts, measures to be taken to reduce possible negative impacts,**

The solid wastes that will be generated during the works to be carried out from the land preparation and construction phase of the project until the units are put into operation can be listed as domestic wastes, packaging wastes, construction wastes, scrap wastes, possible waste oils, end-of-life tires, vegetable oils, waste batteries and accumulators from the vehicles to be operated.

Solid wastes that will be generated during the operation phase of the project can be listed as domestic wastes from employees, packaging wastes, possible waste oils from the vehicles to be operated, end-of-life tires, vegetable oils, waste batteries and accumulators and waste solar panels.

Information on land preparation and construction works within the scope of the Project and the wastes to be generated during the operation phase are presented below.

**Domestic Solid Waste**

There will be domestic solid waste (organic waste, etc.) from a maximum of 40 people who are expected to work during the land preparation and construction phases of the Project and waste (wood, iron, cement paper, etc.) from construction works. Assuming a daily solid waste amount of 0.85 kg/person-day [(12)];

40 people x 0.85 kg/day= 34 kg/day domestic solid waste will be generated.

Domestic solid wastes from the personnel who will work on the Project will be collected in sealed waste containers placed at various points within the sites that will be used as construction sites during the construction phase.

[(12)]**Source:** Muş Province, 2020 Municipal Waste Statistics, www.tuik.gov.tr

These domestic wastes accumulated in containers will be collected and disposed of by Special Provincial Administration and/or licensed company vehicles in certain periods.

Metal parts such as iron, steel, sheet metal, etc. generated during land preparation and construction works will be collected as scrap and temporarily stored in an area to be established within the construction site, with a floor sealed and a shed structure on it. Recyclable wastes will be reused and/or given to licensed recycling companies. Wastes that cannot be recycled will be disposed of by licensed companies to the relevant solid waste collection system.

Project employees will be warned about the solid wastes (food waste, etc.) that will be generated within the scope of the project in accordance with the provision of Article 5 (ö) of the *"Waste Management Regulation*" published in the Official Gazette dated 02.04.2015 and numbered 29314, which states that *"it is forbidden to pollute the environment by dumping, direct filling and storage of wastes into soil, seas, lakes, rivers and similar receiving environments" and* will act in accordance with the provisions of the relevant Regulation.

During the construction phase of the project, the project will be carried out in accordance with the *Prime Ministry Circular on Stream Beds and Floods (2006/27)*, which entered into force after being published in the Official Gazette dated 09.09.2006 and numbered 26284.

**Packaging Waste**

Packaging waste (paper, cardboard, glass, metal, plastic, plastic, glass and wood) will be generated during the land preparation and construction phase of the planned project.

During the works, mixed packaging wastes such as glass, plastic bottles and nylon, which can be utilized in municipal wastes, are generated. Packaging wastes constitute 30% of solid wastes by weight13. The amount of municipal waste generated within the scope of the Project is calculated as 46.5 kg/day for the construction phase and 14.88 kg/day for the operation phase.

Amount of packaging waste to be generated accordingly;

Land preparation and construction phase : 46.5 kg/day x 0.30= 13.95 kg/day

Packaging wastes that are likely to be generated during the construction phase of the project will be collected separately from other wastes and will be disposed of in accordance with the provisions of the "Regulation on Control of Packaging Wastes" published in the Official Gazette dated 26.06.2021 and numbered 38745.

The packaging wastes likely to be generated within the scope of the Project and Waste Codes of Annex-IV List of Waste Management Regulation are given in Table III.1.9.1.

**Table III.1.9.1.** Potential Packaging Wastes and Waste Codes to be Generated under the Project

| Waste Code | Waste Identification |
|---|---|
| 15 01 01 | Paper and cardboard packaging |
| 15 01 02 | Plastic packaging |
| 15 01 03 | Wooden packaging |
| 15 01 04 | Metallic packaging |
| 15 01 06 | Mixed packaging |
| 15 01 07 | Glass packaging |

**Source:** Waste Management Regulation Annex-IV List (O.G. dated 02.04.2015 and numbered 29314)

[13]**Source:** Abrogated Ministry of Environment, Urbanization and Climate Change, General Directorate of Environmental Management, Environmental Indicators 2020, https://webdosya.csb.gov.tr/db/cevreselgostergeler/dokumanlar/cevresel-gostergeler--8230-46248- 20210105114837.pdf

**Waste Oils**

Maintenance, repair and cleaning of the vehicles and work machines to be used within the scope of the Project will not be carried out at the Project site and will be carried out at the nearest authorized services and/or fuel stations. However, if it is necessary to carry out vehicle maintenance at the project site, the provisions of *the "Waste Management Regulation"*, which entered into force after being published in the Official Gazette dated 02.04.2015 and numbered 29314, will be complied with for the disposal of waste oils that may be generated as a result of the maintenance and repair works to be carried out in this case.

In the event that any waste oil is generated when maintenance and repairs are carried out within the facility, waste oils will be collected in a closed and sealed metal container in order to prevent the oil from mixing into the soil and / or water and will be given to the licensed recovery company within the scope of the *"Waste Oil Management Regulation"*, which entered into force after being published in the Official Gazette dated 21.12.2019 and numbered 30985, within the contract. In case of maintenance and repair of the vehicles within the facility; these operations will be carried out in the area within the construction site area where the floor is sealed and covered with a shed structure, and during the works to be carried out, the provisions of *the "Regulation on Soil Pollution Control and Point Source Contaminated Sites (Amended R.G. 11.07.2013-28704)"*, which entered into force after being published in the Official Gazette dated 08.06.2010 and numbered 27605, will be acted in accordance with the provisions.

The waste oils likely to be generated within the scope of the Project and the Waste Codes of Annex-IV List of Waste Management Regulation are given in Table III.1.9.2.

**Table III.1.9.2.** Potential Waste Oils and Waste Codes to be Generated within the Scope of the Project

| **Waste Code in Annex-IV List of Waste Management Regulation** | **Listed in Annex-IV of Waste Management Regulation Waste Identification** | **Waste Management Regulation Annex-IV List Description** |
|---|---|---|
| 13 02 08 | Other engine, transmission and lubricating oils | A |

**Source:** Waste Management Regulation Annex-IV List (O.G. dated 02.04.2015 and numbered 29314)

**Vegetable Waste Oils**

The catering needs of the personnel who will work during the land preparation and construction phase of the Project will be met by purchasing from catering companies. The catering needs of the personnel who will work during the operation phase will be met from the administrative building of Alpaslan II Dam and HEPP production facility. Therefore, no vegetable waste oil generation is expected within the project area.

If any vegetable waste oil is generated during the construction or operation phase, the vegetable waste oils will be collected in sealed and sealed drums and then recovered through companies licensed by the Ministry of Environment, Urbanization and Climate Change. In all stages of the project, the provisions of *the "Regulation on the Control of Vegetable Waste Oils"* published in the Official Gazette dated 06.06.2015 and numbered 29378 will be complied with.

Table III.1.9.3 shows the waste codes of vegetable waste oils that are likely to be generated within the scope of the Project and Waste Management Regulation Annex-IV List Waste Codes.

**Table III.1.9.3.** Potential Vegetable Waste Oils to be Generated under the Project and Waste Codes

| **Waste Management Regulation Annex-IV Waste Code in the List** | **Listed in Annex-IV of Waste Management Regulation Area Waste Identification** | **Waste Management Regulation Annex-IV List Description** |
|---|---|---|
| 20 01 25 | Edible oils and fats | - |
| 20 01 26* | 20 01 Fats and oils other than 25 | A |

**Source:** Waste Management Regulation Annex-IV List (O.G. dated 02.04.2015 and numbered 29314)

**Hazardous Waste**

Hazardous wastes that are likely to be generated during the land preparation and construction phases of the project will be stored in a closed area marked with warning signs with a sealed base to be established within the project area and will be sent to licensed disposal facilities in accordance with the provisions of *the "Waste Management Regulation"* published in the Official Gazette dated 02.04.2015 and numbered 29314.

Hazardous wastes likely to be generated within the scope of the Project and Waste Codes of Annex-IV List of Waste Management Regulation are given in Table III.1.9.4.

**Table III.1.9.4.** Potential Hazardous Wastes and Waste Codes

| **Waste Listed in Annex-IV of the Management Regulation Waste Code** | **Waste Identification in Annex-IV List of Waste Management Regulation** | **Waste Management Regulation Annex-IV List Description** |
|---|---|---|
| **13 01** | **Waste Hydraulic Oils** | |
| 13 01 13* | Other Hydraulic Oils | A |
| **13 02** | **Waste Engine, Transmission and Lubricating Oils** | |
| 13 02 08* | Other engine, transmission and lubricating oils | A |
| 15 01 10* | Containing residues of hazardous substances or contaminated with hazardous substances contaminated packaging | A |
| **15 02** | **Absorbers, Filter Materials, Cleaning Cloths and Protective Clothing** | |
| 15 02 02* | Absorbents, filter media contaminated with hazardous substances (other oil filters if not so specified), cleaning cloths, protective clothing | M |
| **16 01** | **End-of-Life Vehicles of Various Types of Transportation (Including Construction Machinery) and Dismantling of End-of-Life Vehicles and V e h i c l e Maintenance (except 13, 14, 16 06 and 16 08) Waste Sourced** | |
| 16 01 07* | Oil filters | A |
| **16 06** | **Batteries and accumulators** | |
| 16 06 01* | Leaded batteries and accumulators | A |
| 17 02 04* | Containing hazardous substances or contaminated with hazardous substances wood, glass and plastic | A |
| **20 01** | **Separately Collected Fractions (Except 15 01)** | |

**Medical Waste**

The personnel working during the project activity will benefit from the nearest health centers in the Central district and/or Muş province.

There will be no infirmary in the project area during the construction phase. However, in case medical waste is generated within the project area, the medical waste will be collected and disposed of separately from other wastes in accordance with the "obligations of medical waste generators" specified in the *"Regulation on Control of Medical Waste"* published in the Official Gazette dated 25.01.2017 and numbered 29959. Regulation requirements regarding the separation and accumulation of medical waste at the source will be fulfilled. Medical wastes, which will be temporarily stored in the facility within the scope of the Regulation on Control of Medical Wastes, will be given to licensed disposal companies for disposal.

Temporary storage, transportation and disposal of medical wastes that may occur within the project area will be carried out in accordance with the provisions specified in Section 3 of *the "Regulation on Control of Medical Wastes"*, which entered into force after being published in the Official Gazette dated 25.01.2017 and numbered 29959.

In the event that medical waste is generated within the project area, the medical waste will be placed in red plastic bags that are resistant to tearing, puncture, explosion and transportation; made of original medium density polyethylene raw material, leak-proof, double bottom stitched and without gusset, double layer thickness of 100 microns, with a lifting capacity of at least 10 kilograms, large enough to be seen on it and bearing the "International Biohazard" emblem and the phrase "CAUTION MEDICAL WASTE" on both sides.

The bags will be filled at most 3/4 full and their mouths will be tightly tied and if necessary, each bag will be placed in another bag with the same characteristics to ensure absolute tightness.

Cutting and piercing wastes will be collected separately from other medical wastes in boxes or containers made of plastic or laminated cardboard with the same properties, which are puncture, tear, breakage and explosion resistant, waterproof and impermeable, cannot be opened and mixed, bear the "International Biohazard" emblem and the phrase "ATTENTION! CUTTING AND PUNCHING MEDICAL WASTE". These containers will be filled to a maximum of 3/4 full and placed in red plastic bags. Cutting and piercing waste containers will never be compressed, opened, emptied or recycled after they are full.

Medical wastes likely to be generated within the scope of the Project and Waste Codes of Annex-IV List of Waste Management Regulation are given in Table III.1.9.5.

**Table III.1.9.5.** Potential Medical Wastes and Waste Codes to be Generated under the Project

| Waste Listed in Annex-IV of the Management Regulation Waste Code | Waste Identification in Annex-IV List of Waste Management Regulation | Waste Management Regulation Annex-IV List Description |
|---|---|---|
| 18 01 03* | Special collection and disposal to prevent infection horses subject to treatment | A |

**Waste Batteries and Accumulators**

In the event that the maintenance and repairs of the vehicles to be used in the land preparation and construction phases of the Project are carried out within the activity area, the waste batteries that are likely to arise will be stored in a closed environment with a sealed floor within the Project area in accordance with the provisions of *the "Regulation on the Control of Waste Batteries and Accumulators (Amended R.G - 23.12.2014 - 29214)"*, which entered into force after being published in the Official Gazette dated 31.08.2004 and numbered 25569, and will be disposed of by giving them to a licensed recovery company.

Waste batteries and accumulators likely to be generated within the scope of the Project and Waste Codes of Annex-IV List of Waste Management Regulation are given in Table III.1.9.6.

**Table III.1.9.6.** Waste Batteries and Accumulators that may be generated within the scope of the Project and Waste Codes

| Waste Listed in Annex-IV of the Management Regulation Waste Code | Waste Identification in Annex-IV List of Waste Management Regulation | Waste Management Regulation Annex-IV List Description |
|---|---|---|
| 16 06 01* | Leaded batteries and accumulators | A |

**End-of-Life Tires**

In cases where the tires of the vehicles and construction equipment to be used in the land preparation and construction phases of the Project need to be replaced on site, the used and end-of-life tires will be collected separately from other wastes in accordance with the provisions of *the "Regulation on the Control of End-of-Life Tires (Amended R.G-10.11.2013-28817)"* published in the Official Gazette dated 25.11.2006 and numbered 26357, and will be disposed of by giving them to recycling companies through licensed carriers.

If the EIA Positive Decision is obtained within the scope of the project, construction works will be initiated and all regulations regarding waste management specified in the Environmental Law No. 2872 will be complied with during the land preparation and construction phase of the project.

Since the planned project is not included in the scope of Annex-1 and Annex-2 lists of *the "Environmental Permit and License Regulation"*, which entered into force after being published in the Official Gazette dated 10.09.2014 and numbered 29115, "Environmental Permit Exemption Application" will be made to the Provincial Directorate of Environment, Urbanization and Climate Change of the Governorship of Muş with the necessary documents when the project is put into operation.

Waste Codes of end-of-life tire wastes and Waste Management Regulation Annex-IV List Waste Codes are given in Table III.1.9.7.

**Table III.1.9.7.** Potential End-of-Life Tires and Waste Codes to be Generated within the Scope of the Project

| Waste Listed in Annex-IV of the Management Regulation Area Waste Code | Waste Identification in Annex-IV List of Waste Management Regulation | Waste Management Regulation Annex-IV List Description |
|---|---|---|
| 16 01 03 | End-of-life tires | - |

**Scrap Waste**

During the construction phase of the project, solid wastes such as iron, steel, sheet metal, packaging materials and similar solid wastes will be generated during the construction of the panel legs and assembly of the panels, and a certain amount cannot be determined as the amount of these wastes will vary. However, the wastes will be collected as scrap and stored in a suitable place within the project area and the wastes that can be recovered will be reused and the wastes that cannot be recovered will be disposed of within the framework of the provisions of the "Waste Management Regulation" and the "Communiqué on Recovery of Certain Non-Hazardous Wastes".

Scrap wastes likely to be generated within the scope of the Project and Waste Codes of Annex-IV List of Waste Management Regulation are given in Table III.1.9.8.

**Table III.1.9.8.** Potential Scrap Wastes to be Generated under the Project and Waste Codes

| Waste Code | Waste | Dangerousness Status |
|---|---|---|
| **17** | **CONSTRUCTION AND DEMOLITION WASTE (INCLUDING EXCAVATION FROM CONTAMINATED AREAS)** | |
| **17 01** | **Concrete, Brick, Tile and Ceramic** | |
| 17 01 07 | 17 01 06 Concrete, brick, tile and ceramic mixtures or separated groups other than 06 | A |
| **17 04** | **Metals (Including Alloys)** | |
| 17 04 05 | Iron and steel | |
| 17 04 07 | Mixed metals | |

**End-of-Life Solar Panels**

The economic life of the project is estimated to be 25 years. However, in the event that the solar panels are damaged due to external factors, the desired efficiency cannot be obtained, and the solar panels are out of use, the waste codes given in Table III.1.9.9 will be given to the relevant licensed companies for recycling or disposal.

**Table III.1.9.9.** Waste Solar Panels and Waste Codes Likely to be Generated within the Scope of the Project

| Waste Code | Wastes | Dangerousness Status |
|---|---|---|
| **17** | **WASTES NOT OTHERWISE SPECIFIED IN THE LIST** | |
| **17 02** | **Electrical and Electronic Equipment Waste** | |
| 17 01 07 | 16 02 09 to 16 02 13, except scrap equipment | |
| **20** | **MUNICIPAL WASTE, INCLUDING SEPARATELY COLLECTED FRACTIONS (HOUSEHOLD AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL WASTE)** | |
| 20 01 35* | 20 01 21 and 20 01 23 discarded electrical and electronic equipment containing dangerous components other than 20 01 21 and 20 01 23 | A |

**III.1.10. From where and in what quantity the water to be used within the scope of the project will be obtained; indication of alternative sources for water supply; indication of the quantities separately according to the purposes of use of the water; types and quantities of wastewater to be generated, disposal methods, the media to be discharged, identification of possible problems that may affect the environment, interaction with the receiving environment, determination of cumulative effects, measures to be taken to reduce possible negative effects,**

**Water Use**

Within the scope of Alpaslan II Dam and Hydroelectric Power Plant Auxiliary Source Solar Power Plant Project, water will be used for personnel needs. It is planned to employ 40 people during the land preparation and construction phase of the Project.

According to 2020 TURKSTAT Municipal Statistics Data, the amount of water withdrawn per capita in Muş province is 331 lt/person-day[14] . Water use calculations for the personnel within the scope of the Project are based on this value.

While calculating the amount of wastewater to be generated, it is assumed that all (100%) of the personnel water use will be converted into wastewater for both project phases. In this context, personnel water use;

40 people x 331 lt/person-day= 13.24 m3/day

Assuming that all (100%) of the water used will be converted into wastewater, 13.24 m3/day of domestic wastewater will be generated during the land preparation and construction phase.

Water use by personnel, water supply location, amount of wastewater to be generated and wastewater disposal method for the land preparation and construction phase of the Project are summarized in Table III.1.10.1.

**Table III.1.10.1.** Water Use and Wastewater Generation under the Project

| Project Phase | Water Use | Water Supply | Wastewater Amount | Wastewater Disposal Method |
|---|---|---|---|---|
| Potable water for a total of 40 people during land preparation and construction phase | 13.24 $m^3$/day | The domestic water needs of the personnel are met during the land preparation and construction phase in return for a fee. 2.6 In accordance with the protocol given in the protocol given in 2.6, drinking water needs will be met by transporting it from Dumlusu Neighborhood by tanker truck and purchasing it from the market with carboys. | 13.24 $m^3$/day | The needs of the personnel who will work during the land preparation and construction phase will be met from the mobile prefabricated construction site to be established. Domestic wastewater to be generated within this scope; Article 32 of the Water Pollution Control Regulation (Amended 17.12.2022/32046), which entered into force after being published in the R.G. dated 31.12.2004 and numbered 25687 "Wastewater generated from settlements with a population of less than 2000 shall be collected in a sealed septic tank to be established, taking into account the environmental characteristics of the settlement, and shall not be allowed to overflow. When it reaches 85-90% fullness, removal and disposal with the vacuum trucks belonging to the relevant administration will be provided. |
| Prevent dusting during land preparation and construction phase water needs for | Approx. 20 $m^3$/day | In accordance with the protocol given in Annex-2.6 tanker from Dumlusu Neighborhood will be provided by transportation. | - | Irrigation as some of it will remain in the soil and the rest will evaporate wastewater will not be generated. |
| **TOTAL** | **33.24 $m^3$/day** | | | |

[14]**Source:** Muş Province, Statistics on Water Withdrawn Per Capita in 2020, www.tuik.gov.tr

Domestic wastewaters that will be generated during the construction phase due to the use of personnel will be treated in accordance with Article 32 of the Regulation on Water Pollution Control *(Amended 17.12.2004)*, which entered into force after being published in the Official Gazette dated 31.12.2004 and numbered 25687*.2022/32046)* Article 32 states that *"Wastewaters generated from settlements with an equivalent population of less than 2000 shall be disposed of by treatment methods such as treatment, individual septic tank with leakage or central septic tank without leakage, which will be deemed appropriate by the Provincial Directorate of Environment, Urbanization and Climate Change, taking into account the environmental characteristics of the settlement, in a way that will not harm the environment and human health and meet the relevant provisions of this Regulation.*

*Domestic wastewater of hotels, motels, holiday villages, holiday sites and summer sites and industrial facilities with an equivalent population or capacity of less than 2000 people, detached from settlements, shall be disposed of by treatment and/or disposal methods deemed appropriate by the Provincial Directorate of Environment, Urbanization and Climate Change, taking into account the wastewater infrastructure situation in the region, in a way that does not harm the environment and human health."* will be collected in the leak-proof septic tank pit to be established within the scope of the provision, and when it reaches 85-90% fullness without overflow, it will be removed and disposed of by the vacuum trucks of the relevant administration.

The volume of the septic tank to be installed for the land preparation and construction phase of the project is planned to be approximately 160 $^{m3}$ . The amount of wastewater to be generated during the land preparation and construction phase will be 13.24 m3/day. Considering the amount of wastewater in question, the septic tank will be emptied with the help of a vacuum truck approximately every 12 days.

The drinking and utility water of the personnel who will work within the scope of the Project will be provided in accordance with the provisions of the "Regulation on Water Intended for Human Consumption" published in the Official Gazette dated 17.02.2005 and numbered 25730 and the "Regulation on the Amendment of the Regulation on Water Intended for Human Consumption" published in the Official Gazette dated 20.10.2016 and numbered 29863.

In all stages of the project, the provisions of the Water Pollution Control Regulation (Amended 25.03.2012 dated - R.G. No. 28244), which entered into force after being published in the Official Gazette dated 31.12.2004 and numbered 25687, will be complied with.

**III.1.11. Natural plant species to be removed for land preparation and provision of land required for the construction area and how much area these works will be carried out, identification of possible problems that may affect flora/fauna and affect the environment, interaction with the receiving environment, identification of cumulative effects, measures to be taken to mitigate possible negative effects,**

**Flora**

There are endemic plants in the area, therefore, prior to construction activities and road opening activities, the project area should be examined by a PhD Botanist and ex situ measures should be taken. Before starting any activity, the seeds of the plant subject to ex situ protection measures should be collected and the unrotted and fertile seeds should be given to the Seed Gene Bank. In addition, after the seeds are collected, the area within a radius of approximately 15 cm should be removed together with the soil and transplanted to suitable areas around the project area with similar soil and habitat structure. Transplantation activities should also be supported by seed propagation using various methods and the sustainability of the mentioned plant taxa in the region should be maintained by sowing/planting.

During the field studies, it was observed that there are existing roads up to a certain point while providing transportation to the region. Existing roads should be used primarily for transportation to the project area. In addition, roads should not be opened except in cases of necessity (connection road).

Many scientific studies on plant physiology have shown that organic dust particles accumulated on the leaf surface negatively affect plant growth and development (Hitron and Zur, 1990; Cornish et al., 1991; Farmer 1993; Cleugh et al., 1998; Prajapati 2002; Zia-Khan et al., 2015). Dust deposits on leaves can alter the optical properties of light, especially the apparent surface reflectance, causing dust-covered leaves to receive less light, as well as adversely affecting gas exchange (O2 and CO2) by blocking stomata (pores).

can affect the photosynthesis rate. For these reasons, if the leaf surface is covered with a dense layer of dust particles, the rate of direct photosynthesis can be reduced, resulting in a significant reduction in biomass formation and crop yield. In order to eliminate this reduction in yield and to allow plants to photosynthesize in a healthy way, the leaf surface should not be allowed to be covered with dust particles as much as possible.

The material (vegetative soil, excavation material, etc.) that will be generated during the works within the scope of the Project must not be disposed of in the stream beds located outside the project area.

Within the scope of the project, the protection measures of the Bern Convention and the provisions of Article 5 of this convention must be strictly complied with.

Article 5
1 shall take appropriate and necessary legislative and administrative measures to ensure the special protection of the wild flora species listed in Annex 1. The deliberate plucking, collecting, cutting or rooting of these plants shall be prohibited. Each Contracting Party shall, where appropriate, prohibit the possession or trade in such species.

In addition, the provisions of the CITES convention must be respected within the scope of the project.

Domestic solid wastes, domestic wastewater, packaging wastes, waste batteries, medical wastes, end-of-life tires, hazardous wastes, etc. that may be generated as a result of the activities within the scope of the project should not be thrown indiscriminately into the environment, and the Environmental Law No. 2872 and the National Park Law No. 2873 should be complied with the regulations issued in accordance with these laws. In addition, dry and wet stream beds outside the project area should not be interfered with and no waste, rubble, excavation, etc. should be dumped in these areas. In addition, all activities within the scope of the project should be carried out by considering the ecological structure and the vegetation outside the project area should not be destroyed.

Plant species identified as a result of field and literature studies on the project area are given in detail in Table II.2.9.4.

**Risk-impact-measure matrix for flora**

The Risk-Impact-Action Matrix for flora species identified as a result of field and literature studies is given in the table below (see Table III.1.11.1).

**Table III.1.11.1.** Risk-impact-measure matrix for flora

| RISK | IMPACT | LEVEL OF EFFECT | PREVENTIVE/MITIGATIVE MEASURES |
|---|---|---|---|
| Closing of stomata due to dust | Micron-sized dust particles that will accumulate on the entire surface of herbaceous plants and mostly on the leaves of woody plants (shrubs and trees) close the stomata (pores) and reduce the rate of photosynthesis in plants | Middle | If possible, activities that generate excessive dust should be carried out outside the spring months, these environments should be constantly watered to keep them moist or dust sources should be screened. |
| Affecting endemic species (*Ferula huber- morathii*) | Disappearance | High | Prior to construction and road opening activities, the project area should be inspected by a PhD Botanist to take ex situ measures. |
| Lack of attention to ex-situ conservation measures | Decrease in local population density of plants subject to ex situ conservation measures | High | Before any activity is started, the seeds of the plant subject to ex situ conservation measures should be collected and the unrotted and fertile seeds should be given to the Seed Gene Bank.<br><br>In addition, after the seeds are collected, the area within a radius of about 15 cm should be taken together with the soil, and the project area with similar soil and habitat structure should be |

| RISK | IMPACT | LEVEL OF EFFECT | PREVENTIVE/MITIGATIVE MEASURES |
|---|---|---|---|
| | | | transplantation should be carried out, i.e. relocation to suitable areas around it.<br><br>Transplantation efforts should also be supported by seed propagation using various methods and the sustainability of the mentioned plant taxa in the region should be maintained by sowing/planting. |

**Fauna**

As a result of field and literature studies, 3 two-lived taxa were identified in the project area. There are no endemic species among the identified species. In addition, there are no non-endemic, rare or endangered bivalve species in the project area. Since the area is under anthropogenic impact, no impact on bivalve species is expected.

As a result of field and literature studies, 20 reptile taxa were identified in the project area. There are no endemic species among the identified species. Among the reptile taxa identified in the project area and its immediate vicinity, there is 1 species (Testudo graeca) in the "VU" category according to IUCN (International Union for Conservation of Nature - Red List Species). Although the IUCN threat category is considered as "VU (Vulnerable)" on a global scale, it can be added to a lower risk category considering the population status in our country. If the species is detected in the area before the construction works, it should be moved out of the area in order not to be affected. Since the area is under anthropogenic impact, no impact on reptile species is expected.

As a result of field and literature studies, 205 bird taxa were identified within the project area. There are no endemic species among the identified species. According to IUCN (International Union for Conservation of Nature - Red List Species), 1 species (Vanellus gregarius) is categorized as "CR" (Critical), 2 species (Aquila nipalensis, Neophron percnopterus) as "EN" (Endangered), 4 species (Aquila heliaca, Aythya ferina, Otis tarda, Streptopelia turtur) as "VU" (Vulnerable).

As a result of field and literature studies, 18 mammal taxa were identified in the project area. There are no endemic species among the identified species. In addition, there are no non-endemic, rare or endangered mammal species in the project area. Since the area is under anthropogenic impact, no impact on mammal species is expected.

During the activities within the scope of the Project, any food, household organic waste, etc. that may attract wild animals to the area should not be left indiscriminately in the project area and its immediate surroundings. Because some wild animals have a very sensitive sense of smell, food or household organic waste that may be left around may be attractive and attract wild animals to the project area. This may trigger human-wild animal conflict. In addition, boxes, parcels, etc. in the packaging waste that may be generated should not be left in the project area and its immediate surroundings. Such packaging wastes may cause entanglement, entrapment, etc. in the bodies of wild animals and affect their daily activities (feeding, movement, etc.).

In the event that an injured wild animal is encountered during the works within the scope of the Project, the authorities of the General Directorate of Nature Conservation and National Parks and/or the Ministry of Agriculture and Forestry of the Republic of Turkey should be informed and the area should be closed and should not be intervened until the relevant authorities arrive in the area.

There are no endemic species among the wild animals and fauna species identified in the Project area and its immediate vicinity. However, there are species protected by IUCN, Bern Convention, CITES Convention and MAKK lists.

The Bern Convention safeguards and the provisions of Articles 5, 6 and 7 thereof must be strictly observed.

In addition, within the scope of the project, the provisions of the CITES convention, Central Hunting Commission Decision, Land Hunting Law No. 4915 and Regulations and all protection measures in these agreements must be complied with.

Domestic solid wastes, domestic wastewater, packaging wastes, waste batteries, medical wastes, end-of-life tires, hazardous wastes, etc. that may be generated as a result of the activities within the scope of the project should not be thrown indiscriminately into the environment, and the Environmental Law No. 2872 and the National Park Law No. 2873 should be complied with the regulations issued in accordance with these laws. In addition, dry and wet stream beds outside the project area should not be interfered with and no waste, rubble, excavation, etc. should be dumped in these areas. In addition, all activities within the scope of the project should be carried out by considering the ecological structure and wildlife and vegetation associated with wildlife outside the project area should not be destroyed.

The fauna species identified as a result of field and literature studies on the Project area are given in detail in Table II.2.9.5, Table II.2.9.6, Table II.2.9.7 and Table II.2.9.8.

**Risk-impact-measure matrix for fauna**

The Risk-Impact-Action Matrix for fauna species identified as a result of field and literature studies is given in the table below (see Table III.1.11.2. Table III.1.11.2., Table III.1.11.3., Table III.1.11.4., Table III.1.11.5).

**Table III.1.11.2.** Risk-impact-measure matrix for Bivalves

| RISK | IMPACT | LEVEL OF EFFECT | TREATMENT |
|---|---|---|---|
| Harm to bivalves | Reduced population density regionally | Middle | Before starting any activity within the scope of the project, visual controls should be carried out before the land preparation phase, and bivalves should be removed from the areas to be studied with various species-specific methods. |
| Ecosystem disruption | Weakening of bivalve population densities | Middle | All activities within the scope of the project should be carried out by considering the ecological structure and the vegetation associated with the fauna outside the project area should not be destroyed. |
| Land preparation stripping during the hibernation period | Loss of individual | Middle | Surface stripping should take into account the hibernation period of wild animals using the area. |

**Table III.1.11.3.** Risk-effect-caution matrix for reptiles

| RISK | IMPACT | LEVEL OF EFFECT | TREATMENT |
|---|---|---|---|
| Damage to reptiles | Reduced population density regionally | Middle | Before starting any activity within the scope of the project, visual controls should be carried out before the land preparation phase, nesting areas should be identified, and reptiles should be removed from the areas to be studied with various species-specific methods. The nests of individuals that move away from the area should be closed. Juveniles and adult individuals that do not move away from the area despite abduction techniques should be taken out of the project area by using appropriate capture and trapping techniques. |
| Opening unnecessary new roads | Habitat loss | Middle | Existing roads should be used primarily for transportation to the project area. No road should be opened except in cases of necessity (connection road). |
| During the hibernation period | Loss of individual | Middle | Surface stripping should take into account the hibernation period of wild animals using the area. |

| | | | |
|---|---|---|---|
| land preparation-stripping process | | | |

**Table III.1.11.4.** Risk-impact-measure matrix for birds

| RISK | IMPACT | LEVEL OF EFFECT | TREATMENT |
|---|---|---|---|
| Construction phase of the facility | Dispersal of migratory species from the accommodation area | High | Carrying out the activities to be carried out without damaging and polluting the wetland. |

**Table III.1.11.5.** Risk-effect-caution matrix for mammals

| RISK | IMPACT | LEVEL OF EFFECT | TREATMENT |
|---|---|---|---|
| Damage to mammal species | Reduced population density regionally | Middle | Before starting any activity within the scope of the project, visual controls should be carried out before the land preparation phase, nesting areas should be identified, and mammal species should be removed from the areas to be studied with various species-specific methods. The nests of individuals that move away from the area should be closed. Young individuals and adult individuals that do not move away from the area despite abduction techniques should be taken out of the project area in a way that they will not be harmed by using appropriate capture and trapping techniques. |
| Dust formation | Mammal species are affected and leave the area | Middle | In order to prevent dust formation, it should be ensured that a dust extractor is used and dust-generating areas are regularly moisturized. |

**III.1.12. The size of the agricultural-pasture-grazing areas to be disposed of -if any- in order to prepare the land and provide the land required for the construction area, land use capabilities and types of agricultural products, non-agricultural use of agricultural lands, processes such as change of qualification of pasture areas, distance to agricultural areas if all or part of the project area is outside the agricultural area, determination of possible impacts on livestock activities and agricultural areas, determination of possible problems that may affect the environment, interaction with the receiving environment, determination of cumulative impacts, measures to be taken to reduce possible negative impacts,**

"Alpaslan II Dam and Hydroelectric Power Plant Auxiliary Source Solar Power Plant Project (41.9916 MWm-62.74 ha)" project is planned by Murat Nehri Enerji Üretim A.Ş. in Muş province, Merkez district, Dumlusu Village Murat Mevkii and Akkonak Village Gölhazal Mevkii.

A large part of the Project area was previously used as construction site and administrative area for Alpaslan II Dam and Hydroelectric Power Plant. Land leveling works have been carried out in the area.

The 1/25.000 Scale Land Asset Map showing the Project area and its surroundings i s given in Annex-5. According to the Project 1/25.000 Scale Land Asset Map, although the SPP Area is within irrigated agriculture (insufficient) areas, it is currently within the **"Solar Energy Area qualified"** areas **with non-agricultural use permits**.

The planned project area is located in "Treeless Forest Areas" according to the stand map. In this context, there is no forest area utilization and tree felling specific to the activity (See Annex-6 1/50.000 Scale Stand Map of the Project Area and Surroundings).

The approved Environmental Plan, Legends and Relevant Plan Provisions for the Muş-Bitlis-Van Planning Region with a scale of 1/100.000, where the Project area is located, are given in Annex-3 and the EIA Area and SPP Area are defined as "Dam" in the Environmental Plan with a scale of 1/100.000. However, although the project area appears as "Dam" in the Environmental Plan, it is currently within the "Solar Energy Area" areas **that have been granted non-agricultural use permits**.

For the agricultural lands in the project area; within the scope of the Soil Conservation and Land Use Law No. 5403, with the letter dated 20.02.2003 and numbered 2844-002375 of the General Directorate of Agricultural Production and Development of the Ministry of Agriculture and Rural Affairs, a total area of 5469 hectares including the Alparslan II Dam and HEPP project area was given permission for non-agricultural use within the scope of the Regulation on the Protection and Use of Agricultural Lands in force at that time.

The "Non-Agricultural Use Permit Opinion" received by Muş Provincial Directorate of Agriculture and Forestry from the Ministry of Agriculture and Forestry, General Directorate of Agricultural Reform, regarding whether this permit is valid for the planned SPP project is given in Annex-2.4. In the opinion of the General Directorate of Agricultural Reform given in Annex-2.4, it is stated that *"5469 hectares of land with a surface area of 5469 hectares, which was granted permission for non-agricultural use with the letter dated 20.02.2003 and numbered 2844-002375 of the abrogated Ministry of Agriculture and Rural Affairs General Directorate of Agricultural Production and Development, is outside the scope of Law No. 5403, and it is considered that no action can be taken within the scope of Articles 13, 14, 20 and 21 of Law No. 5403 within this area."* In this context, no additional permission, etc. will be obtained for land use.

The measures to be taken within the scope of the Project are listed below:

- During the stripping of vegetative soil, excavation of excavation material and installation works within the scope of the activity, the issues specified in Annex-1 of "SDHCPD" will be complied with. In order to minimize the dusting that may occur on the land, measures will be taken at the emission source, such as stripping in a controlled manner (slowly and without causing dust) and improving the roads if necessary.

- Within the scope of the Project, irrigation will be carried out with a water truck in the project area and existing roads if n e c e s s a r y during land leveling and installation activities.

- Necessary measures will be taken for the protection of agricultural lands around the project area as stipulated by the Soil Conservation and Land Use Law No. 5403, which entered into force after being published in the Official Gazette dated 19.07.2005 and numbered 25880.

Although there are no pasture areas in the immediate vicinity of the project area, in order to prevent damage to livestock activities that may be seen near the project area, the perimeter of the project area will be fenced, animal passageways will be left and necessary warnings will be made to the project personnel.

The routes of the Animal Access Roads were clarified in consultation with Dumlusu Neighborhood and local people. Before entering the Animal Access Roads, consent was obtained from the owners of the private land to be used for transportation outside the project area.

**III.1.13. Types and numbers of trees to be felled -if any- in line with the management plans in order to prepare the land and provide the land required for the construction area, stand type, closure, effects of the trees to be felled on the forest ecosystem in the region, distance of the project to forest areas, measures to be taken against forest fires, determination of possible impacts on forest areas, possible problems that may affect the environment, interaction with the receiving environment, determination of cumulative impacts, measures to be taken to reduce possible negative impacts,**

The planned project area is located within "Treeless Forest Areas" on the 1/25.000 Scale Oak Map and no forest area will be used within the scope of the project (See Annex-6). There will be no forest area utilization in the activity area within this scope and no damage will be caused to any forest commodity and no tree felling will be carried out within this scope.

All necessary precautions will be taken to prevent the dumping of vegetable soil and excavation surplus materials and wastes that will be generated during the land preparation and construction works of the Project, and waste oils that are likely to be generated from construction machinery, into forest areas.

It is a fact that forest fires are constantly increasing due to human or natural impacts. Therefore, the most important factor in the fight against forest fires is the response time to the fire.

to shorten the duration of the fire and to ensure that the fire is brought under control before it grows. The people living in the region play an important role in early intervention. It is important to share information about the Alo 177 Forest Fire Hotline with the project employees who will be part of the region if the project is established.

In general, fire precautions will be given importance within the scope of the project and the necessary equipment, tools and equipment for first intervention will be available at the operation sites. In case of a possible fire, all personnel will be ready to respond to the fire at any time. Materials used in forest fires such as picks, shovels, rakes, spanks, etc. that are necessary for the first intervention to the fire will be kept ready. During a possible fire, all work machines and vehicles used in the operation phase will be placed at the disposal of the fire chief.

The closest forest areas to the Project area are shown in Figure III.1.13.1.

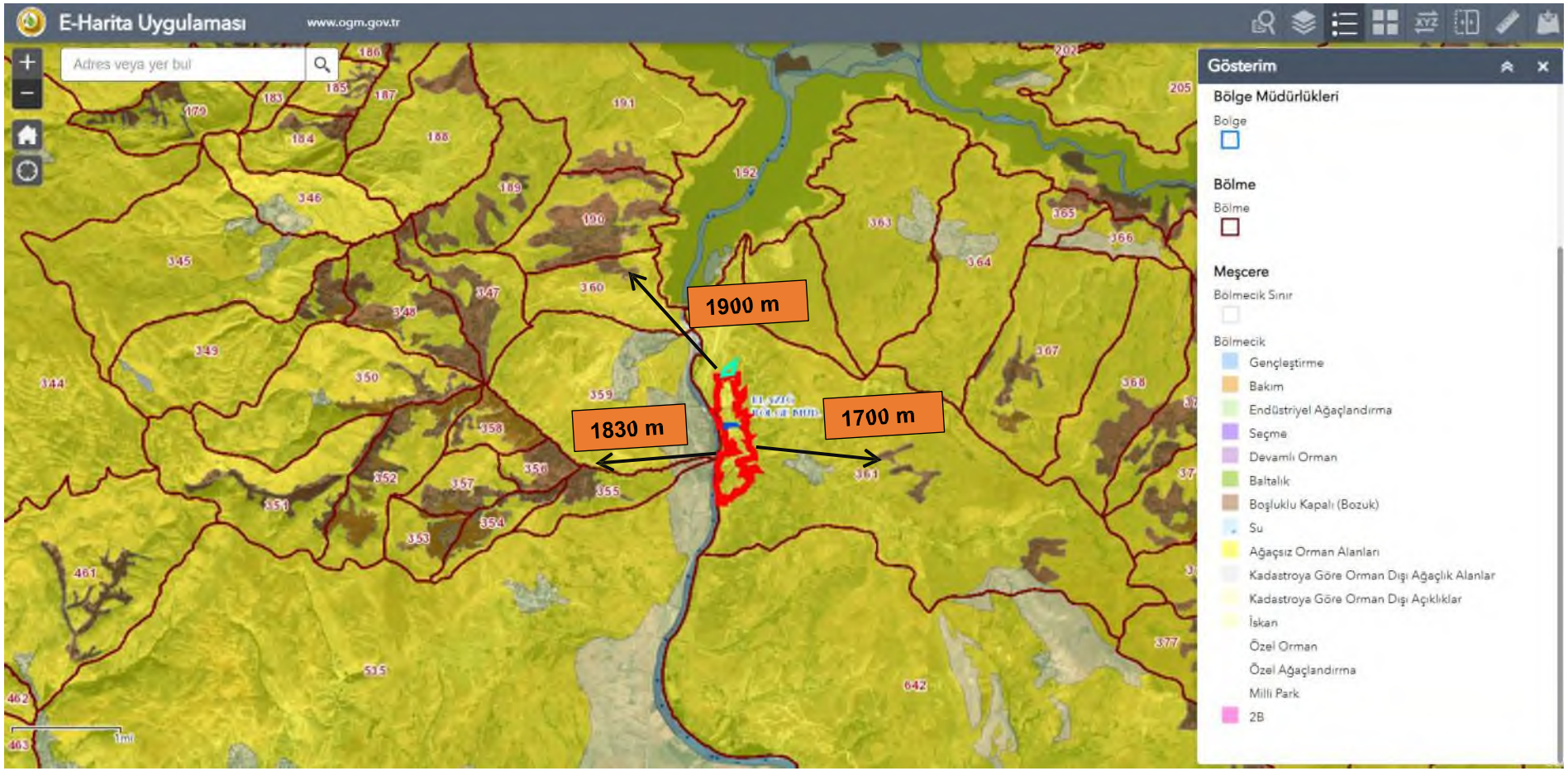


**Figure III.1.13.1** Distance to the Nearest Forest Area
**Source:** https://cbs.ogm.gov.tr

Within the scope of the Project, the following measures will be taken to ensure that there is no negative impact on existing forest areas:

- Entry and exit to and from the activity area will be kept under control,
- Fire-fighting measures will be taken against forest fires that may break out in neighboring forests, as foreseen by the Directorates of Management,
- At the request of the Directorates of Management, workers and construction equipment will be dispatched to forest fires,
- During both construction and operation periods, fire extinguishing and measures to prevent any injury or loss of life will be kept up to date within the scope of Emergency Response Plans,
- In state forests, transportation structures, outbuildings, service facilities and maintenance and operation facilities on access control highways will be kept within the highway boundary line,
- Excavation material, waste or any material that will be generated during the construction of the project will not be dumped in areas considered as forests, and the excavation material will be utilized within the framework of the permits to be obtained,
- Waste oils and other wastes, especially waste oils from construction machinery to be used during construction, will not be dumped in forest areas, and disposal measures will be implemented in accordance with the provisions of the legislation,
- Within the scope of the project, landscaping arrangements will be made for recreational purposes to prevent soil erosion and dust emission in the filling areas where the excavated material will be stored, and
- In order to minimize the dust emission that will occur during excavation and filling operations, measures such as filling and unloading operations at the source of emission, filling and unloading operations without tossing, rehabilitation of roads, covering the vehicles with tarpaulins during material transportation and keeping the top of the material at 10% humidity will be taken. In addition, in order to reduce dust on the roads during the transportation of materials within the scope of the project, irrigation of the roads will be provided with a water truck when necessary.

This will minimize impacts on other areas, particularly forest areas, in the region during the construction period.

### III.1.14. Types and properties of fuels to be used in the works to be carried out starting from the preparation of the land until the opening of the units, emissions to be generated, determination of possible problems that may affect the environment, interaction with the receiving environment, determination of cumulative effects, measures to be taken to reduce possible negative effects,

Diesel fuel will be used as fuel for the machinery and equipment planned to be used in the land preparation, construction and operation phases of the Project. The general properties of the diesel fuel to be used are given in Table III.1.14.1 and the mass flow limit values given in Table 2.1 of the Regulation on the Control of Industrial Air Pollution, which entered into force after being published in the Official Gazette dated 03.07.2009 and numbered 27277, are given in Table III.1.14.2.

**Table III.1.14.1.** Specifications of diesel fuel to be used in vehicles

| Features | Diesel |
|---|---|
| Consistency | Very Fluent |
| Tip | Distilled |
| Color | Amber |
| Density (15 $^0$C-gr/cm$^3$) | 0,8654 |
| Viscosity (38 $^{(0)C}$) | 2,68 |
| Pour Point (0 $^{(0)C}$) | -18 |
| Atomization Temperature (0 $^{(0)C}$) | Atmospheric |
| Pumping Temperature (0 $^{(0)C}$) | Atmospheric |

| Features | Diesel |
|---|---|
| Carbon Residuals (%) | Artwork |
| Sulfur (%) | 0,4-0,7 |
| Oxygen-Nitrogen (%) | 0,2 |
| Hydrogen (%) | 12,7 |
| Carbon (%) | 86,4 |
| Water and Sediment (%) | Artwork |
| Ash (%) | Artwork |
| Heat Value (Kcal /lt) | 9,387 |

**Source:** Air Pollution Control and Audit, Chamber of Chemical Engineers, 1991

**Table III.1.14.2** Mass Flow Limit Values

| Emissions | Mass flow rates (kg/hour) for operating hours under normal operating conditions and weekly working days | |
|---|---|---|
| | Through the chimney | From Places Other Than Chimney |
| Dust | 10 | 1 |
| Lead | 0,5 | 0,05 |
| Cadmium | 0,01 | 0,001 |
| Thallium | 0,01 | 0,001 |
| Chlorine | 20 | 2 |
| Hydrogen chloride and gaseous Inorganic Chloride Compounds | 20 | 2 |
| Hydrogen fluoride and gaseous Inorganic Fluoride Compounds | 2 | 0,2 |
| Hydrogen Sulfide | 4 | 0,4 |
| Carbon Monoxide | 500 | 50 |
| Sulfur Dioxide | 60 | 6 |
| Nitrogen Dioxide [$_{NOx}$ (in $_{NO2}$)] | 40 | 4 |
| Total Organic Compounds | 30 | 3 |
| Note: Emissions in the table are hourly mass flow rates emitted from the entire plant (total of stacks). | | |

**Source:** Regulation on Control of Industrial Air Pollution

With the assumption that the amount of fuel to be consumed in one hour by the vehicles to be used in the activities to be carried out in the field during the construction and operation period within the scope of the planned project will be 30 L on average; the emission amounts calculated with these emission factors determined by EPA are given in Table III.1.14.3.

**Table III.1.14.3** Emissions from Vehicles

| Emission | Fouling Factor* (gr/L) | Emission Amount (kg/hour) |
|---|---|---|
| Carbon Monoxide | 9,7 | 9.70 g/l X 30 l/h / 1000 g/kg= ***0.291*** |
| Sulfur Dioxide | 6,5 | 6.50 g/l X 30 l/h / 1000 g/kg= ***0.195*** |
| Nitrogen Dioxide | 36,0 | 36.0 g/l X 30 l/h / 1000 g/kg= ***1.08*** |
| Dust | 18,0 | 18.0 g/l X 30 l/h / 1000 g/kg= ***0.54*** |

When Table III.1.14.3 is evaluated, it is seen that the limit values given in Table III.1.14.2 are not exceeded and are even far below the limit values.

The emissions from the vehicles to be used in the land preparation and construction works will be very low and it is anticipated that the emissions from the equipment will not have a negative impact on the existing air quality. In order to minimize the emissions from the vehicles that will be used during the land preparation and construction phase, all vehicles and equipment will be routinely inspected, the vehicles that require maintenance will be serviced and other vehicles will be used for the works until the maintenance is completed.

**III.1.15. Where and how the construction site and other technical/social infrastructure needs will be provided for the personnel to work, starting from the preparation of the land until the units are put into operation,**

It is envisaged that 40 people will be employed during the construction phase of the planned project.

A construction site will be established within the project area for the personnel to be employed in the construction works of the planned project.

During the land preparation-construction phase of the Project, the drinking water needs of the personnel will be met by purchasing from the market with carboys. The domestic water needs of the personnel will be met by tanker truck from Dumlusu Neighborhood in accordance with the protocol given in Annex-2.6 during the land preparation and construction phase and from the administrative building of Alpaslan II Dam and HEPP production facility during the operation phase.

For all of the water to be used within the scope of the activity, the provisions of the "Regulation on Water Intended for Human Consumption", which entered into force after being published in the Official Gazette dated 17.02.2005 and numbered 25730, will be complied with.

Domestic wastewater that will be generated from the use of personnel will be collected in a sealed septic tank and when it reaches 80-90% fullness without any transportation, it will be extracted by a vacuum truck and disposed of by a vacuum truck to be supplied from the relevant Municipality in accordance with the provisions of the Water Pollution Control Regulation and Waste Management Regulation, which entered into force after being published in the Official Gazette dated 31.12.2004 and numbered 25687 *(Amendment: 17.12.2022 dated and numbered 32046).*

In case medical intervention is required for personnel at the project site, they will be referred to the nearest health institution.

**III.1.16. The works that are risky and hazardous for human health and the environment from the works to be carried out starting from the preparation of the land until the units are put into operation, identification of possible problems that may affect the environment, interaction with the receiving environment, determination of cumulative effects, measures to be taken to reduce possible negative effects,**

Risky and hazardous works for human health and the environment that may occur during the activities in the land preparation, construction and operation phases of the Project include injuries, traffic accidents in the construction site, accidents that may occur as a result of the operation of construction machinery.

The impacts on human health during all phases of the planned project are occupational accidents and potential health problems. In order to minimize these impacts, occupational safety training will be provided to employees and warning signs will be placed on the site.

In all works within the scope of the Project, all measures to protect the environment and public health will be taken in compliance with the "Public Hygiene Law" No. 1593, "Labor Law" No. 4857, Occupational Health and Safety Law No. 6331, Environmental Law No. 2872 and the bylaws and regulations issued pursuant to these Laws.

Sufficient amount of tools and equipment will be kept in the facility to be used in case of any fire and similar natural disasters in and around the facility site. Thus, in case of any fire, the fire will be intervened as soon as possible. In addition, all kinds of measures specified in the relevant regulations will be taken against possible work accidents. In case of accidents that may occur in the facility, first aid will be provided with the health materials to be kept in the facility. In case of more serious injuries and accidents, they will be immediately referred to health institutions in the nearest settlement.

Environmentally risky activities within the scope of the Project include oil leakage from construction machinery, hazardous waste and waste oils and other wastes.

In case of oil leaks from construction machinery during the land preparation and construction phase of the project and in case of hazardous waste and waste oil formation during the works, the provisions of the "Regulation on Control of Soil Pollution and Point Source Contaminated Sites", Waste Oil Management Regulation, "Waste Management Regulation" will be complied with.

The facilities to be planned will be constructed of materials that will not harm human health, measures will be taken against humidity, adequate ventilation and lighting will be provided, and fire and security measures will be taken, as specified in the "Instruction on the Health Conditions to be met by Residential Buildings" prepared in accordance with Article 250 of the General Hygiene Law.

For the domestic wastewater that will be generated from the use of personnel during the Construction and Operation phase; an impermeable septic tank project will be prepared in accordance with the provisions of the Water Pollution Control Regulation *(Amended 17.12.2022/32046*), which entered into force after being published in the R.G. dated 31.12.2004 and numbered 25687, and a septic tank will be constructed in accordance with the project by having it approved by the relevant institutions.

All necessary measures will be taken by the investor company to prevent and eliminate health problems that may develop due to dust emissions that may occur.

**III.1.17. Determination of the impacts of the project on cultural and natural assets located underground and above ground, impacts on sensitive areas, identification of potential problems that may affect the environment, interaction with the receiving environment, determination of cumulative impacts, measures to be taken to mitigate negative impacts on the environment,**

There are no ecologically protected areas within the project area. Considering the activities within the scope of the project and its environmental impacts, there is no topographical and morphological connection between the project area and the nearest protected areas, and there is no negative impact on the areas protected by legal legislation due to their distance from the project area.

When the project area is evaluated according to the ecologically protected areas under the legal legislation of both the Republic of Turkey Ministry of Agriculture and Forestry, General Directorate of Nature Conservation and National Parks and the Republic of Turkey Ministry of Environment, Urbanization and Climate Change. Ministry of Environment, Urbanization and Climate Change, the Project area is not included in National Parks (MP), Nature Conservation Areas (NCA), Wildlife Development Areas (WLCA), Wild Animal Settlement Areas (WLA), Nature Parks (TP), Nature Monuments (TA), Ramsar Sites (RA), Wetlands (SA) and Special Environmental Protection Areas (SEPA).

According to the opinion dated 07.07.2022 and numbered 6261213 of the General Directorate of Nature Conservation and National Parks of the Ministry of Agriculture and Forestry of the Republic of Turkey, *"...it has been determined that the project area does not fall within the Protected Areas under the management of our General Directorate within the scope of the National Parks Law No. 2873 (National Park, Nature Park, Nature Monument and Nature Conservation Area), Land Hunting Law No. 4915 (Wildlife Protection Area, Wildlife Development Area), Regulation on the Protection of Wetlands dated 04.04.2014 dated 28962 numbered Regulation on the Protection of Wetlands, it has been determined that it is not within the Protected Areas under the management of our General Directorate."* The statements are included. An ecosystem assessment report was prepared for the subject project area within the framework of the Wetland Activities Ecosystem Assessment Report Format and Solar Power Plant Projects Assessment Format (Annex-2) (See Annex-12).

In the institutional opinion of the Regional Board for the Protection of Cultural Assets of Van dated 14.11.2022 and numbered 3144597, it is stated *that "... it has been understood that there is no record of any archaeological site or immovable cultural asset that has been identified and registered so far and that it does not remain within the protection area, and there is no objection to the construction of SPP by our Directorate."* (See Annex-2.16).

No cultural property requiring protection has been encountered in the project area, and if any Cultural Property is encountered as a result of the construction and physical interventions to be made, the nearest Museum Directorate or the Local Administrative Authority will be notified in accordance with Articles 4 and 5 of the Law No. 2863. During all works to be carried out within the scope of the Project, Law No. 2863 will be complied with.

As stated in the opinion of the General Directorate for the Protection of Natural Assets presented in Annex-2.17, there are no registered natural protected areas and natural assets in the project area.

In the event that any protected natural assets are encountered during the works to be carried out in the project area, the Provincial Directorate of Environment, Urbanization and Climate Change of Muş Governorship will be informed without any intervention in accordance with Article 4 of the Law No. 2863.

**III.1.18. How much area and how the field arrangements (afforestation and/or green area arrangements, etc.) to be made in the project area to create landscape elements or for other purposes,**

Today, the energy demand caused by population growth and the projects realized to meet this demand put pressure on the environment. One of these pressures is the effects that the energy projects that have been built and planned to be built have/may have on the natural landscape.

Within the scope of landscape studies, it is aimed to determine the changes that will occur in the function and structure of the natural landscape (new areas, spots and corridors, etc.) and their effects and to carry out the necessary planning and implementation studies.

Accordingly, site landscaping and environmental protection works will be carried out in the Project area to mitigate post-construction impacts. During these works, necessary measures will be taken to minimize the damage to the existing structure.

With the commencement of construction works in the project area, environmental protection and implementation works should also commence. The success of the post-construction landscaping and remediation works is largely dependent on this. In this context; determination of the boundaries of the work area, stripping and storage of topsoil, temporary erosion measures and sedimentation control works will be carried out within the scope of the project. The applications to be realized for these studies are given in detail below.

*Determination of Study Area Boundaries*

During the construction period, the personnel who will work in the field should be informed and made aware of the natural landscape values of the area. The first thing to be done for this is that all employees receive environmental training, visual communication tools such as banners, posters, etc. are hung at certain points of the construction site and work sites, the boundaries of the work and construction site areas are determined in order to prevent further deterioration of the natural structure, and all personnel should not engage in any activities outside these areas, both constructional (opening unauthorized roads, using extra space, etc.) and social (especially all kinds of hunting activities, lighting fires, etc.). Especially considering the natural vegetation around the planned project area, these measures are inevitable. A construction site is planned to be established within the scope of the Project.

*Soil Stripping and Storage Operations*

The most important stage to be considered during the construction period is good "Topsoil Management". In all areas where construction work will be carried out within the scope of the Project (including areas with steep and side slopes), topsoil should be stripped and protected by taking necessary measures so that it does not mix with the subsoil during construction.

It is not planned to store and discharge the vegetative soil stripped within the Project area. The excavation material will be used for filling, land leveling and landscaping in the first stage, and the vegetative soil material will be used for landscaping works. In case of leftover materials, they will be transported to the authorized dumping areas of the administration.

*Temporary Erosion Measures*

Another important issue to be considered during construction is the evaluation of project areas in terms of erosion. During construction activities, especially in sloping areas;

- Because the topsoil was scraped off,
- Because surface cover and wooded areas are destroyed, existing
- vegetation is removed,
- As the topography of the land is altered and
- As the existing stable land plastic is disturbed, necessary temporary erosion measures should be taken until
- construction is completed.

If necessary erosion control measures are not taken, especially in sloping areas and in areas where the topography has been changed and the top cover has been removed, serious topographic changes can be seen with soil loss and decrease in land productivity, decrease in water quality in rivers with sediment transport and a slip that may occur.

Therefore, during the construction works, firstly, the removal of topsoil and material removal will be in a manner that will not cause excessive erosion and will not be affected by erosion. The following temporary erosion measures will be implemented during site preparation, construction and installation activities:

- Material deposits will be left to interrupt surface flow and prevent scouring of the bottom. Schematic representation is given in Figure III.1.18.1.
- Drainage channels will be created where necessary on vertical and transverse slopes.
- When slopes need to be cut, mini weirs will be constructed and these weirs will ensure the discharge of runoff downstream along the slope.
- Continuous monitoring will be carried out to prevent collapses and soil losses.
- Where necessary, the surface will be covered with soil and an erosion mat and planted with seed or shrubs using native species.

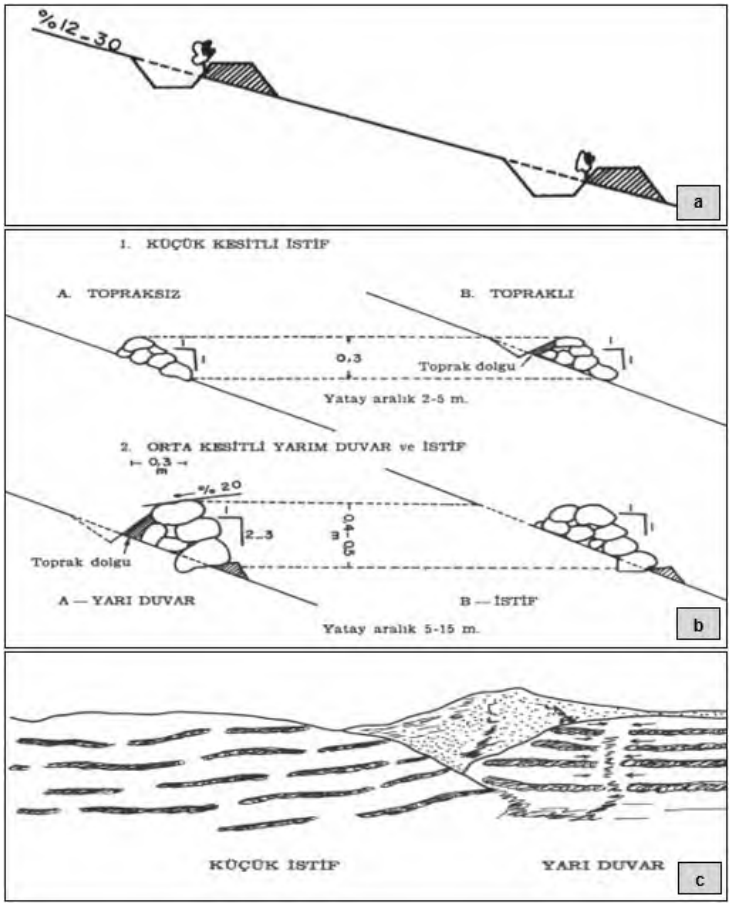


**Figure III.1.18.1.** Material Accumulations and Stacks Created within the Scope of Erosion Prevention Methods

These precautions are mandatory to avoid dangerous situations during construction (cave-ins, landslides, collapses, etc.) and to prevent further damage to the topography of the land. In addition, the most important goal of post-construction landscaping is to prevent topsoil erosion in unstable, newly repaired areas. Therefore, these measures should also be implemented in post-construction landscaping.

Thanks to the environmental protection measures and practices taken during construction, it is seen that fewer areas are damaged and construction works progress in a controlled and environmentally respectful manner. In addition, with the landscaping works to be carried out after construction, it is seen that the areas damaged and destroyed during construction can repair themselves in a shorter time.

Therefore, paying attention to the above-mentioned issues is of great importance for the protection of the natural environment and the continuity of the ecosystem.

In the Project area, after the construction works, site arrangements will be made to create landscape elements or for other purposes. In this context, the topography of the land will be arranged in accordance with the natural structure in accordance with the climate and soil characteristics of the region after the top cover soil is laid and erosion measures are taken around the areas where construction activities are carried out and permanent facilities are created, and planting will be done with species specific to the area (using natural plant species if possible).

**III.1.19. Project impact on climate during the construction phase (nature and magnitude of GHG emissions) and how the project will be affected by climate change,**

Greenhouse gases are emitted by both natural processes and human activities. The most important natural greenhouse gas in the atmosphere is water vapor. However, human activities release large amounts of greenhouse gases, increasing their atmospheric concentrations, which in turn increases the greenhouse effect and warms the climate. The main sources of anthropogenic greenhouse gases are:

- Combustion of fossil fuels (coal, oil and gas) for use in electricity generation, transportation, industry and households ($CO_2$);
- Land use changes such as agriculture ($CH_4$) and deforestation ($CO_2$);
- Landfilling of waste ($CH_4$);
- Industrial use of fluorinated gases[15].

There will be no combustion system within the scope of operation activities and diesel fuel will be used as fuel for the vehicles. There is no greenhouse gas emission source within the scope of the "Regulation on Monitoring Greenhouse Gas Emissions" published in the Official Gazette dated 17.05.2014 and numbered 29003. Therefore, there is no issue that will cause greenhouse gas and climate change.

In order to minimize possible emissions from fossil fuels, new technology vehicles with low emission values will be used. Regular maintenance and repair of vehicles will be carried out and fuel consumption will be taken under control.

Exhaust emission inspections of construction machinery will be carried out regularly and it will be documented that they meet the limit values set for exhaust emissions.

A Sustainable Greenhouse Gas Reduction Plan has been prepared within the scope of the format announced by the Republic of Turkey Ministry of Environment, Urbanization and Climate Change on 04.08.2022 and is given in Annex-21.

**III.1.20. Risk of project-related disasters or accidents due to climate change during construction phase,**

Climate change can be defined as understanding the interaction between land and atmosphere. The use of fossil fuels and the associated release of greenhouse gases such as water vapor ($H_2O$), carbon dioxide ($CO_2$) and methane ($CH_4$) cause an increase in the earth's temperature and a change in climate [16].

The evaluation of meteorologically induced disasters occurring in Turkey is regularly conducted and shared with the public every year through bulletins published by MGM. When it comes to the evaluations made over many years, it is seen that the most common natural disasters in Turkey are storms, floods, droughts and forest fires (TMMOB, 2018).

Solar, wind, geothermal, hydraulic and biomass are infinite and renewable energy sources when evaluated with human life. Renewable energy resources have a strategic value for our country as they have negligible greenhouse gas emission values, are domestic, and provide high national benefits in economic, social and political terms[17].

Within the scope of the project, direct current (DC) electricity to be generated by photovoltaic panels to be installed in the solar power plant will be collected in combiner boxes and converted to alternating current (AC) by inverters. The electrical energy to be generated will be transferred first to the transformer and then to the existing switchyard to be supplied to the interconnected system.

[15] **Source:** Reducing greenhouse gas emissions - European Environment Agency (europa.eu)
[16] **Source:** Technological and Social Impacts of Solar Power Plants, İzzettin Enes Şen, Nezihe Yıldıran, Emin Tacer. 2014.
[17] **Source:** ilbank.gov.tr

No harmful gases such as gas, smoke, dust, carbon or sulphur, completely clean and cost-effective. It is silent and can be used in places without electricity grid. It can be used wherever there is more or less sunshine. It is also possible to generate electricity in winter and cold weather[18]. Renewable energy systems do not require the burning of fossil fuels to generate electricity. In this context, renewable energy systems will be used with the planned project and the amount of fossil fuel use will be reduced.

## III.2. Impacts of the Project on the Physical and Biological Environment during the Operation Phase and Measures to be Taken

### III.2.1. Technical specifications of the project (where the solar energy system to be used will be procured from, how the system will be installed, the number, characteristics, dimensions of the panels to be used, the main production capacity of the facility during the operation phase, electricity connection line, etc., type and amount of auxiliary materials to be used in the facility, etc.),

**Main Production Area of the Facility in Operation**

The current operation is a 280 MWe hydroelectric power plant operated by Murat Nehri Enerji Üretim A.Ş. in Murat Mevkii of Dumlusu Village and Gölhazal Mevkii of Akkonak Village in Muş Province, Central District.

The planned project is the auxiliary source solar power plant project, which is planned to be established in addition to the main activity, hydroelectric power plant.

**Production Capacities**

Capacity information for the currently operating power plant and the planned auxiliary resource project is given in Table III.2.1.1.

**Table III.2.1.1** Capacity Information for Existing and Planned Project

| AVAILABLE CAPACITY | | | | |
|---|---|---|---|---|
| **Type of Energy Used** | **Capacity (MWe)** | **Capacity (MWm)** | **Energy Produced (GWh)** | **Type of Energy Produced** |
| Hydroelectric Power Plant | 280 | 283,520 | 866,22 | Electricity |
| **PLANNED CAPACITY** | | | | |
| **Type of Energy to be used** | **Capacity (MWe)** | **Capacity (MWm)** | **Energy to be Produced (GWh)** | **Type of Energy to be Produced** |
| Solar Energy | 42 | 41,9916 | 28,154 | Electricity |
| **TOTAL CAPACITY TO BE CREATED WHEN THE PLANNED PROJECT BECOMES OPERATIONAL** | | | | |
| **Type of Energy Used** | **Capacity (MWe)** | **Capacity (MWm)** | **Energy to be Produced (GWh)** | **Type of Energy to be Produced** |
| HEPP Auxiliary Source SPP | 280 | 325,5116 | 866,22 | Electricity |

**Supply of Solar Energy Panels**

Within the scope of the solar power plant project, the panels will be supplied from domestic producers or from abroad. The components other than panels that are planned to be brought from abroad will be brought to Turkey by sea and transported to the project area by road (truck).

The components planned to be procured domestically will be loaded directly onto trucks and transported to the site by road.

[18] **Source:** ilbank.gov.tr

The main raw material that the facility will use in energy generation is solar radiation, which is a natural resource. In addition, the materials to be used during maintenance work will be supplied from domestic suppliers.

**Characteristics of Solar Panels to be used**

Within the scope of the "Alpaslan II Dam and Hydroelectric Power Plant (HEPP)" project, it is planned to install 76,440 si-mono photovoltaic panels of ELNSM72M-545-HC-HV model etc. with a power of at least 540 Wp and an efficiency value of at least 20.1%, and the panel in question has IEC61215:2016 and IEC61730:2016 international standards.

Technical details of the panel to be used within the scope of the Project are given in Table I.1.6 in Section I.1 and the technical presentation document is given in Annex-2.3.

**Raw and Auxiliary Materials**

The main raw material that the facility will use in energy generation is solar radiation, which is a natural resource. Apart from this, the materials to be used during maintenance works will be supplied from domestic and/or foreign suppliers.

No chemical, explosive/explosive materials will be used during the land preparation and construction phase of the Project.

**Solar Energy Technology**

Solar energy technologies vary widely in terms of method, material and technological level, but can be divided into two main groups.

**Photovoltaic Solar Technology:** Semiconductor materials called photovoltaic cells convert sunlight directly into electricity. Photovoltaic systems include many different types with the use of different materials in the panels.

**Thermal Solar Technologies (Concentrated Solar Energy):** In these systems, heat is first obtained from solar energy. This heat can be used directly or it can also be used in electricity generation.

Solar cells (photovoltaic cells) are semiconductor materials that convert sunlight directly into electrical energy. Solar cells, whose surfaces are shaped as squares, rectangles or circles, are usually around 100 cm² in area and 0.1 - 0.4 mm in thickness.

Solar cells work based on the photovoltaic principle. In other words, when light falls on them, an electrical voltage is generated at their ends. The source of the electrical energy given by the cell is the solar energy coming to its surface.

Solar energy can be converted into electrical energy with an efficiency between 5% and 30% depending on the structure of the solar cell. For ease of installation, to increase power output, to increase resistance to external factors and to reduce production costs, a large number of solar cells are connected in parallel or in series and mounted on a surface, this structure is called a solar cell module or photovoltaic module.

Photovoltaic cells, such as transistors and rectifier diodes used in today's electronic products, are made of semiconductor materials. Among the many materials with semiconductor properties, the most suitable ones for making photovoltaic cells are materials such as silicon, gallium arsenide, cadmium telluride. A solar cell, a semiconductor diode, is a device that converts light directly into electric current.

Semiconductor materials such as silicon, gallium arsenide and cadmium telluride are used to make solar cells. Their structure simply consists of a P and N junction. Based on the principle of the "photovoltaic event", electrons plucked by photons move across the junction and an electric current is generated.

In order for semiconductor materials to be used as solar cells, they must be doped with N or P type. Whether the resulting semiconductor is N or P type depends on the dopant.

To obtain n-type silicon from silicon, the most common solar cell material, an element from group 5 of the periodic table, for example phosphorus, is added to the silicon melt. Since there are 4 electrons in the outer orbit of silicon and 5 electrons in the outer orbit of phosphorus, the one extra electron of phosphorus gives one electron to the crystal structure. This is why group V elements are called 'donor' or 'n-type' dopants.

To obtain P-type silicon, an element from group 3 (such as aluminum, indium, boron) is added to the melt. Since these elements have 3 electrons in the last orbital, the crystal lacks an electron, which is called a hole or a vacancy and is assumed to carry a positive charge. Such substances are called 'p-type' or 'acceptor' dopants.

When p- and n-type doped materials are brought together, semiconductor junctions are formed. Electrons are the majority carriers in the N-type semiconductor and holons in the P-type semiconductor. Before P- and N-type semiconductors come together, both materials are electrically neutral. In other words, in type P the negative energy levels and the number of holons are equal, in type N the positive energy levels and the number of electrons are equal. When the P-N junction is formed, the electrons, which are the majority carriers in the N type, create a current towards the P type. This continues until a charge balance is established on both sides. At the interface of the P-N type substance, i.e. in the joint region, negative charge accumulates on the P side and positive charge accumulates on the N side. This joint region is called the 'transition region' or the 'charge-free region'. The electric field generated in this region is called the 'structural electric field (Ey)'.

In order for the semiconductor junction to work as a solar cell, photovoltaic conversion must be achieved in the joint region. This conversion takes place in two stages, first, light is incident on the junction region to create electron-hol pairs, and second, they are separated from each other by the electric field in the region. The separated electron-hol pairs create a useful power output at the ends of the solar cell. This process continues in the same way when a photon strikes the surface of the solar cell again.

In order to increase the power output, a large number of solar cells are connected in series or parallel to each other and mounted on a surface. This structure is called a solar panel or photovoltaic module. Depending on the power demand, modules can be connected in series or parallel to each other to create a system from a few W to MW.

Within the scope of the planned project, photovoltaic solar technology, which is an advanced technology product, will be used, and this technology is more efficient and more environmentally friendly than thermal solar technologies.

In SPP projects, factors such as annual sunshine duration, meteorological (humidity, temperature, wind, etc.), topographical, geographical (absence of hills and mountains that can block the sun, absence of facilities that will block the sun by releasing gas, etc.) and proximity to the electricity grid if the consumption of electricity is intended to be made elsewhere are taken into consideration.

Within the scope of the project, direct current (DC) electricity to be generated by photovoltaic panels to be installed in the solar power plant will be collected in the combiner box and converted to alternating current (AC) by the inverter. The electrical energy to be generated will be transferred first to the transformer and then to the existing switchyard to be supplied to the interconnected system. The Single Line Diagram prepared within the scope of the project is given in Annex-2.7.

**III.2.2. What kind of operations will be carried out for the maintenance of the solar power plant and energy connection lines, the materials to be used, the types (battery, PV, oil waste, etc.) and quantities of wastes to be generated, their characteristics and how they will be disposed of; how the panels will be cleaned, where the water will be supplied if it will be used, how much water will be used, the amount of wastewater to be generated and the disposal method, determination of possible problems that may affect the environment, interaction with the receiving environment, determination of cumulative effects, measures to be taken to reduce possible negative effects,**

When solar power plants, one of the renewable energy sources, are compared with other power plants, there is a big gap in terms of lifetime. Today, the average lifespan of solar panels is around 25 years and it can be stated that there is no power plant that can compete with SPP in terms of maintenance and repair activity period. Although solar panels impress with their longevity, this does not mean that they never fail. Air pollution (dusting of panel surfaces), some ecological factors and disruption of regular maintenance can limit the lifespan of solar power plants and reduce their efficiency. The problems encountered in solar power plants are listed below:

- One of the most common failures in solar power plants is insulation faults. Insulation faults can be caused by incorrect and loose connections. In addition to these, insulation faults can be seen due to reasons such as pulling the cables tight or damaging the cables, rodents damaging the cables. Insulation errors can also cause short circuits. It can also cause the failure of the devices to which it is connected.

- One of the common failures in solar panels is cable failures in junction boxes. For example, incompatibility in connectors can lead to connector failure. This incompatibility is called "missmatch". The mismatch here can cause a fire.

- Another one of the failures experienced in solar power plants can be experienced in medium voltage systems. Failures are encountered especially in transformers and breakers. Therefore, it is clear that periodic maintenance is very important.

- Another problem is failures caused by relay coordination and relays are the equipment that protects energy systems from abnormal conditions. Relay coordination is a critical issue and in case of failure, there are dangerous consequences that can lead to explosions.

Switches used in solar power plants are one of the main causes of electrical failures. These switches may have overheating problems. The overheating problem is solved by performing connection maintenance. It will be ensured that all connections are heat tested at least once a year at the SPP site.

During periodic maintenance, it will be ensured that all imaging is performed by competent personnel under the conditions specified in the relevant standards, oil-gas analyzes are performed in oily transformers, resistances are measured, relay settings and cable connector connections are checked for correctness, and thermal tests of all connections are performed at least once a year.

Since dust accumulation on the panel surface due to air pollution during the operation phase of solar power plants affects the efficiency of the panels, it is a necessity to clean their surfaces. The period of the cleaning work in question varies according to the environmental conditions in the area where the project is planned (road, industry, mining facility, etc.) and it is envisaged that it will be sufficient to carry out cleaning work once every 6 months within the scope of the project.

However, in order to prevent damage to the surface of solar panels and mechanical/electrical equipment, the water to be used for cleaning should not cause problems such as lime and conductivity. Within the scope of the project, the water to be used for the removal of dust that may form on the panels over time will be specially conditioned.

The water requirement will be provided from outside and there will be no treatment process within the project area. As mentioned above, this work is envisaged to be carried out approximately once every 6 months and there will be no addition of any hazardous substances.

Although the amount of water to be used for cleaning the panels is not clear, assuming 2.5 liters/panel[19] in 6-month periods, **191.1 tons (2.5 liters/panel x 76,440 panels) of** water will be needed. Within the scope of the Project, pure water will be used for cleaning the panels and no chemicals will be used. In case chemicals are used, drainage and sealing measures will be taken in storage areas and related plant units to prevent contamination of surface and groundwater resources.

Sealing measures specified in all relevant regulations will be provided for the storage conditions of all potential pollutants within the scope of the Project and containment channels will be established around them.

There is no continuous waste generation during the operation phase of SPP projects. The wastes that will be generated during the maintenance/repair of the panels and other equipment (relays, connectors, cables, etc.) will be disposed of by the maintenance company or the investor company by giving them to the recovery companies that have a temporary activity certificate / environmental permit certificate within the framework of the provisions of the "Waste Management Regulation" published in the Official Gazette dated 02.04.2015 and numbered 29314. No prediction can be made at this stage regarding the amount of wastes to be generated during maintenance works.

Within the scope of the project, batteries and accumulators that have completed their service life will be collected and accumulated separately from domestic wastes and will be disposed of by delivering them to licensed collection points and temporary storage places as stated in Article 13 of the "Regulation on the Control of Waste Batteries and Accumulators", which entered into force after being published in the Official Gazette dated 31.08.2004 and numbered 25569, in order to prevent direct or indirect discharge of batteries and accumulators that have completed their service life into the receiving environment in a way to harm human health and the environment.

**III.2.3. Electric and magnetic fields that may occur and their intensities, effects, measures to be taken; comparison with national and international standards, determination of possible problems that may affect the environment, interaction with the receiving environment, determination of cumulative effects, measures to be taken to reduce possible negative effects,**

When electromagnetic fields and their effects on human health are examined, the concept of radiation comes first. Depending on their power, electromagnetic waves to which people are exposed transfer their energy to living beings through photons at different rates depending on the characteristics of the wave.

In general, the effect of electromagnetic waves on living things depends on the intensity (power) of the field and the energy of the photon, and is examined in two classes as ionizing and non-ionizing radiation according to their frequency and energy, that is, according to the degree of effect on living things. According to this

- Non-ionizing Electromagnetic Radiation between DC - 300 GHz,
- Above 300 GHz is defined as ionizing Nuclear Radiation (such as neutrons, protons, alpha, beta particles, x and gamma rays).

Non-ionizing radiation is EM waves formed by photons that do not have the energy necessary to break atomic bonds. These are visible light, infrared, RF (radio frequency), microwave, static and magnetic fields. In other words, it is the part of the frequency spectrum starting from 1 Hz to approximately 1000 GHz. The measured energy value is, for example, 0.00125 eV (electron volts) at 300 GHz, which is very low for ionization. However, depending on factors such as distance, power and exposure time, these fields can cause some biological effects in the body as well as the thermal effect described above. The carcinogenic effect has not yet been proven.

[19] **Source:** https://solarpost.in/om/role-water-long-term-performance-solar-pv-plants/

Radio-TV and base stations used in communication, which are in the non-ionizing radiation part of the frequency domain, are useful for public use, but each of these are sources of unintentional continuous exposure.

Ionizing radiation is high-frequency (above 1.014 Hz) EM waves with enough photon energy to ionize the atomic bonds that hold molecules together in cells. Examples include X-rays and gamma rays, although some sources also include ultraviolet (UV) radiation in this class. They have minimum energy values starting at 12 eV (electron volts). Excessive exposure can lead to dangerous conditions such as damage to organelles in living cells and disruption of the DNA chain.

Due to the developments in technology and the widespread use of wave generating devices, exposure to electromagnetic waves in daily life is increasing. Electric and magnetic fields and their intensities that may arise from energy projects implemented to meet the ever-increasing energy demand and to reduce external dependence on energy are being investigated.

Photovoltaic (PV) systems do not emit any emissions to the environment during their operation. However, as in any power plant, they generate electromagnetic fields (EMF). The electromagnetic field generated during electricity generation is non-ionizing radiation. This means that it has enough energy to move atoms in a molecule, but not enough energy to damage DNA. In the modern world, all people are exposed to EMF from the electronic devices they use in their daily lives or the environment they are in. Someone outside the fenced perimeter of a solar plant is not exposed to significant EMF from the solar plant. Therefore, the EMF generated in solar power plants has no adverse health effects.[20]

The electricity to be generated within the scope of the planned project will first be transferred to the transformer, then to the existing switchyard or the power plant building MV busbar, and then to the interconnected system via a step-up transformer. The energy connection between the SPP site and the HEPP will be connected with a 33 kV overhead line.

According to the results of studies on the intensity of electromagnetic fields emitted by power transmission lines; the effects of 400 kV ETL are well below the international reference standard values.

For the energy transmission line to be established within the scope of the project, Article 46 of the "Regulation on Electrical High Current Facilities (EKAT)", which entered into force after being published in the Official Gazette dated 30.11.2000 and numbered 24246, imposed some limitations on the distance of energy transmission lines to settlements, roads and facilities and the installation permit of the lines will be obtained in accordance with these conditions.

Electromagnetic fields from the power plants planned to be established within the scope of the Project will be negligible within the boundaries of the facility. Therefore, a cumulative interaction cannot be mentioned.

**III.2.4. Impacts such as light reflection, glare and measures to be taken against them, identification of possible problems that may affect the environment, interaction with the receiving environment, determination of cumulative effects, measures to be taken to reduce possible negative effects,**

One of the effects of solar power plants is the reflection and glare effect on the panels as a result of direct sunlight or the image or light created by a bright sky. The severity of the glare and glare effect depends mainly on the time of year and the geographical location of the power plant, but the importance of the effect depends on variables such as potential receiving points (settlements in the impact area, transportation routes, airports, etc.). Since photovoltaic panels absorb sunlight, the glare and glare effect in PV-type systems is lower than in systems using other solar energy technologies.

[20]**Source:** NC State University, Health and Safety Impacts of Solar Photovoltaics, 2017

Monocrystalline photovoltaic panels will be used in the project. Monocrystalline solar panels are produced by the "Czochralski Method", which is the most expensive and oldest type of panel production techniques. In this method, silicon dioxide ($SiO_2$) compound is placed in a container and melted at a very high temperature. A small graft is then immersed in the molten material in the crystal and slowly pulled upwards into the cold region. As a result of this process, monocrystalline silicon solar cells are formed. The resulting monocrystalline silicon material is cut into the desired cross-sectional type with a thickness of 0.2-0-3 mm. This material is the "P-type semiconductor" material of solar panels. The P-type semiconductor material is combined with the N-type semiconductor material and then covered with an anti-reflective glass layer as the last step. Coating with anti-reflective material in the last step greatly reduces the amount of reflection, thereby reducing reflection hazards and power loss as much as possible.

According to the US Federal Aviation Administration (FAA), existing solar panels reflect slightly more light than black asphalt, on par with bodies of water and well below bare soil, vegetation, roofs, glass, snow or metal.[21]

The sunlight reflection rates of metals are given in Figure III.2.4.1.

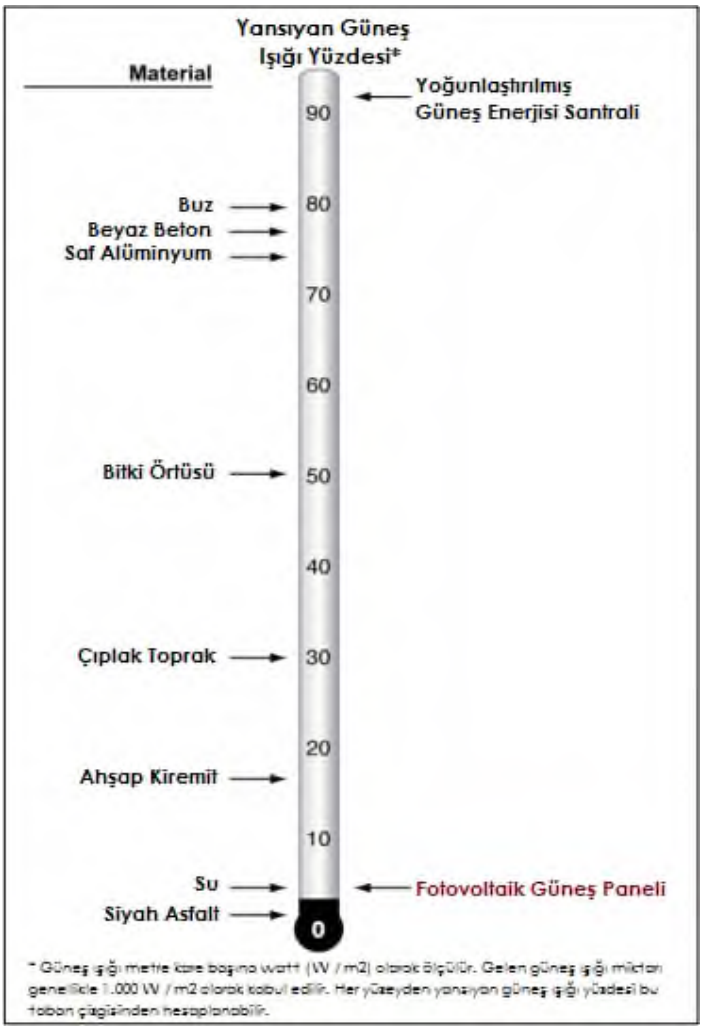


**Figure III.2.4.1** Sunlight Reflectance Percentages of Various Materials
**Source:** https://www.savemoneycutcarbon.com/learn-save/do-i-need-to-worry-about-glare-from-solar-panels/

[21]**Source:** https://www.savemoneycutcarbon.com/

As stated in the opinion of the General Directorate of Highways dated 08.12.2022 given at the EIA Special Format stage, Article 9.1 of the "Regulation on the Technical Evaluation of Solar Energy Based Electricity Generation Applications" published in the Official Gazette dated 30.06.2017 and numbered 30110 states "Glare analysis *ARTICLE 9 - (1) The General Directorate of Highways and the General Directorate of State Airports Authority may request a glare analysis from the General Directorate in order to minimize the possible negative effects of solar energy systems planned to be installed around existing and planned highways and airports if deemed necessary. The General Directorate shall complete the analysis and forward it to the relevant institutions and organizations. The measures to be taken against the possible risks included in the glare analysis are specified in the report.*" In accordance with the provision, it is necessary to determine whether the facility will cause any inconvenience in terms of glare and luminescence according to the planned design within the General Directorate of Energy Affairs of the Ministry of Energy and Natural Resources in order to ensure that the SPPs do not pose a negative situation in terms of road safety and traffic safety on the existing and/or planned roads in the road network of the General Directorate of Highways.

In this context, an official letter was sent to the General Directorate of Highways Traffic Safety Department and it was asked whether there is a need for a glare analysis. In the opinion of the General Directorate of Highways Traffic Safety Department dated 17.05.2023 and numbered E.1176023, it was requested to have a glare analysis with the statements *"It is understood that the solar power plant to be built ..... is close to the highway and it is* deemed necessary by our administration *to have a glare analysis to determine whether it will adversely affect traffic safety* and to submit the result to our administration as a report." (See Annex-2.18).

In this context, "Reflection and Glare Impact Analysis Report" dated 07.06.2023 was prepared by Macom Environment and Energy (See Annex-14).

As a result of the modeling performed within the scope of the report, the annual green and annual yellow glare was found to be 0 minutes, and it was determined that this would not cause reflection and glare at any of the glare receptors. In addition, since there are no structures with glass and reflective surfaces around the project area, a cumulative reflection and glare effect is not expected in the topography of the region. As a result of the glare analysis, the receptors located closest to the solar panels where people or living beings are constantly present were evaluated. As a result of the assessment of the selected risks, no permanent and significant reflection and glare impacts are expected due to the Project. Therefore, no mitigation measures are considered necessary at the receptors.

The Reflection and Glare Impact Analysis Report was submitted to KGM, Traffic Safety Department on 06.07.2023 and as a result of the review, the opinion of KGM, Traffic Safety Department dated 11.07.2023 and numbered E.1226002, which is presented in Annex-2.19, was received. It was stated by the Traffic Safety Department that there is no objection to the realization of the project in the area.

**Precautions Against Light Reflection, Glare and Glare**

- The panels to be installed will be positioned so as not to create glare in the eyes of vehicle drivers using the highway.
- In order to ensure safe traffic flow, structural arrangements (signs, etc.) that physically prevent the passage of reflected light on the road along the expropriation boundary of the road will be designed and implemented on site by the investor company.
- In the first year of operation, vegetative or artificial visual screens will be applied at the required points according to visual monitoring and complaints from nearby settlements.
- TS EN 62305-1 (General rules), TS EN 62305-2 (Risk Management), TS EN 62305-3 (Physical damage and danger to life in buildings) and TS EN 62305-4 (Lightning protection - Part 4: Electrical and electronic systems in buildings) standards published by the Turkish Standards Institute regarding lightning protection will be complied with.

- The economic benefits of the installation of lightning protection measures and the selection of adequate protection measures will be made according to risk management procedures. Risk management is the subject of TS EN 62305-2 and appropriate measures will be taken by conducting the necessary field studies and inspections before starting the operation phase.

**III.2.5. Whether there are risks that may jeopardize safety (fire, lightning strike or thermal explosion), identification of potential problems that may affect the environment, interaction with the receiving environment, identification of cumulative effects, measures to be taken to mitigate any adverse effects,**

The positioning of solar energy systems in open areas can pose a danger due to events that can cause high voltage impulses such as lightning. The use of lightning rods in photovoltaic systems may cause the lightning strike generated by cumulus clouds to be directed to the power plant by attracting the lightning strike to the system. For this reason, the use of lightning rods in solar energy systems is not considered appropriate. The necessary protection will be provided by grounding. The main purposes of grounding in power plants producing electrical energy;

- Minimizing the possibility of damage to workers and surrounding animals by electric current,
- Prevention of high and sudden voltages and protection against lightning,
- Prevention of damage and material losses that may occur in the system due to high voltage and energy potential differences.

**III.2.6. Impacts on forest areas and agricultural production in the region, impacts on livestock and pasture areas, grazing activities, measures to be taken against forest fires, identification of possible problems that may affect forest and agricultural areas, interaction with the receiving environment, identification of cumulative impacts, measures to be taken to mitigate possible negative impacts,**

The 1/25.000 Scale Land Asset Map showing the Project area and its surroundings i s given in Annex-5. According to the Project 1/25.000 Scale Land Asset Map, although the SPP Area is within irrigated agriculture (insufficient) areas, it is currently within the **"Solar Energy Area qualified"** areas **with non-agricultural use permits**.

The planned project area is located in "Treeless Forest Areas" according to the stand map. In this context, there is no forest area utilization and tree felling specific to the activity (See Annex-6 1/50.000 Scale Stand Map of the Project Area and Surroundings).

The approved Environmental Plan, Legends and Relevant Plan Provisions for the Muş-Bitlis-Van Planning Region with a scale of 1/100.000, where the Project area is located, are given in Annex-3 and the EIA Area and SPP Area are defined as "Dam" in the Environmental Plan with a scale of 1/100.000. However, although the project area appears as "Dam" in the Environmental Plan, it is currently within the "Solar Energy Area" areas **that have been granted non-agricultural use permits**.

For the agricultural lands in the project area; within the scope of the Soil Conservation and Land Use Law No. 5403, with the letter dated 20.02.2003 and numbered 2844-002375 of the General Directorate of Agricultural Production and Development of the Ministry of Agriculture and Rural Affairs, a total area of 5469 hectares including the Alparslan II Dam and HEPP project area was given permission for non-agricultural use within the scope of the Regulation on the Protection and Use of Agricultural Lands in force at that time.

The "Non-Agricultural Use Permit Opinion" received by Muş Provincial Directorate of Agriculture and Forestry from the Ministry of Agriculture and Forestry, General Directorate of Agricultural Reform, regarding whether this permit is valid for the planned SPP project is given in Annex-2.4. In the opinion of the General Directorate of Agricultural Reform given in Annex-2.4, it is stated that *"5469 hectares of land with a surface area of 5469 hectares, which was granted permission for non-agricultural use with the letter dated 20.02.2003 and numbered 2844-002375 of the abrogated Ministry of Agriculture and Rural Affairs General Directorate of Agricultural Production and Development, is outside the scope of Law No. 5403, and within this area, transactions are established within the scope of Articles 13, 14, 20 and 2 1 of Law N o . 5403.*

"In t h i s context, no additional permits, etc. will be required for land use. In this context, no additional permits, etc. will be required for land use.

In the Public Participation Meeting held within the scope of the Project, local people requested that a road be left to pass their animals to the MURAT NEHRİ from the planned SPP area within the scope of animal husbandry activities. In this context, the investor has planned to leave two "Animal Passage Roads" within the boundaries of the SPP area. The North Animal Passage Road will be approximately 350 m long and have an area of 14.151 $m^2$ and the South Animal Passage Road will be approximately 525 m long and have an area of 9.971 $m^2$. The animal passage roads and the entire SPP site boundaries will be surrounded by wire fences, and upon the request of the local people at the Public Participation Meeting, no structure such as barbed wire etc. will be added to the wire fences that will harm the animals.

The routes of the Animal Access Roads were clarified in consultation with Dumlusu Neighborhood and local people. Before entering the Animal Access Roads, consent was obtained from the owners of the private land to be used for transportation outside the project area.

It is a fact that forest fires are constantly increasing due to human or natural impacts. Therefore, the most important factor in the fight against forest fires is to shorten the response time to the fire and to ensure that the fire is taken under control before it grows. The people living in the region play an important role in early intervention. It is important to share information about the Alo 177 Forest Fire Hotline with the project employees who will be part of the region if the project is established.

In general, fire precautions will be given importance within the scope of the project and the necessary equipment, tools and equipment for first intervention will be available at the operation sites. In the event of a possible fire, all personnel will be ready to intervene in the fire at any time. Fire fighting facilities and capabilities will be equipped within the marina. Materials used in forest fires such as picks, shovels, rakes, spanks, etc. that are necessary for the first intervention to the fire will be kept ready. During a possible fire, all work machines and vehicles used in the operation phase will be placed at the disposal of the fire chief.

Within the scope of the Project, the following measures will be taken to ensure that there is no negative impact on existing forest areas:

- Entry and exit to and from the activity area will be kept under control,
- Fire-fighting measures will be taken against forest fires that may break out in neighboring forests, as foreseen by the Directorates of Management,
- At the request of the Directorates of Management, workers and construction equipment will be dispatched to forest fires,
- During both construction and operation periods, fire extinguishing and measures to prevent any injury or loss of life will be kept up to date within the scope of Emergency Response Plans,
- In state forests, transportation structures, outbuildings, service facilities and maintenance and operation facilities on access control highways will be kept within the highway boundary line,
- Excavation material, waste or any material that will be generated during the construction of the project will not be dumped in areas considered as forests, and the excavation material will be utilized within the framework of the permits to be obtained,
- Waste oils and other wastes, especially waste oils from construction machinery to be used during construction, will not be poured into forest areas, and disposal measures will be implemented in accordance with the provisions of the legislation,
- Within the scope of the project, landscaping arrangements will be made for recreational purposes to prevent soil erosion and dust emission in the filling areas where the excavated material will be stored, and

- In order to minimize the dust emission that will occur during excavation and filling operations, measures such as filling and unloading operations at the source of emission without throwing, improving the roads, covering the vehicles with tarpaulins during material transportation and keeping the top of the material at 10% humidity will be taken. In addition, in order to reduce dust on the roads during the transportation of materials within the scope of the project, irrigation of the roads will be provided with a water truck when necessary.

This will minimize impacts on other areas, particularly forest areas, in the region during the construction period.

**III.2.7. Noise sources and measures to be taken during the operation of the project units, cumulative impact assessment with already installed/ongoing projects (Dam-PPP, SPP etc.),**

There will be solar power plant panels to be installed to be operated as an auxiliary source during the operation phase of the planned project. Apart from the panels, there will be no use of any machinery-equipment that may cause noise emission.

Sound PLAN 8.1 program was used to determine the noise emission that may occur during the land preparation, construction and installation works of the Project. Information on the noise levels of the vehicles and equipment selected as noise sources in the calculations was obtained from the database in the library of the program.

An Acoustic Report has been prepared within the scope of the project and evaluations have been made about the possible noise that may occur during the land preparation, construction and assembly phase of the activity and the measures to be taken against it. The Acoustic Report is given in the appendices (See Annex-15). In addition, detailed assessments on noise are made in Section III.1.8.

*Measures to be taken*

- Necessary measures will be taken within the scope of the Environmental Noise Control Regulation published in the Official Gazette dated 30.11.2022 and numbered 32029.
- Employees will be provided with the protective equipment specified in the "Occupational Health and Safety Law" numbered 6331.
- All kinds of complaints and suggestions from the settlements in the Project impact area will be taken into consideration.

**III.2.8. Emissions that will occur with the realization of the project, determination of possible problems that may affect the environment, interaction with the receiving environment, determination of cumulative effects, measures to be taken to reduce possible negative effects,**

Within the scope of the planned project, dust emissions are likely to occur during vegetative soil stripping and excavation dismantling works due to land preparation, road works and solar panel installation activities. There will be no dust emission during the operation phase of the project.

The emissions from the vehicles to be used in the land preparation and construction works will be very low and it is anticipated that the emissions from the equipment will not have a negative impact on the existing air quality. In order to minimize the emissions from the vehicles that will be used during the land preparation and construction phase, all vehicles and equipment will be routinely inspected, the vehicles that require maintenance will be serviced and other vehicles will be used for the works until the maintenance is completed.

In order to minimize the dust emission that may arise from activities such as vehicle movement etc. on the site during the construction works, the site will be periodically irrigated with a backhoe.

In all phases of the project; necessary measures will be taken to reduce dust emissions in the facilities to be established, nearby residential areas, agricultural lands and the provisions of the Regulation on the Control of Industrial Air Pollution, which entered into force after being published in the Official Gazette dated 03.07.2009 and numbered 27277, will be complied with.

There will be no combustion system within the scope of operation activities and diesel fuel will be used as fuel for the vehicles. There is no greenhouse gas emission source within the scope of the "Regulation on Monitoring Greenhouse Gas Emissions" published in the Official Gazette dated 17.05.2014 and numbered 29003. Therefore, there is no issue that will cause greenhouse gas and climate change.

There will be solar power plant panels to be installed during the operation phase of the planned project. Apart from the panels, there will be no use of any machinery-equipment that may cause noise emission.

**III.2.9. Where and how the housing and other social/technical infrastructure needs of the personnel who will work during the operation of the Project and the population dependent on this personnel will be provided,**

The economic life of the project is estimated to be 25 years and the construction phase is planned to last 18 months. It is planned to employ 40 personnel during the construction phase and 8 personnel during the operation phase of the project. The administrative and social needs of the personnel who will work in the land preparation-construction phase of the project will be met from the mobile prefabricated construction site to be established, and the needs of the personnel who will work in the operation phase will be met from the administrative building of Alpaslan II Dam and HEPP production facility. In case local people are employed, transportation of the personnel to the site will be provided by shuttle service.

**III.2.10. Where the drinking and potable water will be supplied from in the administrative and social units, the amount of wastewater to be generated after its use, the disposal method, the amount of wastewater to be discharged to which receiving environments, how and in what quantities, identification of possible problems that may affect the environment, interaction with the receiving environment, determination of cumulative effects, measures to be taken to reduce possible negative effects,**

It is envisaged that 40 people will be employed during the construction phase and 8 people will be employed during the operation phase of the planned project. In the selection of unskilled personnel to be employed within the project, preference will be given to the local people who have been affected by the disasters occurring in the region as much as possible, thus contributing to the economy of the region.

Water will be used in the project area due to personnel needs. The domestic water needs of the personnel will be provided by bringing tankers from Dumlusu Village mukhtarate in return for a fee and the protocol between the investor company and Dumlusu Village mukhtarate regarding the domestic water is given in Annex-2.6.

Domestic wastewaters that will be generated during the construction phase due to the use of personnel will be treated in accordance with Article 32 of the Regulation on Water Pollution Control *(Amended 17.12.2004)*, which entered into force after being published in the Official Gazette dated 31.12.2004 and numbered 25687*.2022/32046)* Article 32 states that *"Wastewaters generated from settlements with an equivalent population of less than 2000 shall be disposed of by treatment methods such as treatment, individual septic tank with leakage or central septic tank without leakage, which will be deemed appropriate by the Provincial Directorate of Environment, Urbanization and Climate Change, taking into account the environmental characteristics of the settlement, in a way that will not harm the environment and human health and meet the relevant provisions of this Regulation.*

*Domestic wastewater of hotels, motels, holiday villages, holiday sites and summer sites and industrial facilities with an equivalent population or capacity of less than 2000 people, detached from settlements, shall be disposed of by treatment and/or disposal methods deemed appropriate by the Provincial Directorate of Environment, Urbanization and Climate Change, taking into account the wastewater infrastructure situation in the region, in a way that does not harm the environment and human health."* will be collected in the leak-proof septic tank pit to be established within the scope of the provision, and when it reaches 85-90% fullness without overflow, it will be removed and disposed of by the vacuum trucks of the relevant administration.

The provisions of the Environmental Law No. 2872, Water Pollution Control Regulation, Regulation on the Protection of Water Basins and Preparation of Management Plans, Regulation on Surface Water Quality Management, Regulation on the Protection of Groundwater against Pollution and Degradation will be complied with for all wastewater to be generated from project activities and all necessary measures will be taken to prevent water pollution.

During the operation phase of the project, there will be water demand and wastewater generation from the 8 personnel who will work.

According to 2020 TURKSTAT Municipal Statistics Data, the amount of water withdrawn per capita in Muş province is 331 lt/person-day[22] . Water use calculations for the personnel within the scope of the Project are based on this value.

8 people x 331 lt/person-day= 2.65 m3/day

Assuming that all (100%) of the water used will be converted into wastewater, 2.65 m3/day of domestic wastewater will be generated during the land preparation and construction phase.

All the needs of the personnel who will work during the operation phase will be met from the administrative building of Alpaslan II Dam and HEPP production facility and the wastewater will be disposed of by giving it to Alpaslan II Dam and HEPP infrastructure. The calculation of the amount of wastewater to be generated within the scope of the planned project is given in Section III.1.10.

The drinking and utility water of the personnel who will work within the scope of the Project will be provided in accordance with the provisions of the "Regulation on Water Intended for Human Consumption" published in the Official Gazette dated 17.02.2005 and numbered 25730 and the "Regulation on the Amendment of the Regulation on Water Intended for Human Consumption" published in the Official Gazette dated 20.10.2016 and numbered 29863.

In all stages of the project, the provisions of the Water Pollution Control Regulation (Amended 25.03.2012 dated - R.G. No. 28244), which entered into force after being published in the Official Gazette dated 31.12.2004 and numbered 25687, will be complied with.

**III.2.11. Quantity and characteristics of solid wastes to be generated from administrative and social facilities, where and how these wastes will be transported or for what purposes and how they will be utilized, identification of possible problems that may affect the environment, interaction with the receiving environment, determination of cumulative effects, measures to be taken to mitigate possible negative effects,**

It is planned to employ 8 personnel during the operation phase of the Project. All the needs of the personnel who will work during the operation phase will be met from the administrative building of Alpaslan II Dam and HEPP production facility.

***Domestic Solid Waste***

The amount of municipal solid waste to be generated from the personnel, assuming that the daily amount of solid waste from one person is 0.85 kg/person-day [23];

8 people x 0.85 kg/day= **6.8 kg/day** domestic solid waste will be generated.

The waste code and estimated amount of municipal solid wastes to be generated during the operation phase according to the Waste Management Regulation Annex-IV List are given in Table III.2.11.1.

**Table III.2.11.1.** Domestic Solid Wastes and Amount

| Waste Code | Description | Source | Disposal | Feature | Quantity (kg/year) |
|---|---|---|---|---|---|
| 20 03 01 | Mixed municipality waste | Staff | Relevant Municipal Administration Solid Waste Collection System | Non-hazardous | 7.740 |

[22] **Source:** Muş Province, 2020 Water Withdrawn Per Capita Statistics, www.tuik.gov.tr

[23] **Source:** Muş Province, 2020 Municipal Waste Statistics, www.tuik.gov.tr

***Packaging Waste (Paper, Glass, Plastic, etc.)***

During the operation phase, it is expected that packaging wastes such as paper-cardboard, plastic, glass, etc. will be generated due to the personnel working and it is assumed that the amount of packaging waste to be generated will be approximately 20% of the total amount of municipal solid waste;

6.8 kg/day x 0.20≅ **1.36** ***kg/day of*** packaging waste is foreseen.

The waste code and estimated amount of total packaging waste likely to be generated during the operation phase, defined according to the Waste Management Regulation Annex-IV List, are given in Table III.2.11.2.

**Table III.2.11.2** Packaging Waste and Amount

| Waste Code | Description | Source | Disposal | Feature | Quantity (kg/year) |
|---|---|---|---|---|---|
| 15 01 01 | Paper-cardboard | Personnel, warehouse, shipping, packaging, etc. | Licensed recovery/disposal company | Non-hazardous | 1.560 |
| 15 01 02 | Plastic | | | | |
| 15 01 07 | Cam | | | | |

***Medical Waste***

Regulation on Occupational Health and Safety Services dated 29.12.2012 and numbered 28512 11.Article 2, paragraph 2;

*"Employers in workplaces with 50 or more employees,*

*a) Provides a total of two rooms of not less than 8 square meters for the occupational physician, other health personnel and o c c u p a t i o n a l safety specialist.*

*b) The workplace shall also have a suitable vehicle to ensure that employees are transported to the nearest health unit in case of emergency."*

The statement is included. In this context, since it is planned to have 8 people during the operation period within the scope of the planned project, it is not necessary to establish an infirmary area in the field. If medical intervention is required for the personnel, they will be referred to the nearest health institution.

However, in the event that it is necessary to perform medical intervention at the project site, red plastic bags that are resistant to tearing, puncture, explosion and transportation, made of medium density polyethylene raw material, leak-proof, double bottom stitched and gusset-free, double layer thickness of 100 microns, with a lifting capacity of at least 10 kilograms, large enough to be seen on it and bearing the black "International Biohazard" emblem and the phrase "ATTENTION! MEDICAL WASTE" on both sides will be used for the collection of possible medical waste.

The bags will be filled to a maximum of ¾ full, the mouths will be tightly tied and, where necessary, each bag will be placed in another bag with the same characteristics to ensure absolute tightness.

Cutting and piercing wastes are collected separately from other medical wastes in boxes or containers made of plastic or laminated cardboard with the same properties, which are resistant to puncture, tearing, breaking and explosion, waterproof and impermeable, cannot be opened and mixed, with the black "International Biohazard" emblem and the phrase "CAUTION! CUTTING AND PUNCHING MEDICAL WASTE" written in black letters. Possible medical wastes will be placed in sealed medical waste bags with the phrase "Caution Medical Waste" on them separately from other wastes and will be disposed of regularly within the framework of the "Regulation on the Control of Medical Waste" *(Amended 18.08.2022/31927)*, which entered into force after being published in the Official Gazette dated 25.01.2017 and numbered 29959.

However, in the event that it is mandatory to plan the establishment of an infirmary within the scope of the project in the future and/or if medical intervention is required for the personnel in the field, the annual amount of medical waste per person is assumed to be 0.69 kg[24] and all personnel who will work in the field will receive medical intervention at least once a year;

8 people x 0.69 kg/person/year≅ ***5.52 kg/year*** of medical waste is foreseen.

The waste code and estimated amount of medical waste likely to be generated during the operation phase according to the Waste Management Regulation Annex-IV List are given in Table III.2.11.3.

**Table III.2.11.3.** Medical Waste and Amount

| Waste Code | Description | Source | Disposal | Feature | Quantity (kg/year) |
|---|---|---|---|---|---|
| 18 01 03 | Wastes whose collection and disposal are subject to special treatment in order to prevent infection | Infirmary | Licensed Medical Waste Disposal/Sterilization Plant | Dangerous | 13,8 |

**End-of-Life Tires**

Since the tire changes of the vehicles to be used during the operation phase of the project will be carried out at authorized services outside the project area, it is not foreseen that end-of-life tires will be generated in the project area. However, if waste tires are generated as a result of the maintenance to be carried out within the site, they will be disposed of in accordance with the provisions of the Regulation on the Control of End-of-Life Tires, which entered into force after being published in the Official Gazette dated 25.11.2006 and numbered 26357.

The waste code and estimated amount of waste tires that may be generated during the operation phase according to the Waste Management Regulation Annex-IV List are given in Table III.2.11.4.

**Table III.2.11.4.** End-of-Life Tire Wastes and Amount

| Waste Code | Description | Source | Disposal | Feature | Quantity (kg/year)* |
|---|---|---|---|---|---|
| 16 01 03 | End-of-life tires | Vehicle maintenance | Licensed recovery/disposal company | Non-hazardous | 40 |

*The amount will vary according to the status of the works.

***Waste cartridges and printing toner***

Within the scope of the Project, it is likely that waste cartridges and toners will be generated from the printer equipment to be used in case of office activities during operation activities. In order to minimize the generation of these wastes, refillable cartridges will be used.

The provisions of the "Waste Management Regulation", which entered into force after being published in the Official Gazette dated 02.04.2015 and numbered 29314, will be complied with during the transportation and disposal of waste cartridges that are likely to occur at all stages of the planned project.

The waste code and estimated amount of waste cartridges that may be generated during the operation phase according to the Waste Management Regulation Annex-IV List are given in Table III.2.11.5.

**Table III.2.11.5.** Cartridge Waste and Amount

| Waste Code | Description | Source | Disposal | Feature | Quantity (kg/year)* |
|---|---|---|---|---|---|
| 08 03 17 | Waste printing containing hazardous substances toners | Printers and printing devices use of | Licensed recovery/disposal firm | Dangerous | 35 |

*The amount will vary according to the status of the works.

[24] **Source:** www.tuik.gov.tr Turkey Annual Medical Waste Amount Per Capita,2018

***Waste fluorescent and mercury bulbs***

If office activities are realized within the scope of the project, it is likely that waste fluorescent and mercury bulbs will be generated as a result of the end-of-life of the lighting equipment to be used. In order to minimize the generation of these wastes, long-lasting and environmentally friendly LED lighting will be used.

In the stages of transportation and disposal of waste fluorescent and light bulbs that are likely to occur in all stages of the planned project, the provisions of the "Waste Management Regulation", which entered into force after being published in the Official Gazette dated 02.04.2015 and numbered 29314, will be acted in accordance with.

The waste code and estimated amount of waste fluorescent and light bulbs that may be generated at the project site according to the Waste Management Regulation Annex-IV List are given in Table III.2.11.6.

**Table III.2.11.6.** Fluorescent Waste and Amount

| Waste Code | Description | Source | Disposal | Feature | Quantity (kg/year)* |
|---|---|---|---|---|---|
| 20 01 21 | Fluorescent lamps and other mercury-containing waste | Production and administrative buildings with lighting | Licensed recovery/disposal company | Dangerous | 50 |

*The amount will vary according to the status of the works.

***Waste Electrical and Electronic Equipment and Discarded Equipment***

Waste electronic equipment and discarded equipment that may occur at the project site will be handled in accordance with the provisions of the Regulation on the Management of Waste Electrical and Electronic Equipment and Waste Management Regulation, which entered into force after being published in the Official Gazette dated 26.12.2022 and numbered 32055.

The waste code and estimated amount of waste electronic equipment and discarded equipment that may be generated at the project site according to the Waste Management Regulation Annex-IV List are given in Table III.2.11.7.

**Table III.2.11.7.** Electronic Waste and Amount

| Waste Code | Description | Source | Disposal | Feature | Quantity (kg/year)* |
|---|---|---|---|---|---|
| 16 02 15 | Hazardous parts removed from discarded equipment | Entire facility area | Licensed recovery/disposal company | Dangerous | 50 |
| 16 01 21 | 16 01 07 to 16 01 11 and 16 01 13 to 16 01 14 other hazardous parts | | | | |
| 20 01 35 | 20 01 21 and 20 01 23 discarded electrical and electronic equipment containing dangerous components other than 20 01 21 and 20 01 23 | | | | |

*The amount will vary according to the status of the works.

***Contaminated Packaging (Paint Cans, Chemical Cans, Pressure Vessels, etc.)***

Plastic, tin, etc. materials contaminated with hazardous materials and pressure vessels contaminated with hazardous materials that may be generated as a result of maintenance, repair, etc. activities in the project area will be collected separately from other wastes and disposed of in accordance with the provisions of the Waste Management Regulation.

The waste code and estimated amount of contaminated wastes that may be generated at the Project site according to the Waste Management Regulation Annex-IV List are given in Table III.2.11.8.

**Table III.2.11.8.** Contaminated Packaging Waste and Amount

| Waste Code | Description | Source | Disposal | Feature | Quantity (kg/year)* |
|---|---|---|---|---|---|
| 15 01 10 | Containing residues of hazardous substances or contaminated with hazardous substances contaminated packaging and | Maintenance repair work | Licensed back recovery/disposal company | Dangerous | 100 |
| 15 01 11 | Metallic packaging containing hazardous porous solid structure (e.g. asbestos), including empty pressurized containers | | | | |

*The amount will vary according to the status of the works.

***Dirty Gloves, Cloths, Overalls, etc.***

During maintenance, repair, etc. activities in the Project area, dirty gloves, overalls, overalls, overalls, cloths, etc., especially due to the use of workers, may occur.

Wastes such as gloves, overalls, overalls, cloths, etc. contaminated with hazardous substances will be collected separately from other wastes and disposed of in accordance with the provisions of the Waste Management Regulation.

The waste code and estimated amount of waste such as gloves, overalls, overalls, cloths, etc. that may be generated at the Project site according to the Waste Management Regulation Annex-IV List are given in Table III.2.11.9.

**Table III.2.11.9.** Contaminated Wastes and Amount

| Waste Code | Description | Source | Disposal | Feature | Quantity (kg/year)* |
|---|---|---|---|---|---|
| 15 02 02 | Absorbents contaminated with hazardous substances, filter materials (oil filters if not otherwise specified), cleaning cloths, protective clothing | Staff utilization Maintenance and repair works | Licensed recovery/disposal company | Dangerous | 100 |

*The amount will vary according to the status of the works.

***Vegetable Waste Oil***

If the food needs of the personnel at the project site are met by cooking within the facility, it is likely that vegetable waste oil will be generated.

If the food needs of the personnel who will work during the operation phase of the project are met within the facility, the amount of vegetable waste oil from cooking activities is assumed to be 12 kg[25] per person per year;

8 people x 12 kg/person.year= ***96 kg/year*** of vegetable waste oil is expected to be generated.

The waste code and estimated amount of vegetable waste oils that may be generated at the project site according to the Waste Management Regulation Annex-IV List are given in Table III.2.11.10.

**Table III.2.11.10.** Vegetable Waste Oil and Amount

| Waste Code | Description | Source | Disposal | Feature | Quantity (kg/year) |
|---|---|---|---|---|---|
| 20 01 26 | Except 20 01 25 (e) oils and fats | (Dining Hall) | Licensed recovery/disposal company | Dangerous | 96 |

[25] **Source:** Kolza Biodiesel A.Ş., General Principles of Vegetable Waste Oils

***Waste Oils***

Maintenance and repairs of the vehicles to be used within the scope of the Project will be carried out by authorized services outside the facility. Waste oils that may be generated as a result of the need for activities such as vehicle maintenance, oil change, etc. within the project site will be collected in sealed tanks separately from other wastes and will be disposed of in accordance with the provisions of Waste Management Regulation, Waste Oil Management Regulation.

In line with the provisions of the Waste Oil Management Regulation, "Motor Oil Change Point Permit Certificate" will be obtained in case of any activity that will generate waste oil within the project area.

***Other Hazardous/Non-Hazardous Wastes***

In line with the provisions of the "Zero Waste Regulation" published in the Official Gazette dated 12.07.2019 and numbered 30829, Zero Waste Management System will be established within the enterprise and "Zero Waste Certificate" will be obtained.

Wastes that will be released within the scope of the Project will not be discharged to agricultural lands, stream beds, water resources and any receiving environment in any way, and all necessary measures will be taken within the framework of the Legislation.

**III.2.12. Activities during the operation phase of the project that are risky and dangerous for human health and the environment, measures to be taken; health protection band distance; possible impacts on flora and fauna species and measures to be taken; Determination of important areas for species such as bees, birds and bats in and near the project area and possible impacts on these areas, determination of possible problems that may affect the environment, interaction with the receiving environment, determination of cumulative impacts, measures to be taken to reduce negative impacts on the environment, creation of a risk-impact-response matrix, (Making the necessary evaluations in the Report to be prepared within the scope of SPP Activities Evaluation Format.)**

During the preparation and construction works that will take place within the scope of the planned project, the impacts that may be risky and dangerous for human health and the environment can be listed as work accidents that may occur during all construction activities, environmental pollution and potential health problems that may be caused by work accidents.

During site preparation and construction works to be carried out within the scope of the Project;

- Transportation of materials required for the activity,
- Pile driving and concrete pouring operations,
- There may be a risk of accidents from the machinery and equipment used.

During site preparation and construction works to be carried out within the scope of the Project;

- Technically within the scope of all safety measures required by regulations;
  - Occupational health and safety trainings will be given to the staff at certain intervals.
  - Directional signs and warning signs will be placed appropriately within the site.
  - Workers will be provided with personal protective equipment (clothing, masks, headphones, etc.) .
- Within the scope of controlled entry and exit of all entrances and exits in the facility;
  - It will be ensured that a security guard is present in the operation area.
  - Hazard, notice and warning boards will be placed.

- In cases of pandemic, epidemic, etc., relevant measures will be taken and recorded (supply of masks, use of disinfectants, fever measurement, HES Code control, etc.).

- It will be ensured that the machinery and equipment to be used will be maintained at regular intervals.

- During the winter months, it will be ensured that in-plant roads are kept open, vehicles are used with winter tires and icing is prevented.

In all stages of the planned project and especially in the construction workplaces, work will be carried out in accordance with the provisions of the "Regulation on Occupational Health and Safety in Construction Works", which entered into force after being published in the R.G. dated 05.10.2013 and numbered 28786.

**1. Robustness and Durability**

- All kinds of materials, equipment and their parts that may affect the health and safety of workers due to any unexpected movement should be kept in a safe and appropriate place
  will be fixed in such a way.

- Unless appropriate equipment and working conditions are provided to ensure that the work is carried out safely, it is not permitted to work on surfaces that are not sufficiently durable and to work on and against surfaces that are not sufficiently durable.
  will not be allowed to enter. Warnings will remain posted until a suitable environment is prepared.

**2. Fire Detection and Firefighting**

- The characteristics of the building site, the size and use of the enclosed spaces, the equipment in the area, the physical and chemical properties of the substances in the area, the
  Depending on the maximum number of people, fire-fighting tools and equipment of appropriate quality and in sufficient numbers, and fire detectors and alarm systems will be available where necessary.

- Fire fighting tools and equipment, fire detectors and alarm systems will be regularly checked and maintained. Periodically, appropriate trial and
  tests will be carried out.

- Non-automatic fire extinguishing equipment shall be easily accessible and simple to use. The equipment shall be marked in accordance with the relevant regulation.
  will be in place. Signs will be placed in appropriate places and will be permanent.

**3. Special Risks**

- Workers will be prevented from being exposed to harmful levels of noise or harmful external factors such as gases, vapors and dust.

- Workers shall not be employed in high-risk environments with limited air volume. Where necessary, at a minimum, these workers shall be continuously monitored from the outside, and any necessary assistance shall be provided immediately.
  every precaution will be taken to ensure that this is done.

**4. Traffic Roads - Hazardous Areas**

- Traffic routes will be designed to ensure easy and safe passage and will not pose a danger to those working near them.

- Roads used for pedestrians and loading and unloading, roads used for material transportation by vehicles, in accordance with the number of potential users and the nature of the work performed in the workplace
  dimensions. During panel transportation work on traffic roads, sufficient safety distance shall be left on the roadside for other persons using this road or appropriate

protective measures will be taken. Roads will be visibly marked and regularly checked to ensure that they are always well maintained.

- There shall be sufficient distance between roads with vehicular traffic and gates, passageways, pedestrian passageways, corridors and stairs.

- Unauthorized persons will be prevented from entering forbidden areas in construction areas by using appropriate tools and equipment. Dangerous areas shall be clearly marked, these necessary measures will be taken to protect workers who are authorized to enter the zones.

**5. Loading Lots and Ramps**

- Loading places and ramps shall be suitable for the dimensions of the cargo to be transported.
- There shall be at least one exit at the loading docks.
- Loading ramps will be safe to prevent workers from falling.

**6. Freedom of Movement at the Workplace**

- Taking into account the area of the workplace, any necessary equipment and tools, workers should be able to move freely while performing their work, and should have no physical health problems or limitations. that they won't have to live in.

**7. Plant and Machinery-Equipment**

- The use of any power-driven plant, machinery and equipment, including mechanical hand tools, is appropriate, taking into account the principles of ergonomics as far as possible. designed and manufactured in such a way.
- Maintenance will be carried out at regular intervals.
- Necessary training will be provided to appropriate personnel for machinery-equipment and vehicles whose use requires special permission and/or training.
- Machinery-equipment and vehicles will always be used for their intended purpose.

**8. First Aid**

- It will take measures to ensure that workers who have an accident or illness in the workplace reach the places where medical intervention will be made as soon as possible.
- First aid equipment shall be available wherever required by working conditions. This equipment shall be in easily accessible places and in accordance with the legislation in force. will be marked. Local emergency service addresses and telephone numbers will be available in visible locations.
- Employees will undergo regular health screenings.
- If deemed necessary, employees will be provided with Basic Level First Aid Training.

**9. Cleaning Equipment**

**9.1 Locker and Wardrobe**

- Workers will be provided with work clothes and footwear appropriate to the units in which they work. Workers shall not be allowed to undress in an inappropriate place for ethical or health reasons. will not be allowed and suitable changing rooms will be created for workers. Changing rooms

There will be enough cupboards, hangers and seating in the rooms. Ventilation will be provided at regular intervals.

- If a locker room is not required, a locked locker will be provided for each worker where he/she can keep his/her personal clothes and belongings.

- In works that do not require a shower facility, a suitable and sufficient number of washbasins shall be provided near workplaces and changing rooms. Washbasins for male and female workers shall be separate or necessary arrangements shall be made for their separate use.

- Entry and exit of persons other than employees will be prevented with the necessary warning signs.

### 9.2 Toilets and Washbasins

- A sufficient number of toilets and washbasins and cleaning materials shall be provided near working, resting, washing and changing places. Toilets and washbasins for men and women workers will be separate or necessary arrangements will be made for their separate use.

### 9.3 Rest and shelter

- In particular, if the number of workers employed is high or if the nature of the work or the remoteness of the workplace and similar reasons require it in terms of health and safety, workers shall be provided with easily accessible places of rest and/or shelter.

- Rest rooms or shelters shall be of sufficient width and shall have sufficient tables and chairs with backs for workers.

- If such facilities are not available, places for workers to rest during work breaks will be provided.

## 10. Disabled Workers

- In workplaces where disabled workers work, taking into account the special conditions of these workers necessary Regulation will be done. Especially Study places with doors, passageways, stairs, stairs, showers, sinks, toilets and parking lots.

## 11. Miscellaneous Provisions

- The perimeter of the construction site and the work area will be fenced and marked so that it can be easily seen and recognized.

- Adequate drinking water will be available for workers at workplaces.

- Workers will be provided with the means to eat and, where necessary, to prepare their own meals in appropriate conditions.

- In addition, all work will be carried out by fulfilling the following minimum requirements that must be complied with in indoor and outdoor workplaces.

In addition to the above-mentioned issues, all health and safety rules determined by the regulations and the relevant legislation of the Occupational Health and Safety Law No. 6331 on occupational health and safety will be complied with in order to prevent all possible risks to human health at all stages of the project.

In addition, the "Public Hygiene Law" numbered 1593, which entered into force after being published in the R.G. dated 06.05.1930 and numbered 1489, and the regulations and directives issued and to be issued in accordance with this law and the relevant legislation will be complied with.

Workers will be ensured to use dust masks and earplugs when necessary to avoid being affected by dust and noise. Machinery and equipment will be kept in constant maintenance and necessary precautions will be taken.

A sufficient number of fire extinguishers will be available at the facility site against any fire that may break out. Fire will be treated sensitively and no fire will be lit in the facility area, workers will be constantly checked and warned.

In case of any accident, fire or sabotage that may occur in the project area, the facility will never be left unoccupied and a guard will be kept at the facility at all times.

Occupational accidents may occur due to the use of vehicles, machinery and equipment in the project area. In order to reduce and prevent all these accidents, personnel will be trained, necessary warnings will be given and warning signs will be hung in relevant places. No one other than the employees will be allowed to enter the Project area. The Project area will be evacuated immediately by the personnel in case of any danger.

In the project area, fire extinguishing equipment (fire extinguisher, water bucket, pickaxe, shovel, etc.) will be available for the number of employees working against any fire that may break out. All precautions will be taken against the possibility of fire in the facility. In case of any fire, the nearest fire department will be contacted.

Rescue and extinguishing teams will be formed among the employees and the list of institutions and organizations to be requested for help in case of emergency and contact numbers will be placed in the work area in a way that can be seen by everyone. The risk of accidents will be minimized by routinely maintaining the equipment to be used.

An Ecosystem Assessment Report has been prepared for the Project and is given in Annex-12. The Project area is not located on bird migration routes and no negative impact on flora and fauna species is foreseen during the operation phase as a result of the measures taken before construction.

The Alpaslan II Dam and Hydroelectric Power Plant Auxiliary Source Solar Power Plant project area has been identified by both the Republic of Turkey Ministry of Agriculture and Forestry, General Directorate of Nature Conservation and National Parks, and the
When evaluated according to the ecologically protected areas under the legal legislation under the responsibility of the Ministry of Environment, Urbanization and Climate Change, it is not included in National Parks (MP), Wildlife Development Areas (WUGAs), Natural Parks (TP), Natural Monuments (TA), Ramsar Sites (RA) and Special Environmental Protection Areas (SEPA).

According to the 2022-2023 Hunting Areas Map, it is located in "General Hunting Areas".

Steppe vegetation is dominant in and around the project area. However, since there are many large and small rivers and streams in the region, riparian vegetation and meadows with high water demand also develop along the streams.

As a result of field and literature studies, 193 plant taxa were identified within the project area. According to IUCN (International Union for Conservation of Nature - Red List Species), 1 endemic species (Ferula huber-morathii) is in the "EN" category. In addition, there are no non-endemic, rare or endangered plant species in the project area.

As a result of field and literature studies, 3 two-lived taxa were identified in the project area. There are no endemic species among the identified species. In addition, there are no non-endemic, rare or endangered bivalve species in the project area. Since the area is under anthropogenic impact, no impact on bivalve species is expected.

As a result of field and literature studies, 20 reptile taxa were identified in the project area. There are no endemic species among the identified species. Among the reptile taxa identified in the project area and its immediate vicinity, there is 1 species (Testudo graeca) in the "VU" category according to IUCN (International Union for Conservation of Nature - Red List Species).

Although the IUCN threat category is "VU (Vulnerable)" on a global scale, it can be added to a lower risk category considering the population status in our country. If the species is detected in the area before the construction works, it should be moved out of the area in order not to be affected. Since the area is under anthropogenic impact, no impact on reptile species is expected.

As a result of field and literature studies, 205 bird taxa were identified within the project area. There are no endemic species among the identified species. According to IUCN (International Union for Conservation of Nature - Red List Species), 1 species (Vanellus gregarius) is categorized as "CR" (Critical), 2 species (Aquila nipalensis, Neophron percnopterus) as "EN" (Endangered), 4 species (Aquila heliaca, Aythya ferina, Otis tarda, Streptopelia turtur) as "VU" (Vulnerable).

As a result of field and literature studies, 18 mammal taxa were identified in the project area. There are no endemic species among the identified species. In addition, there are no non-endemic, rare or endangered mammal species in the project area. Since the area is under anthropogenic impact, no impact on mammal species is expected.

During the activities within the scope of the Project, any food, household organic waste, etc. that may attract wild animals to the area should not be left indiscriminately in the project area and its immediate surroundings. Because some wild animals have a very sensitive sense of smell, food or household organic waste that may be left around may be attractive and attract wild animals to the project area. This may trigger human-wild animal conflict. In addition, boxes, parcels, etc. in the packaging waste that may be generated should not be left in the project area and its immediate surroundings. Such packaging wastes may cause entanglement, entrapment, etc. in the bodies of wild animals and affect their daily activities (feeding, movement, etc.).

In the event that an injured wild animal is encountered during the works within the scope of the Project, the authorities of the General Directorate of Nature Conservation and National Parks and/or the Ministry of Agriculture and Forestry of the Republic of Turkey should be informed and the area should be closed and should not be intervened until the relevant authorities arrive in the area.

There are no endemic species among the wild animals and fauna species identified in the Project area and its immediate vicinity. However, there are species protected by IUCN, Bern Convention, CITES Convention and MAKK lists.

The Bern Convention safeguards and the provisions of Articles 5, 6 and 7 thereof must be strictly observed.

In addition, within the scope of the project, the provisions of the CITES convention, Central Hunting Commission Decision, Land Hunting Law No. 4915 and Regulations and all protection measures in these agreements must be complied with.

Domestic solid wastes, domestic wastewater, packaging wastes, waste batteries, medical wastes, end-of-life tires, hazardous wastes, etc. that may be generated as a result of the activities within the scope of the project should not be thrown indiscriminately into the environment, and the Environmental Law No. 2872 and the National Park Law No. 2873 should be complied with the regulations issued in accordance with these laws. In addition, dry and wet stream beds outside the project area should not be interfered with and no waste, rubble, excavation, etc. should be dumped in these areas. In addition, all activities within the scope of the project should be carried out by considering the ecological structure and wildlife and vegetation associated with wildlife outside the project area should not be destroyed.

**III.2.13. Studies to be carried out for the negative impacts that may arise from inappropriate meteorological conditions (wind, fog, rainfall, snow, etc.) during the operation phase,**

Climate and weather conditions are one of the parameters that affect the energy production efficiency of solar panels. During the design phase of solar power plants, the local climatic conditions of the project area and extreme weather events (excessive rainfall, snow, etc.) that can be seen in the region should be taken into consideration.

Solar panels do not need to receive direct heat to work. Panels produce energy by utilizing the sun's rays. In other words, energy production can be realized at any time when the sun is out, whether it is winter or summer.

On days when the weather is colder, solar panels can produce more energy if there is sun. The reason why solar panels produce less energy in winter is not because the weather is cold, but because the days are short. When the weather is cloudy, the efficiency of these panels that utilize solar energy may decrease.

During the design phase of the planned project, the climatic conditions of the project area and meteorological data for many years were evaluated, snow load calculations were made and the appropriate slope angle for the placement of the panels was determined by considering other criteria.

Thanks to the tilt angle of the solar panels to be used within the scope of the project, the snow mass on the panel will slide down on snowy days and the surface will open up a little. The solar panels, which are produced with the latest technology, are resistant to weather changes as they have an aluminum frame of appropriate thickness and a waterproof windshield resistant to temperature changes.

In order to assess the meteorological conditions in the Project site and surrounding areas, the results of meteorological continuous measurements carried out by the General Directorate of Meteorology (MGM) were analyzed and the results are presented in Section II.2.1 with tables and graphs.

It is essential for solar panels to receive daylight for energy production. For this reason, as long as there is sunlight, it will be possible to ensure the continuity of electricity production by cleaning the solar panels in snowy, hail, gray weather and in case of icing.

**III.2.14. Other activities (Evaluations on whether there will be other activities planned within the scope of the project such as transformers, ETLs, etc.; if there are airports, military or civilian radars, meteorological stations and similar facilities in the EIA study area and impact area, indication of their distances to the EIA study area, determination of cumulative impacts, measures to be taken to reduce their negative impacts on the environment,**

The project in question is planned by the investor company as an auxiliary source to the hydroelectric power plant that is currently in operation, and no activity will be established in addition to the establishment of the auxiliary source solar power plant planned within the scope of the project.

The draft single line diagram of the project is attached (See Annex-2.7).

The closest meteorological station to the Project area is Varto Meteorological Station with station number 17778, located approximately 18.2 km as the crow flies (See Figure III.2.14.1). It is considered that the establishment and operation of the project will not have any negative impact on the station.


**Figure III.2.14.1** Satellite View of Meteorological Station Located Near the Project Area

In addition, the closest airport to the project area is Muş Sultan Alparslan Airport, which is approximately 29.41 km as the crow flies (See Figure III.2.14.2).

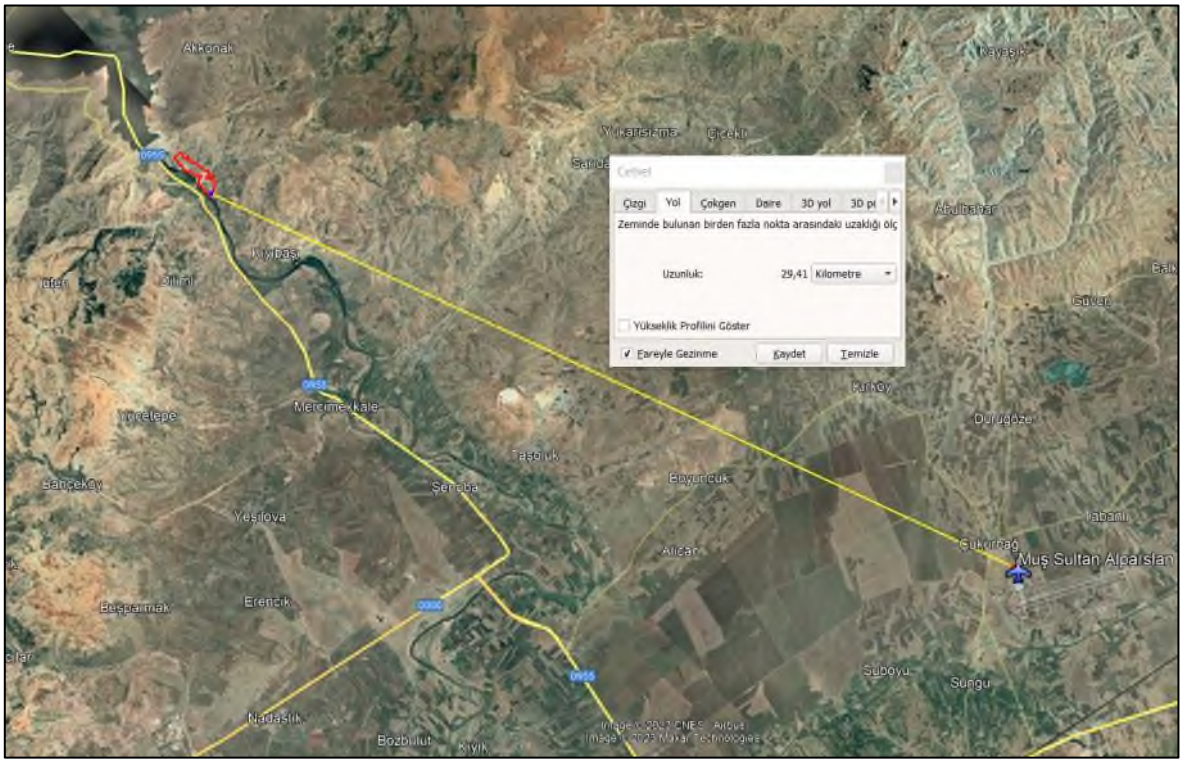


**Figure III.2.14.2** Satellite View of Airports Located Near the Project Area

**III.2.15. Potential and ongoing impacts after the closure of the operation and land reclamation and rehabilitation works to be carried out against these impacts, Monitoring and control program, information on recovery or recycling of end-of-life panels, identification of potential problems that may affect the environment, interaction with the receiving environment, identification of cumulative impacts, measures to be taken to reduce possible negative impacts,**

In order to develop landscape policies, general and detailed landscape conservation strategies based on character-function should be interpreted together with the landscape pattern and the use demands and/or objectives for the area should be taken into account (Şahin et al. 2014). Policies to be realized in this context can be categorized into two groups: landscape conservation and landscape restoration.

Landscape conservation is the protection and maintenance of existing landscapes due to high risks and/or potentials revealed by the analysis of landscape structure/character, function and change. Landscape restoration, on the other hand, encompasses all actions that include restoration *(restoration)*, reintroduction to nature *(rehabilitation)* or creation of new landscapes *(regeneration)* in landscapes whose structure and function characteristics have changed as a result of degradation or intervention (Şahin et al. 2014).

In landscape restoration works, which of these actions will be implemented will be decided and targets will be set according to the strategies to be determined after the landscape analysis to be carried out depending on the type, impact and amount of destruction of the facilities and construction activities to be built, as well as the characteristics of the area.

In case "EIA Positive" decision is taken for the project; in order to ensure the usability of the project throughout its economic life, it will be ensured that the equipment will be regularly maintained and the equipment whose operating life has expired will be renewed and put back into operation. At the end of the license period of the project, the project can be used again for energy purposes with revisions that can be made in the operation according to the conditions of the day.

When the project area and facilities are planned to be used again for similar purposes, it will be appropriate to conduct environmental impact assessment studies again to examine the impacts of the project on the ecosystem during the 25 years of operation of the project and to reveal the difference from the current conditions and to establish new measures.

After the operation is completely closed, land reclamation will be carried out by dismantling the panel units and leveling the ground. After the dismantling of the panels and ground leveling, vegetative soil will be laid and plantation works will be carried out with plants with appropriate characteristics considering the topographic structure, soil characteristics and climate of the area.

Natural landscaping arrangements will be made in the areas covered by the plant units. These arrangements will be made in accordance with the landscape repair and rehabilitation projects and plans to be prepared considering the conditions of the period (terrain, climate, geomorphological conditions, etc.) for post-operation.

In addition, the purpose of restoration (restoration) or rehabilitation (rehabilitation) is not only to green the site, but also to restore the used land to its natural structure and to ensure that it is used for the most appropriate purpose after the activity.

**Monitoring and Control Program**

The EMS to be prepared for the monitoring of the activity will be examined under 3 headings; land preparation and construction period, operation period and post-operation period.

The purpose of the monitoring program is to collect data on environmental conditions in order to determine the environmental impacts that will occur during the above-mentioned periods and the operational practices of the project such as air emissions, wastewater, noise, waste, excavation, permits, etc. will be monitored in order to ensure compliance with the relevant regulations and to minimize the impacts on the environment.

Within the scope of the monitoring studies of the project, it is proposed to carry out monitoring studies on the following issues.

During all phases of the project, all commitments in the report will be fulfilled by the company and it will be the responsibility of the company to ensure that no disturbance is caused to the surrounding community or the environment in the vicinity of the project area. During this period, it is recommended that monitoring work be carried out by a responsible person to be determined by the company on the following issues related to the restrictions specified in the EIA Report and impacts of environmental importance.

First of all, the environmental impacts arising from the works to be carried out in the planning, pre-construction, construction, operation and post-operation periods of the project and the mitigation measures to be taken to prevent or minimize these impacts to the extent that they will not harm the environment and the responsible institution / organization are explained in detail in Table V.1. In addition, the "Monitoring Plan" to be implemented for the Project (parameters to be monitored, where, how and when they will be monitored and the responsible institution/organization) is given in Table V.2.

**Recycling/Recovery of End-of-Life Panels**

The economic life of the Alpaslan II Dam and Hydroelectric Power Plant Auxiliary Source Solar Power Plant Project is estimated to be 25 years. Maintenance, repair and replacement of solar panels, electrical equipment and other equipment will be required throughout the operation period of the Project.

In case the project completes its lifespan, the project units will be dismantled and the areas in question will be planted in accordance with the topographic, climatic and vegetation structure of the region.

If the solar panels are in working condition as a result of the replacement of the panels and the completion of the economic life of the project, they can be delivered to the company from which the panels were purchased. If the solar panels cannot be used, they will be given to licensed companies with the waste codes given in Table III.1.9.9 and recycled or disposed of.

The first step in the recycling process of solar panels is dismantling the installation. This means disconnecting cables and other devices and then cutting or crushing the panels themselves. The individual materials are separated and subjected to appropriate disposal processes. The disposal of solar panels is divided into the conversion of individual components:

- Glass and aluminum are recycled up to 90-100% and melted down into raw materials for further production.
- Up to 80% of silicon wafers can usually be reused after acid etching and enrichment. Damaged wafers are melted down and used in the production of new solar panels.
- The remaining components are melted at 500°C to vaporize the plastic elements [26].

**III.2.16. Project's impact on climate during the operational phase (nature and magnitude of GHG emissions) and how the project will be affected by climate change,**

Greenhouse gases are emitted by both natural processes and human activities. The most important natural greenhouse gas in the atmosphere is water vapor. However, human activities release large amounts of greenhouse gases, increasing their atmospheric concentrations, which in turn increases the greenhouse effect and warms the climate. The main sources of anthropogenic greenhouse gases are:

- Combustion of fossil fuels (coal, oil and gas) for use in electricity generation, transportation, industry and households ($CO_2$);
- Land use changes such as agriculture ($CH_4$) and deforestation ($CO_2$);

[26] **Source:** Lifecycle and disposal of solar panels - PCC Group Product Portal

- Landfilling of waste ($CH_4$);
- Industrial use of fluorinated[27].

There will be no combustion system within the scope of operation activities and diesel fuel will be used as fuel for the vehicles. There is no greenhouse gas emission source within the scope of the "Regulation on Monitoring Greenhouse Gas Emissions" published in the Official Gazette dated 17.05.2014 and numbered 29003. Therefore, there is no issue that will cause greenhouse gas and climate change.

In order to minimize possible emissions from fossil fuels, new technology vehicles with low emission values will be used. Regular maintenance and repair of vehicles will be carried out and fuel consumption will be taken under control.

Exhaust emission inspections of construction machinery will be carried out regularly and it will be documented that they meet the limit values set for exhaust emissions.

A Sustainable Greenhouse Gas Reduction Plan has been prepared within the scope of the format announced by the Republic of Turkey Ministry of Environment, Urbanization and Climate Change on 04.08.2022 and is given in Annex-21.

**III.2.17. Project-related disaster or accident risk due to climate change during operation phase.**

Climate change can be defined as statistically significant changes in the average state of the climate or its variability over decades or more (Türkeş, 2008ab). Climate change can occur due to natural internal processes and external forcing factors, as well as sustained anthropogenic (human-induced) changes in the composition of the atmosphere or land use[28].

Global warming is caused by excessive emissions of greenhouse gases such as carbon dioxide ($CO_2$), methane ($CH_4$), chlorofluorocarbons (CFCs), ozone ($O_3$) and other greenhouse gases released by human activities. Some of the long-wave ground radiation emitted from the Earth's warm surface is absorbed by the many natural greenhouse gases in the upper atmosphere before escaping into space, and then re-emitted. In this way, natural greenhouse gases regulate the Earth's natural temperature balance and keep the Earth habitable.

However, the excessive increase in greenhouse gas emissions causes the earth to warm more than normal. The source of this increase is 49% energy use, 24% industry, 14% deforestation and 13% agricultural activities (Türkeş et al., 2000). Increasing greenhouse gas emissions as a result of these anthropogenic activities bring along extreme conditions such as precipitation, humidity, air movements, etc. with temperature increase. This results in "global climate change", which poses a potential danger to ecosystems and living things[29].

According to the scenarios put forward by the United Nations Intergovernmental Panel on Climate Change (1PCC), it is known that there will be an average increase of 1 to 3.5 degrees in global temperature by 2100. This means that, under the most optimistic conditions, there will be a temperature increase of approximately 0.1 degrees per decade. (IPCC, 2001) As a result of this, there will be a wide range of disastrous consequences arising from sea level rise, changes in temperature and precipitation regimes. Floods, floods, droughts and consequently desertification, storms, epidemics with the characteristics of biological origin disasters are some of these problems, which will spread to wider areas and will be seen much more frequently[30].

The consequences of a possible climate change on Turkey can be summarized as follows:

1. As the habitats of fauna and flora change, there may be localized increases in biodiversity due to new species arrivals. However, increasing adversities (epidemics and

[27] **Source:** Reducing greenhouse gas emissions - European Environment Agency (europa.eu)
[28] **Source:** Observed and Projected Climate Change, Drought and Desertification in Turkey, Murat Türkeş, 2012.
[29] **Source:** Impact of Global Climate Change on Biodiversity and Ecosystem Resources, Aynur Demir.
[30] **Source:** Global Climate Change and Its Possible Impacts on Turkey, Kemal Öztürk, 2002.

fires) may lead to decreases in biodiversity and increases in nuisance (unwanted) species, and habitat fragmentation may create new barriers to the migration of climate-dependent species.

2. Forests are very sensitive to climatic changes. It is predicted that the forests of our country, where destruction is very high, will change in a possible climate change (temperature, precipitation extreme events, spread of pests and fires). Forests are among the most sensitive systems mainly due to changes in the precipitation regime, changes in the spread of pests, changes in age structure and decreases in carbon content. According to model projections, today's net global terrestrial carbon absorption of about (1GTC year) may increase during the first half of the 21st century, either remain at this level or decrease over time (IPCC, 2001 b and Watson, 2001). Destruction of forests, meadows and pastures, which are among the basic elements of ecological balance, and failure to adequately protect national parks will pose major problems for Turkey in the future.
3. Researches indicate that our country will be adversely affected by the climate changes that will occur due to global warming, especially the decrease in water resources, forest fires, drought, desertification and related ecological degradation.
4. Any change in climate will change the amount of precipitation, evaporation, surface runoff and available water in the soil. Changes in seasonal and annual precipitation are very important in terms of both storing water resources and regulating the moisture regime in the soil. Water deficiency that may occur during flowering, pollination, fruit formation and grain filling will cause a significant decrease in yield[31].

Population growth leads to an increase in industrialization and energy demand, which in turn leads to an increase in resource use. This creates a chain cycle with the use of more fossil fuels. This cycle brings carbon dioxide and other greenhouse gases that cause climate change. One of the biggest environmental problems threatening the world is the increase in greenhouse gases and global warming.

Turkey is among the high-risk countries in terms of the devastating consequences of global warming. In the long term, the use of renewable energy sources will play a key role to support a sustainable economy and reduce environmental impacts.

With a renewable energy policy that increases economic competitiveness, the ecological damage caused by irreversible global warming can be reduced. Another important step is to reduce carbon emissions by supporting energy efficiency through more effective and sparing use of energy. Increasing the contribution of renewable energy sources in energy supply will contribute to an environmentally friendly, sustainable and highly foreign dependency reduction[32].

Within the scope of the planned Alpaslan II Dam and Hydroelectric Power Plant Auxiliary Source Solar Power Plant Project (41.9916 MWm-62.74 ha), since renewable energy resources will be used, it is envisaged that it will support carbon emission reduction and there will be no disaster and accident risk related to the project due to climate change.

## III.3. Impacts of the Project on the Socio-Economic Environment

### III.3.1. Income increases expected to be realized with the project; employment opportunities to be created, population movements specific to the project location, migration, education, health, culture, other social and technical infrastructure services and utilization of these services, etc. (Evaluation of social impacts by conducting interviews with local people who will be affected due to the construction of the project),

Economic characteristics and social infrastructure services of the project area and its impact area (information on the main sectors that make up the economic structure of the region, the distribution of the local labor force in these sectors, the place and importance of the production of goods and services in the sectors in the local and national economy; information on education, health, cultural services and the utilization of these services), income (information on the income in the region

[31] **Source:** Global Climate Change and Its Possible Impacts on Turkey, Kemal Öztürk, 2002.
[32] **Source:** The Impact of Renewable Energy Sources on Global Climate Change, Esra Deniz Güner, Emine Su Turan, 2017.

distribution by sectors, maximum, minimum and average income per capita by sector), unemployment and population data are given in Section II.3.

The Project will affect the whole of Turkey, especially the Central District and Muş Province, economically and socially, and the settlements around the project area between Dumlusu and Akkonak Villages in terms of environmental interaction. Within the scope of the project, the first degree affected group is the local people living in the settlements close to the project area. Local people living in the region and making a living from the region will be primarily affected. In addition, local people living in the neighborhoods in the immediate vicinity will be indirectly affected.

Alpaslan II Dam and Hydroelectric Power Plant Auxiliary Source Solar Power Plant Project is planned to employ 40 personnel during the land preparation and construction phase and approximately 8 personnel during the operation phase. Care will be taken to procure the personnel to be employed and the materials to be needed from the local people and tradesmen in the vicinity, and it is envisaged that the project will contribute to the economy of the region, although not at a large level.

Considering that each person to be employed will affect 4 people, it can be said that approximately 160 people will indirectly benefit from the project during the land preparation and construction phase and approximately 32 people during the operation phase.

The potential social impacts of the Project are summarized in Table III.3.1.1, socio-economic impacts in Table III.3.1.2 and socio-cultural impacts in Table III.3.1.3.

**Table III.3.1.1.** Social Impacts of the Project

| Problem | Potential Impacts |
|---|---|
| **Demographic Structure** | |
| Internal migration movements | • Arrival of people to work in the region |
| **Socio-Economic Structure** | |
| Job opportunities | • Short/long term job opportunities during construction and operation phases<br>• Indirect job opportunities for local people |
| Local Procurement | • Contribution to the regional economy as a result of local procurement of some of the materials to be used in the construction of the project |
| **Infrastructure and Natural Resources** | |
| | • Settlements will also benefit from the infrastructure to be built within the scope of the project. |
| **Socio-Cultural** | |
| | • Potential for conflict due to opposing views on the project |
| | • Cultural differences with workers coming to the region from outside |
| **Public Health & Safety** | |
| | • Increased traffic during the construction phase and associated safety risks for local communities<br>• Impacts such as dust and noise that may arise during construction activities |

**Table III.3.1.2.** Socio-Economic Impacts of the Project

| Possible Impact | Project Phase (Pre-Construction-Construction-Operation) | Nature of Impact (+ / -) (Long-term / short-term) | Impact Rating (Very low, low, low, medium, high, very high) |
|---|---|---|---|
| Short/long-term employment for local people possibilities | Construction-Operation | Positive / Short - Long Term | Middle |
| Indirect contributions to the regional economy | Construction-Operation | Positive / Short - Long Term | High |

**Table III.3.1.3.** Socio-Cultural Impacts of the Project

| Possible Impact | Project Phase (Pre-Construction-Construction-Operation) | Nature of Impact (+ / -) (Long-term / short-term) | Impact Rating (Very low, low, medium, high, very high) |
|---|---|---|---|
| Conflict between proponents and opponents of the project possibility of | Pre-construction-Construction | Negative / Short Term | Low |
| Cultural interaction with personnel from outside the region differences | Construction-Operation | Negative / Short-Long Term | Low |

## III.3.2. Environmental cost-benefit analysis.

Considering the current utilization status of the project area, it is considered that the economic and social impacts of the project on the region will be positive.

The most important environmental benefit of the project is that it provides renewable, clean energy production.

Environmental damages during the Project will intensify during the land preparation and construction phase and these damages will be temporary. The impacts will cease with the commissioning of the Project. In this context, in order to minimize the negative environmental impacts at all stages of the project, the provisions of Waste Management Regulation, Industrial Air Pollution Control Regulation, Environmental Noise Control and Management Regulation, Water Pollution Control Regulation and other relevant regulations will be complied with.

In this context, the environmental gains and environmental benefit-cost analysis, which includes the positive and negative impacts of the measures taken by the activity in relation to the environment, are presented in Table III.3.2.1.

**Table III.3.2.1** Environmental Benefit Cost Analysis

| Elements of Evaluation | Interaction +: Positive -: Negative O: Ineffective | Description |
|---|---|---|
| Space Utilization | O | As there is no agricultural land or pasture within the project area, the area use will not have any positive/negative environmental or social impacts. |
| Water Use | O | During the construction phase of the project, the water required for personnel use will be supplied by tankers from the nearest village headman's office. Since the personnel needs will be met from the administrative building of Alpaslan II Dam and HEPP production facility during the operation phase of the project, the domestic water will also be supplied from here. There is no positive or negative environmental impact of the water use to be seen within the scope of the Project. |
| Waste Water | O | The wastewater that will be generated during the construction phase of the Project will be collected in an impermeable septic tank to be installed at the construction site and when the pit is full, it will be disposed of periodically by vacuum trucks to be obtained from the Special Provincial Administration or licensed companies. Personnel needs during the operation phase of the project Alpaslan II Dam and HEPP production facility Since the wastewater will be met from the administrative building, the wastewater will be given to the sewerage system here. |
| Solid Waste | + | Within the scope of the project, domestic solid wastes and all other wastes to be generated by personnel w i l l be disposed of by licensed companies, and those suitable for recycling will be recycled. transformation will be ensured. |
| Emission | - | Although the dust emission during the land preparation and assembly phases of the Project will have a negative impact on the environment, this impact will be short-lived and necessary measures will be taken to minimize the impact. There will be no emissions during the operation phase of the project. |
| Noise | O | Noise generation will be observed from the construction equipment and vehicles that will work during the land preparation and construction phase of the project and from the assembly processes, and in line with the noise modeling, it has been observed that the noise value that will occur in the nearest residential area is below the regulation limit value. During the operation phase of the project, there will be no noise generation due to the operation of solar panels. There is no positive or negative environmental impact of the noise to be generated within the scope of the Project. |
| Renewable and Clean Energy | + | SPP to be added as an auxiliary source to Alpaslan II Dam and Hydroelectric Power Plant With the commissioning of the unit, renewable and clean energy will be produced by using the sun's rays. In addition to solar energy being renewable and clean energy, the production |

| Elements of Evaluation | Interaction +: Positive -: Negative O: Ineffective | Description |
|---|---|---|
| | | The fact that no emissions are observed during the process and that it is an alternative to fossil fuels are important advantages. |
| Socio-Economic Status | + | During the construction phase of the project, 40 personnel will be employed and 8 personnel will be employed during the operation phase. If there is a suitable position, staff will be recruited from the local community. Local employment and a positive socio-economic impact can be seen. |

### III.3.3. Expropriation and/or resettlement.

The project area belongs to the investor as shown in the ownership documents provided in Annex-2.8.

The parcels within the Project area are not forest, agricultural or pasture land and are owned by the investor. Therefore, following the completion of the EIA process, no expropriation etc. land acquisition will be made.

## SECTION IV: CUMULATIVE ENVIRONMENTAL IMPACT ASSESSMENT

(In this section of the EIA Report, a cumulative assessment should be made by including the environmental and social impacts of the planned project/activity in the "Pre-Construction, Construction and Operation Phase Environmental Impacts and Measures to be Taken" identified in Section III, together with other activities within the current or future impact area).

***Definition of Cumulative Impacts***

Cumulative impacts are changes in the environment caused by an action through other past, present or future human activities. "Cumulative Impact Assessment" is the evaluation of these impacts. The aim is to assess the total impact of the various activities as a result of their individual impacts.

International financial institutions in the World Bank Group, such as the IFC, require that the impacts of all activities within the scope of the project be assessed, as well as the impacts of outsourced materials and services.

Performance Standard (PS) 1, published by IFC, defines cumulative assessment as *"the effects resulting from incremental changes in the areas or resources used by or directly affected by the Project that result from other activities that are existing, planned or reasonably identified at the time of identification of risks and impacts".*

Article 9 of the European Bank for Reconstruction and Development (EBRD) Performance Condition 1 states that *"The environmental and social assessment process will also identify and characterize, to the extent appropriate, potentially significant environmental and social issues associated with activities or facilities that are not part of the project but that may be directly or indirectly affected by the project, that exist solely because of the project, or that may pose a risk to the project. These associated activities and facilities may be necessary for the continued existence of the project and may be under the client's control or owned or operated by third parties. Where the client cannot control or influence these activities or facilities, the environmental and social assessment process should identify the associated risks they pose to the project. Where potentially significant adverse environmental and/or social risks associated with third party activities or facilities are identified, the client should work with relevant third parties to manage and mitigate these risks. Similarly, where there are opportunities to enhance benefits, the client should use its influence and impact on the relevant third party. In addition,* the *assessment process will consider the cumulative impacts of the project, together with impacts arising from other relevant past, present and reasonably foreseeable developments and unplanned but anticipated activities made possible by the project that may occur at a later stage or in a different location."*

While environmental impact assessment focuses on the local scale, cumulative impacts, while often no different from those analyzed under EIA, expand their scale further, reaching a regional scale in a sense. The most important factor here is to determine how large an area surrounding an action is to be assessed, what the timeframe of this assessment will be, and how the often complex interactions between actions will be assessed in practice.

Cumulative impacts are changes in the environment caused by an action (project, project activity) through other past, present or future human activities. A SEIA is an assessment of these impacts. In this guide, the words "impact" and "effect" are sometimes used interchangeably. In general terms, both of these terms are intended to describe the change that a project may cause in the environment. In practice, assessing cumulative impacts requires consideration of a number of other assessment concepts that differ from the traditional approaches used in EIA. Some of these concepts include:

- Assessing past and future impacts over a longer period of time,

- Consideration of impacts on Valuable Ecosystem Components (VECs) due to interactions with both the project and other past, present and reasonably foreseeable future actions,

- Assessing significance by considering impacts other than just local and direct impacts (i.e. indirect impacts, cumulative impacts and interactions of impacts); and

- Assessing impacts in a wider area (i.e. "regional").

Cumulative impacts occur in the form of interactions: between actions, between actions and the environment, and between components of the environment. These 'pathways' between a cause (or source) and an effect are often the focus of an indirect or cumulative impact assessment. The magnitude of the compound effects along a pathway can be equal to the sum of the individual effects (aggregate effect) or result in an incremental effect (synergistic effect). Indirect, cumulative and interactional impacts can therefore be defined as follows.

***Indirect Impacts (Secondary Impacts):*** These are impacts that are not directly caused by the project, but are partly the result of the project. Indirect impacts follow a complex pathway or occur remote from the project (e.g. increased freshwater and seawater intrusion due to water withdrawal from a well, and seawater (i.e. salinity) intrusion into a fresh groundwater source)

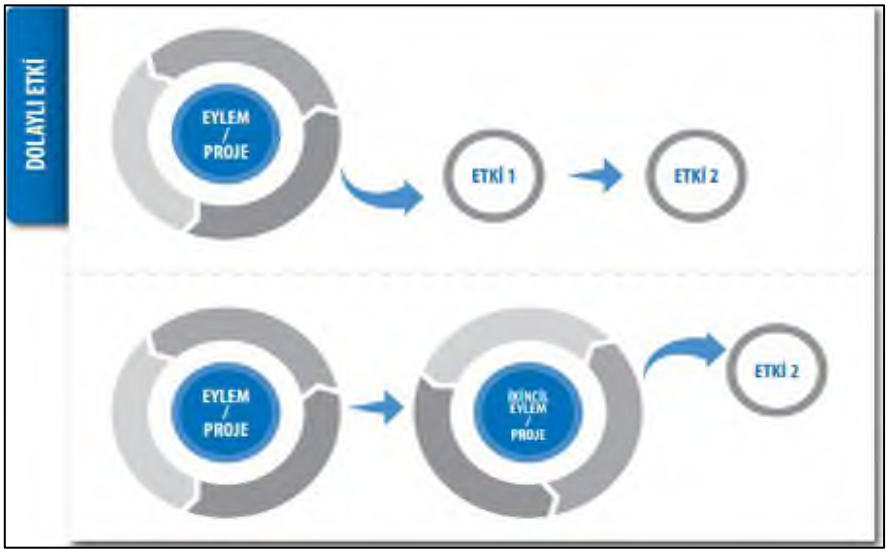


**Figure IV.1.** Indirect Impact

***Cumulative Impacts:*** These are the incremental effects of the proposed project and past, present and future activities (e.g. habitats lost due to quarrying for grading dams in a river basin).

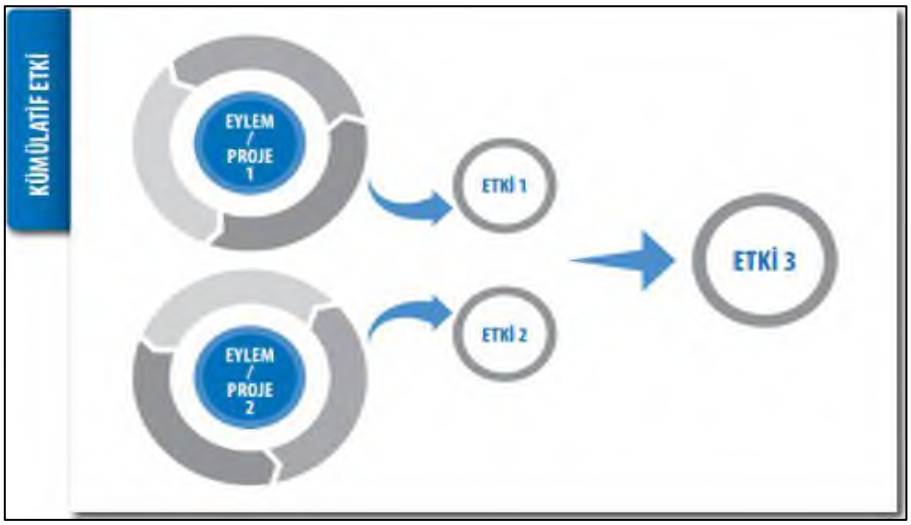


**Figure IV.2.** Cumulative Impact

***Impact Interactions / Interactional Impacts:*** These impacts are the result of a reaction between the effects of the proposed project or other actions (e.g. a reaction between the emissions of the proposed project and an existing facility).

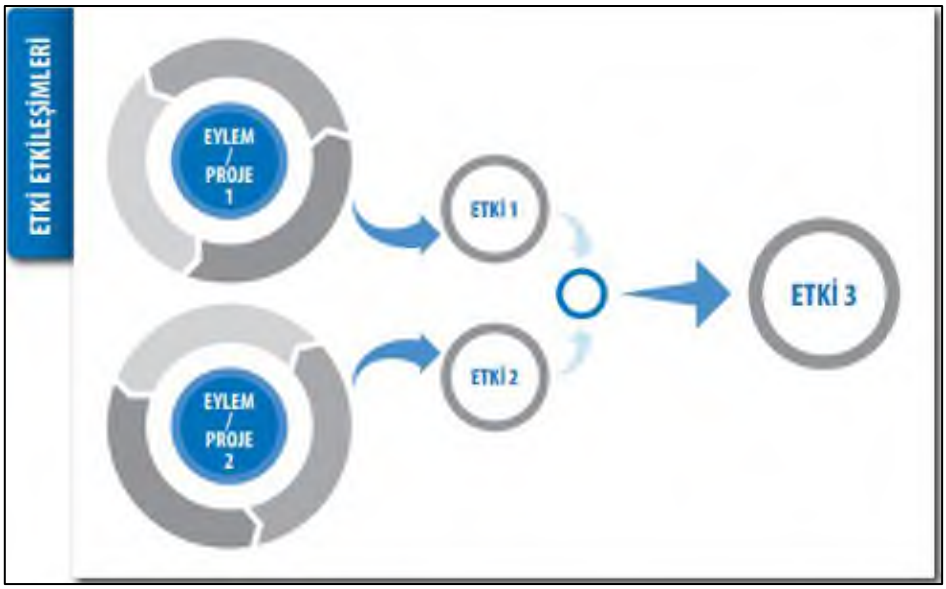


**Figure IV.3.** Impact Interactions

***Basic Concepts***

**Impact Area**

The impact area is the area where the cumulative impact assessment will be conducted. In a sense, it also constitutes the spatial boundaries. This area constitutes one of the important boundaries of the study. This spatial limitation plays an important role in determining the scope of the cumulative assessment. While determining the impact area within the scope of the project, the following points were taken into consideration.

- Land use patterns,
- Existing settlements,
- Habitat and social impacts,
- Blasting effects,
- Areas that may be affected by the project

**Valuable Ecosystem Components**

Valued Ecosystem Components (VECs) are defined as *"a part of the environment that is recognized as important by the organization proposing the project, the public, scientists, and/or the public authority involved in the assessment process. Significance can be determined based on cultural values or scientific concern*" (Hegmann et al., 1999). The RIAs constitute the main element of the evaluation. Both the project and the effects of other past, present and reasonably foreseeable future actions on the selected DEBs are examined. The following considerations were taken into account in the selection of the project's DEBs.

- Level of presence on the ground and in local and regional work areas,
- Ecological importance,
- Indigenous species,
- Risk,
- Sensitivity,
- Ecological sustainability,
- Human health,
- Socioeconomic importance,
- Protection status,
- Data availability,

- Importance in terms of cultural heritage for society

**Project Specific Standards and Acceptable Change Limit**

Project-specific standards are mainly determined based on national environmental legislation. For issues that are not regulated in national legislation in terms of international standards, relevant international requirements and guidelines, the recommendations of the members of the review and evaluation commission and other stakeholders may be taken into consideration.

The concept of an "acceptable limit of change" is the limit at which cumulative change becomes a matter of concern and may be expressed as a target, standard and guideline, carrying capacity or acceptable limit of change. In assessing cumulative impacts, there may not always be a threshold value that is acceptable under legislation. In the absence of defined thresholds, the practitioner may propose an appropriate threshold, consult with various stakeholders, public bodies or technical experts, or accept that there is no threshold, determine the residual impact and allow the reviewing body to determine whether the threshold has been exceeded (Hegmann et al., 1999).

In theory, an action is acceptable if the cumulative impacts of all actions in a region do not exceed a limit or threshold. However, in practice, the absence of such thresholds prevents the assessment of cumulative impacts. In practice, an impact that is known to have no threshold values should be examined by establishing a monitoring program.

**Cumulative Impact Assessment Methods**

In general, when conducting a cumulative assessment, the scope is determined, impacts are assessed, measures are taken to mitigate impacts and then followed up with monitoring.

In August 2013, IFC published a draft guidance note titled "Cumulative Impact Assessment and Management - Guidance for the Private Sector in Emerging Markets (Ref. 14.2)" to guide Cumulative Impact Assessment activities. The guidance note states that *"The client can take into account these broader regional surveys or cumulative assessments by focusing on the incremental contribution of the project on selected impacts that are generally recognized as significant, based on the concerns of Affected Communities in the region under consideration or scientific concerns."*

In Turkey, there is a guidebook published in December 2012 on "Sample Cumulative Environmental Impact Assessment for Hydroelectric Power Plants in Turkey" prepared under ESMAP, a global information and technical assistance program managed by the World Bank.

According to the World Bank Environmental Assessment, OP/BP 4.01 Environmental Assessment; "During the preparation of the Project Conceptual Document, the Task Team discusses with the borrower the scope of the Environmental Assessment and the procedures, schedule and outline of the required Environmental Assessment report." For sector investment and financial intermediation transactions, Bank and borrower staff must consider the potential serious cumulative impacts of multiple sub-projects.

The cumulative assessment within the scope of the Project has been elaborated by taking into account Alpaslan II HEPP, which is located in the north of the Project impact area and is currently in operation, by utilizing the aforementioned guidelines.

Cumulative impact assessment will be carried out in the following ways.

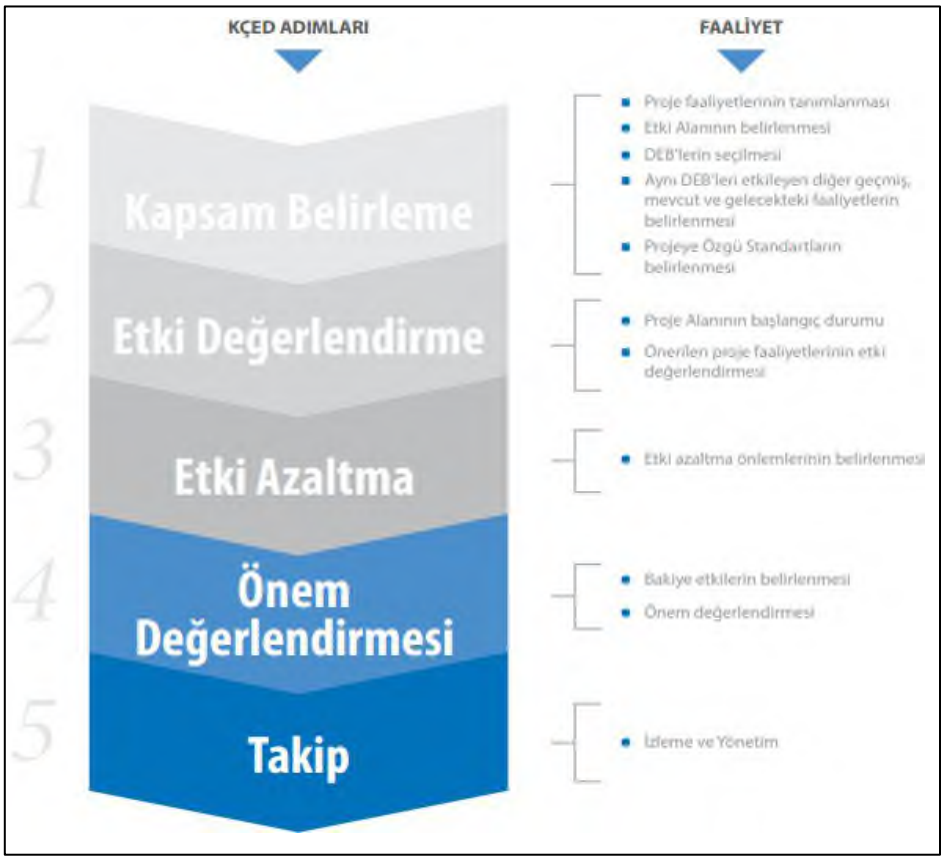


**Figure IV.4.** Cumulative Environmental Impact Assessment Steps

**CUMULATIVE IMPACT ASSESSMENT**

***Description of the Activity***

Specifically identified physical elements and aspects and facilities that will be realized for and because of the project within the scope of the project and that are likely to create impacts, environmental and social risks are called project activities. These activities also include the activities of subcontractors and activities required for associated facilities.

Associated facilities are facilities that are not financed under the project but would not have been constructed or expanded without the project and without which the project would not be viable.

The activity subject to this project is the "Alpaslan II Dam and Hydroelectric Power Plant Auxiliary Source Solar Power Plant Project (41,9916 MWm- 62,74 ha)" project planned by Murat Nehri Enerji Üretim A.Ş. in Muş province, Merkez district, Dumlusu Village Murat Mevkii and Akkonak Village Gölhazal Mevkii. Alpaslan II HEPP is included as an associated facility within the scope of the project.

***Determination of Impact Area***

As is the case for EIA, one of the main concerns in conducting a SEIA is the spatial area where the study/assessment will take place. This area constitutes one of the important boundaries (i.e. spatial dimension) of the study and should be addressed at the scoping stage. In this respect, the minimum study area for conducting an EIA and/or a SEIA for a project is defined as the project's area of influence. This may also be referred to as the area of influence of the relevant project.

Setting spatial study boundaries is a key stage of the SEIA process. In particular, determining appropriate spatial boundaries i s challenging, striking a balance between practical constraints related to time, budget and available data, and addressing complex environmental interactions that could theoretically span significant distances and far into the future.

All possible impacts that may be caused by the works to be carried out within the scope of the Project have been evaluated in terms of environmental and social risks and impact areas have been determined by considering the environmental elements where each possible impact may occur. Although the "minimum study area" for conducting EIA and/or CIA for a project is defined as the impact area of the project, the impact areas have been determined differently for each environmental component within the scope of this project.

Environmental components such as noise, air quality, ecosystem around the activity area and spatial areas around the project area were evaluated and the "Spatial Boundary" was determined.

On the other hand, issues such as noise and dust formation due to construction works, groundwater and surface water flow directions were evaluated within the scope of the project impact area. In this context, especially in Annex-2.1.f.2. of the Regulation on the Control of Industrial Air Pollution in force, *"If the surface distribution of non-stack emission sources (area source) is greater than 0.04 $^{km2}$ , the facility impact area is a square area with a side length of 2 km, with the area source in the center of the square. The facility impact area is taken as* basis *in determining the surface distribution of emission sources."* and the minimum impact area distance is determined as 2 km and the relevant map is shown in Figure II.1.1 is given in

***Selection of Valuable Ecosystem Components***

DEBs,

i) project work and activities,
ii) the environment likely to be affected and
iii) are selected after an understanding of the potential interactions between project work and activities and the environment is established. In general, the following considerations a r e taken into account in the selection of DEBs:

- Level of presence in the field, local and regional work areas
- Data availability
- Ecological importance
- Indigenous species
- Risk
- Sensitivity
- Ecological sustainability
- Human health
- Socioeconomic importance
- Protection status and
- The importance of cultural heritage for society.

The DEBs identified within the Project area are categorized according to environmental elements and presented in Table IV.1.

**Table IV.1.** DEBs Covered by the Project

| Component | Subcomponent | Parameter | DEB |
|---|---|---|---|
| Air | Air Quality | PM10<br>Settling Dust | - Surrounding Settlements<br>- Nearby Agricultural Areas |
| Su | Water Quality | SKKY | - Water Users<br>- Underground and Surface Aquatic Environment |
| | Hydrological Regime | Debi | - MURAT NEHRİ |
| Soil | Soil Quality | Pesticides<br>Heavy metals | - Underground and Surface Aquatic Environment<br>- Nearby Agricultural Areas |
| Noise | - | - | - Surrounding Settlements<br>- Ecological Living |
| Land Use | Land Acquisition | Land Loss | - Investor land |
| Ecology | - | - | - Reptiles<br>- Birds<br>- Mammals |
| Landscape | - | - | - Aesthetics |
| Socio-economics | Employment | Additional Source of Income | - Close Settlement |
| | Procurement | Revenue Increase | - Close Settlement |

***Identifying Past, Present and Future Activities Affecting Valuable Ecosystem Components***

Other past, present and future actions may have caused or may cause specific impacts and may interact with the impacts caused by the action under review. Therefore, all these actions need to be identified within the framework of the SEIA. The selection of future actions should at a minimum reflect a specific scenario to be considered and ideally this should be the most likely scenario.

***Past Actions:*** Actions that cause disturbance to existing and inactive DEBs in the Project impact area. An example is an inactive mine that has not been rehabilitated. In practice, past actions often become part of the existing baseline conditions. However, it is important to ensure that the impacts of these actions are recognized.

***Future Actions:*** The selection of future actions should take into account the certainty of whether the action will actually take place.

Figure IV.5 below summarizes the criteria that can be used in the selection process.

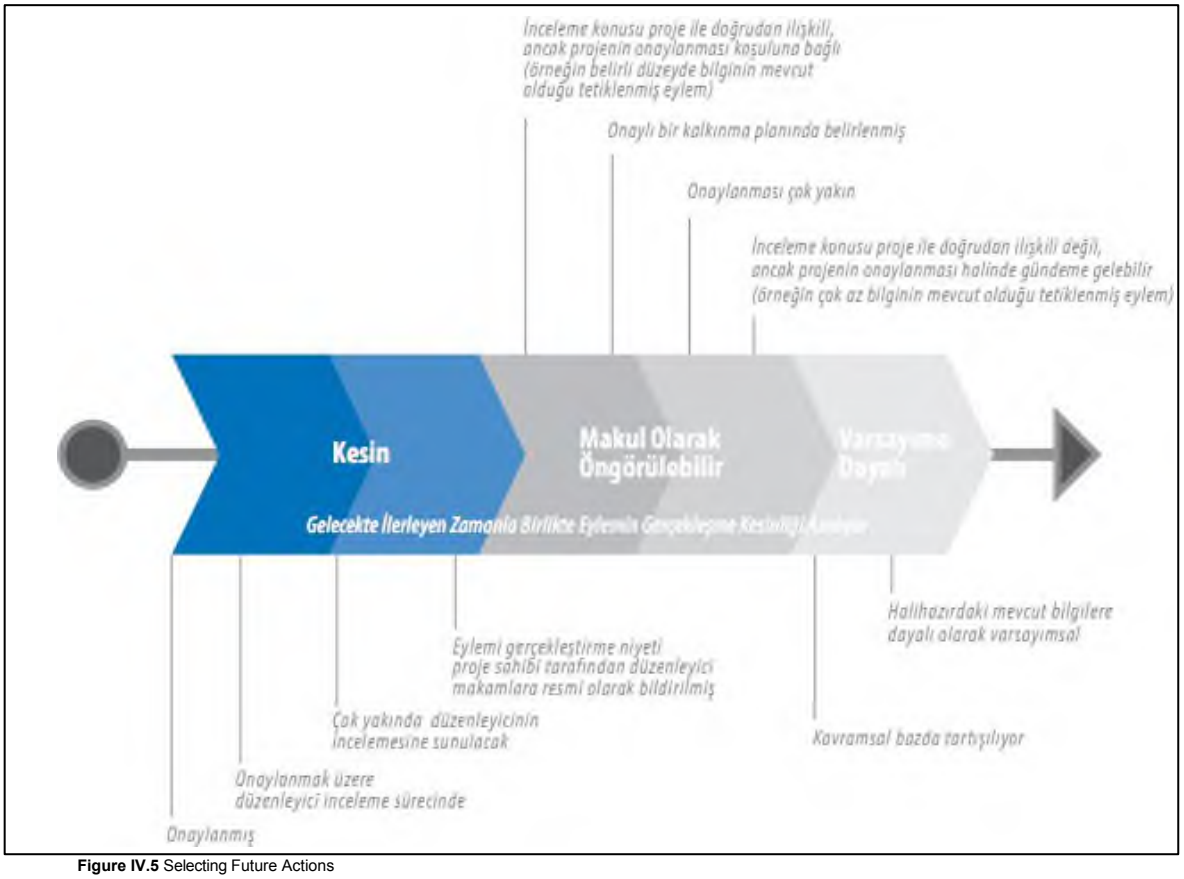


**Figure IV.5** Selecting Future Actions

As can be seen from the figure, actions are classified under three types.

***Certainty*** The action will happen or the action is very likely to happen

***Reasonably Foreseeable:*** The action could occur, but there is a certain level of uncertainty about this outcome (the Canadian Environmental Assessment Agency's Operational Policy Statement on Addressing Cumulative Environmental Impacts under the Canadian Environmental Act recommends that at least three types of projects be considered).

***Assumption Based:*** There is a significant degree of uncertainty that the action will take place.

In this framework, when the current status of the project area and the projects with completed or ongoing legal permitting processes in the region are evaluated, the future actions that will take place within the Project Impact Area are given in Table IV.2 according to the evaluation criteria in Figure 4.5.

**Table IV.2** Future Actions in the Project Impact Area

| Future Actions | Project | Description |
|---|---|---|
| **Exactly.** | Housing | Individual, Non-Residential |
| **Reasonably Foreseeable** | Commercial Enterprise | Small scale, limited environmental impact |

***Determination of Project Specific Standards***

Defining the legal framework is a key task in the impact assessment process. The legal framework delimits the types and levels of impact that are permissible. Furthermore, investors/project owners can apply their own standards, if any, beyond the legal requirements.

The legal framework in this context consists of two components:

i) list of legal requirements
ii) project specific standards

While the list of legal requirements lists relevant regulations and standards, project-specific standards should indicate legal limitations and other limitations based on international standards and the project proponent's own standards that may be project-specific (i.e. based on expert opinions and/or public concerns/consultations).

In this framework, the Standards that are effective in cumulative impact assessment can be evaluated within the scope of the standards, especially in the issues in the Public Informing and Participation Meeting in the EIA Process.

Alpaslan II Dam and Hydroelectric Power Plant Auxiliary Source Solar Power Plant Project (41.9916 MWm-62.74 ha), the Environmental Law constitutes the main standards. Project-specific standards will be included in the following sections under the heading "Impact Assessment" where the potential impacts of the Project are assessed.

***Impact Assessment***

**Current Situation Studies**

For some environmental components such as water quality, air quality and noise levels, data collection provides baseline data that also reveals the aggregated impacts of existing actions. Therefore, the methodology to be proposed by experts as baseline data collection becomes an important task for a successful SEIA implementation.

Analyses and measurements were carried out to determine the current situation within the scope of Alpaslan II Dam and Hydroelectric Power Plant Auxiliary Source Solar Power Plant Project (41.9916 MWm-62.74 ha).

The studies carried out for the current situation analysis within the scope of the project are given below.

- $_{PM10}$ measurements at 3 locations,
- Measurements of settled dust at 3 locations,
- 48-hour noise measurements at 3 locations

Additional studies conducted for the assessment of the baseline and impact status of the Project are given below.

- Ecosystem Assessment Report
- Social Baseline and Impact Assessment Report
- Air Quality Modeling Report (Cumulative assessment is made in this report)
- Acoustic Report (Cumulative assessment is made in this report)
- Stakeholder Engagement Plan
- Sustainable Environmental and Social Management Plans (Zero Waste Plan, Traffic Management Plan, Greenhouse Gas Reduction Plan, Environmental and Social Management Plan, etc.)
- Geological-Geotechnical Investigation Report for Zoning Plan

In this framework, the Current Environmental Status Determination Report prepared to determine the existing pollution load of the region is given in Annex-11 and the relevant assessments are given under headings in Section II.2.13.

**Identification of impacts**

Potential influences that may affect ADHDs need to be identified. This is an important step as it helps experts understand the answer to one of the most fundamental evaluation questions: "What affects what?". A good scoping process in the early stages of the study will mean that the evaluation effort will focus on the pathways that the most likely impacts will follow.

Cumulative impacts occur as interactions between actions, between actions and the environment and between environmental components. These "pathways" between a cause (or source) and an effect are often the focus of a cumulative impact assessment. The magnitude of the compound effects observed along a "pathway" can be equal to the sum of the individual effects (additive effect) or multiplicative (synergistic effect).

One approach to achieve this is to first identify the environmental components (e.g. air, water) that may be affected by the various components of the project under assessment (e.g. land clearing, combustion emissions), a common step in most EIAs. Environmental components that may be affected by other actions in the area of interest can then be identified. The scoping process can then focus on the relationships between the specific impacts of the various actions and specific DEBs. The next section describes one way of doing this in practice.

The analysis of cumulative impacts should focus on the assessment of impacts on the selected NDCs. There are several approaches that can assist experts in assessing cumulative impacts. However, there is no single approach to be used at all times, nor is there a single approach to specific impacts or types of actions. Instead, experts need to select an appropriate approach or assessment "tool" from among the various approaches. The appropriate method is the one that best provides an assessment of the impacts on the RIA under review.

An Interaction Matrix shows the relationship between two quantities in tabular form. Matrices are often used to determine the likelihood that an action will affect a particular environmental component, or to create a ranking of various impact characteristics (e.g. duration, magnitude) for various ECAs. Matrices are an example of a tool that identifies the potentially "strongest" cause-effect relationships during scoping exercises and then summarizes the results of the assessment in a concise way. However, matrices only show the conclusions reached in relation to the interaction and not the underlying assumptions, data and calculations that led to the conclusion shown; matrices are a simple presentation of complex relationships. Matrices should therefore be accompanied by a detailed explanation of how the interactions and rankings were derived (e.g. in a 'decision record').

The identification of the direct and 1st and 2nd indirect impacts of the activities to be carried out within this framework will be made in this section.

The DEB identified within the scope of the Project is given below and the potential impacts and measures to be taken are given in the following sections.

**Table IV.3** Valuable Ecosystem Components (DEC) and Impacts of the Project

| Component | Subcomponent | Parameter | DEB |
|---|---|---|---|
| **Air** | Air Quality | $PM_{10}$<br>Settling Dust | Surrounding Settlements |
| | | | Nearby Agricultural Areas |
| **Water** | Water Quality | SKKY | Groundwater Quality |
| | | | Surface Water Quality |
| | | | MURAT NEHRİ |
| | Hydrological Regime | Debi | MURAT NEHRİ |
| **Soil** | Soil Quality | Pesticide<br>Heavy metals<br>Salinity | Underground and Surface Aquatic Environment |
| | | | Nearby Agricultural Areas |
| **Noise** | | - | Surrounding Settlements |
| | | | Ecological Living |
| **Land Use** | Land Acquisition | Land Loss | Agriculture Areas |
| **Ecology** | - | - | Reptiles |
| | | | Birds |
| | | | Mammals |
| **Landscape** | - | - | Aesthetics |
| **Socio-economics** | Employment | Additional Source of Income | Close Settlement |
| | Procurement | Revenue Increase | Close Settlement |

***Impact Mitigation***

**Identification of Mitigation Measures**

Managing cumulative impacts under SEIA requires the same type of mitigation and monitoring measures as those recommended under EIA as an initial step. The best way to mitigate cumulative impacts is to reduce a local impact as much as possible; however, to be most effective, mitigation and monitoring should be long-term and regionally based.

Mitigation measures may involve several administrative regions and stakeholders, often within the regional work area of an assessment. In many cases, the cooperation of other stakeholders may be required for the successful implementation of the recommended mitigation.

In the application of the assessment methodology, the "Assumptive Situation" given under the heading ***"Identification of Past, Present and Future Activities Affecting DEBs***" was evaluated and necessary impact and mitigation measures were assessed.

**Importance Assessment**

Determining the significance of residual impacts (i.e. impacts remaining after mitigation) is perhaps the most important and challenging step in EIA. Determining significance in the context of a SEIA is essentially the same, although this step can be more complex due to the larger area under consideration. The cumulative impacts approach requires a determination of how much longer an impact can be sustained before a DEB experiences irreversible changes in condition and status.

Conclusions about the level of importance in evaluations should be defensible with some sort of explanation of how the conclusions were reached.

**Follow-up**

*Monitoring and Methodology*

The purpose of monitoring is to confirm the accuracy of environmental assessments and to determine the effectiveness of mitigation measures. In practice, the follow-up activity is normally considered as monitoring and identification of environmental management measures. Under the EIA Regulation in Turkey, a monitoring program is required to be established for all projects subject to the Regulation. The monitoring program needs to be as specific as possible under both EIA and SEIA in order to make available measurable and comparable data/information that will help to identify trends and allow decision makers to take additional measures to mitigate adverse impacts.

In this framework, the Environmental Monitoring Plan, which was created by taking into account the Alpaslan II HEPP facility located in the north of the project impact area, is given in Annex-23.

## SECTION V: ENVIRONMENTAL AND SOCIAL ACTION PLAN

(Preparation of an Environmental and Social Action Plan in the format determined by the Ministry, in which potential environmental and social risks that may arise from the planned project are systematically identified and measured by taking into account local legislation and/or international standards and good practices, and this plan should include the necessary measures and details of these measures to ensure compliance with national and international environmental and social requirements).

A detailed Environmental and Social Action Plan in which potential environmental and social risks that may arise from the planned Alpaslan II Dam and Hydroelectric Power Plant Auxiliary Source Solar Power Plant Project (41.9916 MWm-62.74 ha) are systematically identified, measured and assessed by taking into account local legislation and/or international standards and best practices is presented in Annex-19.

### V.1. Environmental Monitoring Plan. (In order to prevent adverse impacts of the project and to monitor the effectiveness of mitigation measures, preparation of an Environmental Monitoring Plan in the format determined by the Ministry, starting from the implementation phase of the project and continuing throughout the operation phase, description of the key parameters to be monitored to ensure that the construction and operation activities of the project are carried out in accordance with the national legislation and other relevant norms and standards (such as parameters to be monitored, monitoring equipment, monitoring locations, monitoring frequency, etc., monitoring programs and responsible institutions)

The positive and negative, bio-physical and socio-economic impacts of the planned **"**Alpaslan II Dam and Hydroelectric Power Plant Auxiliary Source Solar Power Plant Project (41.9916 MWm-62.74 ha)**"** process during construction and operation phases are detailed in Section III.3. In addition, "monitoring studies" will be carried out to ensure that the activity complies with applicable laws and regulations and that the impacts of the project on the environment and human health are minimized. This will ensure full compliance with the issues and commitments required to be considered and complied with in the EIA Report, which has been prepared taking into account the mitigation measures, approved plans, permits, conditions and requirements related to the project.

In the "Regulation on Environmental Impact Assessment" published in the Official Gazette dated 29.07.2022 and numbered 31907;

*"**ARTICLE 18 - (1) The** Ministry shall monitor, control and supervise whether the matters undertaken in the final EIA report based on the "EIA Positive" decision or in the project introduction file based on the "EIA Not Required" decision are fulfilled or not. The Ministry checks the accuracy of the works and transactions specified in the project progress reports.*

***ARTICLE 18 - (4)** The project owner of the projects for which an "EIA Positive" decision has been given is obliged to have the project progress report containing the developments in the investment prepared by the institutions/organizations that are authorized by the Ministry and that are not involved in the preparation of the EIA report of the project in question, to upload it to the electronic system and to present it during the inspections of the Ministry.* The *method for the fulfillment of the obligation shall be determined by the Ministry."*

In this context, the Project Progress Report, which includes the developments regarding the "Alpaslan II Dam and Hydroelectric Power Plant Auxiliary Source Solar Power Plant Project (41.9916 MWm-62.74 ha)", will be prepared and uploaded to the electronic system in the methods and periods to be determined by the Republic of Turkey Ministry of Environment, Urbanization and Climate Change, by the institutions/organizations that are qualified by the Ministry and are not involved in the preparation of the EIA Report of the project in question, and will be made available to be presented during the Ministry's inspections.

To this end, an "Environmental Management System (EMS)" will be prepared and implemented in the Project in conjunction with the Final EIA Report, which will cover issues related to impacts of environmental significance.

The EMS to be prepared for the monitoring of the activity will be examined under 3 headings; land preparation and construction period, operation period and post-operation period.

The purpose of the monitoring program is to collect data on environmental conditions to determine the environmental impacts that will occur during the above-mentioned periods, and the operational practices of the Project such as air emissions, wastewater, noise, waste, excavation, permits, etc. will be monitored to ensure compliance with the relevant regulations and to minimize the impacts on the environment. The measures to be taken within the scope of the Project are presented in Table V.1.1 and the monitoring program is presented in Table V.1.1.

V.1.2.

The Environmental Monitoring Plan in the format announced by the Republic of Turkey Ministry of Environment, Urbanization and Climate Change is included in Annex-23.

**Table V.1.1** Precautions Plan

| STAGE | SUBJECT | PRECAUTION | RESPONSIBILITY |
|---|---|---|---|
| | Floor Ensuring Safety | The works to be carried out within the scope of the project shall be in accordance with the principles of the "Regulation on Structures to be Built in Disaster Zones" of the abrogated Ministry of Public Works and Settlement published in the Official Gazette dated 14.07.2007 and numbered 26582 and the "Turkish Building Code" of the Disaster and Emergency Management Presidency published in the Official Gazette dated 18.03.2018 and numbered 30364 and entered into force on 01.01.2019. Earthquake Regulation" will be strictly complied with. | - Investor Company |
| | Excavation Transportation Permit | Permits shall be obtained in accordance with the provisions of the "Regulation on the Control of Excavation Soil, Construction and Demolition Wastes" published in the Official Gazette dated 18.03.2004 and numbered 25406. | - Investor Company |
| | Historical, cultural and archaeological assets | In the event that any cultural and natural assets are encountered during the implementation phase of the project (land preparation and construction), the works will be stopped immediately and the nearest Museum Directorate or the Local Administrative Authority will be notified in accordance with Article 4 of the Law No. 2863 amended by Laws No. 5226-3386. | - Investor Company<br>- Subcontractor Company<br>- Museum Directorate,<br>- Van Regional Directorate for the Protection of Cultural Assets |
| | Earthworks | Within the scope of the planned project, the provisions of the "Regulation on the Control of Excavation Soil, Construction and Demolition Wastes", which entered into force after being published in the Official Gazette dated 18.03.2004 and numbered 25406 (Amendment: 09.10.2021 dated and numbered 31623), will be complied with in the reduction, collection, transportation, evaluation and disposal of excavation soil and construction and demolition wastes that are likely to be generated during the installation of SPP panels without harming the environment.<br><br>In all phases of the Project, all actions will be taken in accordance with the Prime Ministry Circular on Stream Beds and Floods (2006/27), which entered into force after being published in the Official Gazette dated 09.09.2006 and numbered 26284. | - Investor Company<br>- Subcontractor Company |
| | Air Emissions | In order to minimize the dust emissions that will occur during the land preparation and construction phase; irrigation will be carried out with an all-terrain vehicle on the road routes, and filling and unloading operations will be carried out without throwing,<br>During the transportation of materials, the vehicles will be covered with tarpaulin and the top of the material will be kept at 10% humidity. | - Investor Company<br>- Subcontractor Company |
| | Vehicle Emissions | In order to minimize emissions from vehicles, in accordance with the "Regulation on Exhaust Gas Emission Control" published in the Official Gazette dated 11.03.2017 and numbered 30004, all vehicles and equipment to be used will be routinely checked, vehicles that need maintenance will be serviced and other vehicles will be used in the works until the maintenance is completed. In addition, they will be warned to work in accordance with the Traffic Law and attention will be paid to loading in accordance with the loading standards. | - Investor Company<br>- Subcontractor Company |
| | Wastewater | Domestic wastewaters that will be generated during the construction phase due to the use of personnel will be treated in accordance with Article 32 of the Regulation on Water Pollution Control (Amended 17.12.2004), which entered into force after being published in the Official Gazette dated 31.12.2004 and numbered 25687.2022/32046) Article 32 states that "Wastewaters generated from settlements with an equivalent population of less than 2000 shall be disposed of by treatment methods such as treatment, individual septic tank with leakage or central septic tank without leakage, which will be deemed appropriate by the Provincial Directorate of Environment, Urbanization and Climate Change, taking into account the environmental characteristics of the settlement, in a way that will not harm the environment and human health and meet the relevant provisions of this Regulation.<br><br>Hotels, motels, holiday villages, holiday sites and cottages that are detached from settlements and have an equivalent population or capacity of less than 2000 people<br>The domestic wastewater of housing estates and industrial facilities will be treated and/or disposed of in a manner that does not harm the environment and human health, taking into account the wastewater infrastructure in the region, in a manner that does not harm the environment and human health, in a manner deemed appropriate by the Provincial Directorate of Environment, Urbanization and Climate Change. | - Investor Company |

| STAGE | SUBJECT | PRECAUTION | RESPONSIBILITY |
|---|---|---|---|
| | | ", and when it reaches 85-90% fullness without overflowing, it will be removed and disposed of by the vacuum trucks belonging to the relevant administration. | |
| | Solid Waste and Packaging Waste | Solid wastes that will be generated during the construction phase will be collected in separate containers according to their qualities (organic, glass, plastic, paper, etc.) within the facility and will be kept in closed containers so as not to pollute the environment in terms of appearance, dust, odor, etc. factors. Those that can be recycled will be collected in separate containers and given to licensed recycling companies. Organic wastes that cannot be recovered will be collected by licensed companies.<br><br>Regarding the packaging wastes that will be generated during the land preparation and operation phases of the project, the works and procedures will be carried out in accordance with the provisions of the *Waste Management Regulation and Zero Waste Regulation for the collection, temporary storage, delivery to collectors, transportation and recovery of packaging wastes*, as stated in Article 19, Paragraph 1 of the "Regulation on the Control of Packaging Wastes" published in the Official Gazette dated 26.06.2021 and numbered 31523, and in line with the relevant Regulations. | - Investor Company<br>- Subcontractor Company<br>- Licensed Recycling Company |
| | Waste Oil | Maintenance and repairs of the vehicles that will work during the construction phase will be carried out at authorized services located near the project site. In the event that waste oil is generated within the facility (maintenance of machinery equipment, etc.), the possible waste oils that will be generated will be disposed of by authorized services l i c e n s e d and authorized by the Ministry of Environment, Urbanization and Climate Change in accordance with subparagraph (d) of Article 8 of Section 2 of the "Regulation on Waste Oil Management" published in the Official Gazette dated 21.12.2019 and numbered 30985.<br>organizations and will be disposed of. | - Investor Company<br>- Subcontractor Company |
| | Medical Waste, Hazardous Waste and Other Waste, | During the land preparation and construction phase of the said planned activity, health services will be provided primarily through the nearest health institutions located outside. However, in case of receiving health services/intervention in the project area, the medical wastes generated will be collected separately from other wastes in accordance with the "Regulation on Control of Medical Wastes" published in the Official Gazette dated 25.01.2017 and numbered 29959 and within the framework of the protocol with licensed companies.<br>disposal will be ensured. The requirements of the regulation on the separation and accumulation of medical waste at source will be fulfilled. | - Investor Company<br>- Subcontractor Company |
| | Noise and Vibration | Since land preparation works will be carried out in the open field within the scope of the Project, it will be very difficult to take noise measures. Noise will vary throughout the day during the works, but since the works will be carried out during the daytime, noise generation will be limited.<br><br>In the works within the scope of the project, the best available technologies will be used to reduce environmental noise within the scope of Article 10 of the Environmental Noise Control Regulation dated 30.11.2022 and numbered 32029 on environmental noise criteria for transportation sources, and necessary measures will be taken to minimize noise generation. In addition, in the project area, the issues specified in Article 13 of the "Environmental Noise Control Regulation" regarding "noise criteria for construction sites" regarding the noise that will occur during the construction phase will be complied with and vehicles with traffic inspections, exhaust measurements and maintenance will be used.<br><br>In order to protect workers from the noise that may occur in machinery and equipment during the construction phase, necessary measures will be taken to protect workers from the risks that may arise in terms of health and safety as a result of exposure to noise, especially risks related to hearing. During the construction phases, workers working on machinery and equipment will be provided with appropriate protective tools and equipment such as headgear, earplugs or earplugs to ensure that they are not affected by noise. Thus, noise and vibration levels arising from machinery and equipment will be reduced to a level that will not disturb the workers.<br>will be ensured. In addition, noise and vibration to the environment will be kept to a minimum level by achieving the values stipulated by the regulations. | - Investor Company<br>- Subcontractor Company |

| STAGE | SUBJECT | PRECAUTION | RESPONSIBILITY |
|---|---|---|---|
| | Staff Housing and Other Technical/Social Infrastructure Needs | The social needs of the personnel who will work within the scope of the Project (accommodation, rest, cafeteria, etc.) will be provided from the social facilities located in the construction sites to be established within the scope of the Project. In addition, if needed, technical or social needs,<br>from settlements in the vicinity of the project area, or from provincial and district centers if they cannot be met from these areas. | - Investor Company<br>- Subcontractor Company |
| | Occupational Health and Safety | (Repealed) by the Ministry of Labor and Social Security, including the minimum health and safety conditions to be taken in construction workplaces<br>It will be ensured that construction works are carried out in accordance with the provisions of the "Regulation on Occupational Health and Safety in Construction Works",<br>which entered into force after being published in the Official Gazette dated 05.10.2013 and 28786. | - Investor Company<br>- Subcontractor Company |
| **Business** | Wastewater | Domestic wastewaters that will be generated during the operation phase due to the use of personnel will be treated in accordance with Article 32 of the Regulation on Water Pollution Control (Amended 17.12.2004), which entered into force after being published in the Official Gazette dated 31.12.2004 and numbered 25687.2022/32046) Article 32 states that "Wastewaters generated from settlements with an equivalent population of less than 2000 shall be disposed of by treatment methods such as treatment, individual septic tank with leakage or central septic tank without leakage, which will be deemed appropriate by the Provincial Directorate of Environment, Urbanization and Climate Change, taking into account the environmental characteristics of the settlement, in a way that will not harm the environment and human health and meet the relevant provisions of this Regulation.<br><br>Domestic wastewater of hotels, motels, holiday villages, holiday sites and summer sites and industrial facilities with an equivalent population or capacity of less than 2000 people, detached from settlements, will be treated and/or disposed of by the Provincial Directorate of Environment, Urbanization and Climate Change in a way that will not harm the environment and human health, taking into account the wastewater infrastructure in the region.<br>", and when it reaches 85-90% fullness without allowing overflow, it will be removed and disposed of with the vacuum trucks belonging to the relevant administration when it reaches 85-90% fullness. | - Investor Company |
| | Solid Waste and Packaging Waste | Solid wastes that will be generated during the operation phase will be collected in separate containers according to their qualities (organic, glass, plastic, paper, etc.) within the facility and will be kept in closed containers so as not to pollute the environment in terms of appearance, dust, odor, etc. factors. Those that can be recycled will be collected in separate containers and given to licensed recycling companies. Organic wastes that cannot be recovered will be collected by licensed companies.<br><br>Regarding the packaging wastes that will be generated during the land preparation and operation phases of the project, the "Regulation on the Control of Packaging Wastes", which entered into force after being published in the Official Gazette dated 26.06.2021 and numbered 31523, states in Article 19, Paragraph 1: "Packaging waste producers shall comply with the provisions of the Waste Management Regulation and Zero Waste Regulation for the collection, temporary storage, delivery to collectors, transportation and recovery of packaging wastes.<br>"In accordance with the provision of the relevant Regulations, works and procedures will be carried out in line with the relevant Regulations. | - Investor Company<br>- Subcontractor Company<br>-Licensed Back Transformation Company |
| | Waste Oil | Maintenance and repairs of the vehicles that will operate during the operation phase will be carried out at authorized services located near the project site. In the event that waste oil is generated within the facility (machine equipment maintenance, etc.), the possible waste oils to be generated will be subject to Article 8 of Section 2 of the "Waste Oil Management Regulation", which entered into force after being published in the Official Gazette dated 21.12.2019 and numbered 30985.<br>Pursuant to subparagraph (d) of Article (d), the waste will be disposed of by entities licensed and authorized by the Republic of Turkey Ministry of Environment, Urbanization and Climate Change. | - Investor Company |
| | Noise | Noise sources during the operation phase of the Project will isolate the noise, so there will be no noise reaching outside the building.<br><br>Environmental Noise Control Regulation will be complied with at every stage of the activity. | - Investor Company |
| **Post Operational** | Land reclamation and reclamation works | Field arrangements to be made within the scope of the project to create landscape elements in the project area or for other purposes will be realized through advertisement works. During these works, first of all, necessary measures will be taken to minimize the damage to the existing structure. The works will start with the separation of the topsoil (vegetative soil) to be used in stabilizing the area, and the landscape planning process specified in the rehabilitation and reclamation study will be taken into consideration.<br>and work will continue. | - Investor Company |

**Table V.1.2** Monitoring Program

| STAGE | PARAMETER TO MONITOR | | PARAMETER LOCATION | MONITORING METHOD | FREQUENCY OF MONITORING | REASON FOR WATCHING | CORPORATE RESPONSIBILITY |
|---|---|---|---|---|---|---|---|
| Land Preparation and Construction Phase | Historical, Cultural and Archaeological Assets | | In the whole project area | Observational | In case cultural and archaeological assets are found | In the event that historical, cultural and archaeological remains are found, preventing and protecting them from damage | -Investor Company<br>-Van Regional Directorate for the Protection of Cultural Assets |
| | Ensuring Ground Safety | | In the whole project area | With drilling equipment and tools | Pre-Construction | Regulation on Structures to be Built in Disaster Areas | -Investor Company |
| | Wastewater | | Septic tank | Observational | When it reaches 80%-90% occupancy, it will be extracted with a vacuum truck | Water Pollution Control Regulation | -Investor Company |
| | Excavation Waste | | Areas to be excavated | Visual inspection, recording and reporting | Continuously during excavation works | Regulation on Control of Excavation Soil, Construction and Demolition Wastes | -Investor Company |
| Land Preparation and Construction Phase | Air Pollution | Dust Emission | Construction sites and access roads, | Observational, when necessary, by organizations certified by the Ministry with measurements | Within the periods required by the legislation, when there is an official institutional request and/or complaint | Determination of whether measures are taken to prevent dust emission,<br>Protection of the environment and the health of workers,<br>Regulation on Control of Industrial Air Pollution | -Investor Company<br>-Muş Provincial Directorate of Environment, Urbanization and Climate Change |
| | | Vehicle Emissions | Construction equipment exhausts | Recorded with exhaust emission measurement devices, observational | Vehicles periodic maintenance periods | Exhaust Gas Emissions Control Regulation<br>Regulation on Control of Industrial Air Pollution | -Investor Company<br>-Muş Environment, Urbanization and Provincial Directorate of Climate Change |
| | Noise | | Construction sites, road routes | Observational, when necessary, by organizations certified by the Ministry with measurements | Within the periods required by the legislation, when there is an official institutional request and/or complaint | Environmental Noise Control Regulation | -Investor Company<br>-Contractor Company<br>-Muş Provincial Directorate of Environment, Urbanization and Climate Change |
| | Vibration | | Construction sites, road routes | Observational, accredited where necessary with measurements to be made by recognized organizations | At sensitive points made during construction work and complaint situations | Environment and employees ensuring security,<br>Environmental Noise Control Regulation | -Investor Company<br>-Contractor Company<br>-Muş Provincial Directorate of Environment, Urbanization and Climate Change Directorate of |
| | Ecology | | Construction works will be made in the land environment | Research and reporting | Construction period | In line with the Law on Fisheries and the request of relevant institutions | -Investor Company |
| | Landscape | | Construction sites | Research and reporting | During the construction period, after operation | Landscaping and restoration works available structure appropriate to be realized as | -Investor Company<br>-Contractor Company |

| STAGE | PARAMETER TO MONITOR | | PARAMETER LOCATION | MONITORING METHOD | FREQUENCY OF MONITORING | REASON FOR WATCHING | CORPORATE RESPONSIBILITY |
|---|---|---|---|---|---|---|---|
| Land Preparation and Construction Phase | Waste Management | Domestic Qualified Solid Waste | SPP Project Area | Observational Audit and Recording | Daily | Waste Management Regulation | -Investor Company |
| | | Packaging waste (paper, cardboard, plastic, metal, glass, wood) | SPP Project Area | Observational Audit and Recording | Daily | Waste Management Regulation Zero Waste Regulation | -Investor Company |
| | | Your lifetime completed tires | Vehicle maintenance area | Observational Audit and Recording | Daily | Waste Management Regulation | -Investor Company |
| | | Construction and demolitio n waste | Construction area | Observational Audit and Recording | Daily | Waste Management Regulation | -Investor Company |
| | | Waste engine, transmission oils | Vehicle maintenance area | Observational Audit and Recording | Daily | Waste Management Regulation<br>Waste Oil Management Regulation | -Investor Company |
| | | Vegetable waste oils | Dining Hall | Observational Audit and Recording | Daily | Waste Management Regulation<br>Regulation on Control of Vegetable Waste Oils | -Investor Company |
| | | Waste cartridges and toners | SPP Project Area | Observational Audit and Recording | Daily | Waste Management Regulation | -Investor Company |
| | | Contaminated packaging | SPP Project Area | Observational Audit and Recording | Daily | Waste Management Regulation | -Investor Company |
| | | Waste batteries and accumulators | SPP Project Area | Observational Audit and Recording | Daily | Waste Management Regulation | -Investor Company |
| | | Waste fluorescents | SPP Project Area | Observational Audit and Recording | Daily | Waste Management Regulation | -Investor Company |
| | | Medical waste | Infirmary | Observational Audit and Recording | Daily | Regulation on Control of Medical Waste | -Investor Company |
| | | Excavation waste | Construction area | Observational Audit and Recording | Daily | Regulation on Control of Excavation Soil, Construction and Demolition Wastes | -Investor Company |
| | Occupational Health and Safety | | Project in the entire field | Observation, auditing, recording underneath Don't take it, Reporting | Daily | Law No. 6331 on Occupational Health and Safety | -Investor Company |
| | Public Safety | | SPP Project Area and its immediate vicinity | Observational Audit and Recording | Continuous before and during construction | Pursuant to Relevant Legislation | -Investor Company |
| | Transportation | | SPP Project Area and on connection roads in the immediate vicinity | Observational and audit | Continuous before and during construction | Protection of safety of life and property Road Traffic Law | -Investor Company |

| STAGE | TO WATCH PARAMETER | PARAMETER LOCATION | MONITORING METHOD | FREQUENCY OF MONITORING | REASON FOR WATCHING | CORPORATE RESPONSIBILITY |
|---|---|---|---|---|---|---|
| **Business** | Waste Water | Leak-free Septic Tank | Observational<br>Periodic removal of the septic tank by vacuum truck service | Continuous | In accordance with SKKY and Environmental Permit | -Investor Company |
| **Business** | Vehicle Emissions | Vehicles | Exhaust emission measurement devices | Vehicles periodic in their care | Exhaust Gas Emission Control According to the Regulation | -Investor Company |
| **Business** | Flood Prevention and Drainage Structures | Within the Project Area | Observational | Stormwater Collection and Discharge System | Su raids to avoid exposure | -Investor Company |
| **Business** | Solid Waste | Project Area | Visual inspection, recording and reporting | Daily | Waste Management According to the Regulation | - Investor Company<br>- Special Provincial Administration<br>-Licensed Disposal Facility |
| **Business** | Packaging Waste | In All Facility Units | Visual inspection, recording and reporting | Daily | Packaging Waste According to the Regulation on Control | - Investor Company<br>- Special Provincial Administration<br>-Licensed Recovery Company |
| **Business** | Waste Oils | Panel maintenance machinery and equipment | Visual inspection, record and report keeping, Accredited laboratory with | Continuous | Waste Oils According to the Management Regulation | - Investor Company<br>-Licensed Recovery Company |

| STAGE | TO WATCH PARAMETER | PARAMETER LOCATION | MONITORING METHOD | FREQUENCY OF MONITORING | REASON FOR WATCHING | CORPORATE RESPONSIBILITY |
|---|---|---|---|---|---|---|
| **Business** | Vegetable Waste Oils | In case of occurrence | Visual inspection, recording and reporting | Continuous | In accordance with the Regulation on Control of Vegetable Waste Oils | - Investor Company<br>-Licensed Recovery Company |
| **Business** | End-of-Life Tires | Within the Project Area | Visual inspection, recording and reporting | Continuous | In accordance with the Regulation on Control of End-of-Life Tires | - Investor Company<br>-Licensed Recovery Company |
| **Business** | Waste Battery and Batteries | Within the Project Area | Visual inspection, recording and reporting | Continuous | Waste Battery and In accordance with the Regulation on the Control of Accumulators | - Investor Company<br>-Licensed Recovery Company |
| **Business** | Medical Waste | In case of occurrence | Visual inspection, recording and reporting | Continuous | Medical Waste According to the Regulation on Control | - Investor Company<br>-Licensed Recovery Company |
| **Business** | Noise and Vibration | In Work Areas, in the Structure Closest to the Project Area and in Sensitive Areas Outside the Work Area | Noise measurements to be carried out by a Qualified and Accredited Company with a Noise and Vibration Measurement Device | In case of a complaint,<br><br>In accordance with the Environmental Noise Control Regulation, day, evening and night by the relevant institution determined in periods | In accordance with the Environmental Noise Control Regulation and Occupational Health and Safety Law | - Investor Company |
| **Business** | Occupational Health and Labor Safety | In All Studies | Written, employees Communiqué with a report | Continuous | In accordance with the Labor Law | - Investor Company |
| **Business** | Public Safety | In All Studies | Obtaining permits from relevant institutions within the framework of the commitments specified in the EIA Report observation of non-receipt | Continuous | Pursuant to law | - Investor Company |
| **Business** | Transportation | On-site and Off-site Roads | Observational | Continuous | Safety of life and property, in accordance with the Highway Traffic Law | - Investor Company |
| **Business** | Landscape Works | Project Area | Observational | Continuous | To prevent visual pollution | - Investor Company |

| STAGE | TO WATCH PARAMETER | PARAMETER LOCATION | MONITORING METHOD | FREQUENCY OF MONITORING | REASON FOR WATCHING | CORPORATE RESPONSIBILITY |
|---|---|---|---|---|---|---|
| **Post Operational** | Land Reclamation | Project Area | Observational | 2 Years | By Environmental and Occupational Safety | - Investor Company |

**V.2. Sustainability Plan (The plans required in this section such as Zero Waste Plan, Traffic Management Plan, Greenhouse Gas Reduction Plan, Environmental and Social Management Plan, etc. should be prepared in the format determined by the Ministry and submitted in the Annexes Section of the EIA Report; the plans to be prepared should be developed for the land preparation, construction and operation phases of the project, and should be updated and improved according to the changing needs and conditions of the project).**

Regarding the packaging wastes that will be generated during the land preparation and operation phases of the project, "*Packaging waste producers are obliged to comply with the provisions of the Waste Management Regulation and Zero Waste Regulation for the collection, temporary storage, delivery to collectors, transportation and recovery of packaging wastes*" stated in Article 19, paragraph 1 of the "Regulation on the Control of Packaging Wastes" published in the Official Gazette dated 26.06.2021 and numbered 31523."The Zero Waste Plan prepared within the scope of the format announced by the Republic of Turkey Ministry of Environment, Urbanization and Climate Change on 04.08.2022 is given in Annex-22.

In addition, the social needs of the personnel will be met from a construction site area in the project area and an administrative building during the operation phase. A zero waste system (container, piggy bank, etc.) will be installed in the construction site and administrative building in accordance with the provisions of the Zero Waste Regulation and an application will be made for the "Basic Level Zero Waste Certificate".

The SPP area planned to be established in the project area will be accessible via Erzurum-Muş (D955) highway. The additional load and traffic volume on Erzurum-Muş (D955) highway has been calculated and detailed information is provided in Section III.1.3. A Sustainable Traffic Management Plan has been prepared in the format announced by the Ministry of Environment, Urbanization and Climate Change on 04.08.2022 and is given in Annex-20.

There will be no combustion system within the scope of operation activities and diesel fuel will be used as fuel for the vehicles. There is no greenhouse gas emission source within the scope of the "Regulation on Monitoring Greenhouse Gas Emissions" published in the Official Gazette dated 17.05.2014 and numbered 29003. Therefore, there is no issue that will cause greenhouse gas and climate change. Section III.1.19 and Section III.2.16 explain in detail the impact of the Project on climate and greenhouse gas emissions during construction and operation phases. A Sustainable Greenhouse Gas Reduction Plan has been prepared within the scope of the format announced by the Republic of Turkey Ministry of Environment, Urbanization and Climate Change on 04.08.2022 and is given in Annex-21.

It is estimated that the land preparation and construction of the Project can be completed within 18 months in total. It is envisaged that 40 personnel will be employed during the construction phase and 8 personnel will be employed during the operation phase of the Project and the impacts of the Project on the socio-economic environment are explained in Section III.3. In addition, an Environmental and Social Management Plan has been prepared within the scope of the format announced by the Ministry of Environment, Urbanization and Climate Change on 04.08.2022 and is given in Annex-19.

A social baseline and impact assessment has also been conducted in the project area and the report is presented in Annex 17. A stakeholder engagement plan has also been prepared for the Project and is presented in Annex-16. The purpose of the stakeholder engagement plan is to ensure continuous two-way communication between the Investor and different stakeholders and to ensure that information on environmental and social risks and impacts, proposed mitigation measures, resettlement plans, grievance redress mechanisms are regularly shared with project stakeholders.

**V.3. Other (proposed notification and information provision program for the construction of the activity, environmental management plan and emergency action plan, actions to be taken within the scope of the Competence Communiqué in case of EIA Positive Certificate.**

It is foreseen that 40 people will be employed during the construction phase of the planned project and 8 people will be employed during the operation phase. Construction works will be carried out in accordance with the provisions of the "Regulation on Occupational Health and Safety in Construction Works" issued by the Ministry of Labor and Social Security and published in the Official Gazette dated 05.10.2013 and 28786, which includes the minimum health and safety conditions to be taken in construction workplaces.

In addition, the impacts of the Project on the socio-economic environment are explained under Section III.3 and an Environmental and Social Management Plan has been prepared within the scope of the format announced by the Republic of Turkey Ministry of Environment, Urbanization and Climate Change on 04.08.2022 and is given in Annex-19.

In the event that the "EIA Positive" decision is taken for the planned project; in order to ensure the availability of the project throughout its economic life, it will be ensured that the equipment will be regularly maintained and the equipment whose operating life has expired will be renewed and re-commissioned. At the end of the license period of the project, the project can be used for energy purposes again with revisions that can be made in the operation according to the conditions of the day.

Article 18 of the Regulation on Environmental Impact Assessment dated 29.07.2022 and numbered 31907 *"The project owner of the projects for which an "EIA Positive" decision has been given; is obliged to have the project progress report, which includes the developments made in the investment in the periods determined by the commission, prepared by the institutions / organizations that are authorized by the Ministry and are not involved in the preparation of the EIA report of the project in question, upload it to the electronic system and present it during the Ministry inspections.* The *method for the fulfillment of the obligation shall be determined by the Ministry."*

## SECTION VI PUBLIC INFORMATION AND PARTICIPATION AND STAKEHOLDER ENGAGEMENT P L A N

### VI.1. Identification of the relevant public likely to be affected by the project (how and by which methods local people are informed) and reflection of public opinions in the environmental impact assessment study,

The EIA studies related to the project are carried out in Article 9 of the Regulation on Environmental Impact Assessment dated 29.07.2022 and numbered 31907, which states *that "In order to inform the public about the investment and to receive their opinions and suggestions regarding the project; a public information and participation meeting is held on the date determined by the Ministry with the participation of the institutions / organizations authorized by the Ministry and the project owner, at a central place and time determined by the provincial directorate where the relevant public, which is expected to be most affected by the project, can easily reach."*

Within the scope of the Project, the first degree affected group is the local people living in settlements close to the Project area. Local people living in the region and making a living from the region will be primarily affected. In addition, local people living in the neighborhoods (villages) in the immediate vicinity will be indirectly affected.

Pursuant to Article 9 of the "Environmental Impact Assessment Regulation", which entered into force after being published in the Official Gazette dated 29.07.2022 and numbered 31907, a Public Participation Meeting is required to be held under the coordination of the Provincial Directorate of Environment, Urbanization and Climate Change of Muş Governorship on the date determined by the Ministry of Environment, Urbanization and Climate Change to inform the public about the investment and to receive their opinions and suggestions regarding the project.

Accordingly, in order to inform the public about the investment and to receive their opinions and suggestions regarding the project, it was decided to hold the meeting on 01.12.2022 as stated in the opinion of the General Directorate of EIA, Permit and Inspection dated 07.11.2022 and numbered E.4952660 regarding the project. Accordingly, written and verbal meetings were held with Muş Governorship Provincial Directorate of Environment, Urbanization and Climate Change to determine the meeting place and time.

After mutual agreement on the place and time of the Public Participation Meeting, it was deemed appropriate to hold the "Public Participation Meeting" at 10:00 at the Dumlusu Neighborhood Condolence House in Dumlusu Neighborhood, Central District, Dumlusu Neighborhood (Village), Muş Province, as stated in the opinion of Muş Governorship Provincial Directorate of Environment, Urbanization and Climate Change dated 16.11.2022 and numbered E.5023090.

Following the approval from the Governorship of Muş, the announcements including the location, date and time of the Public Participation Meeting were published for 1 (one) day on 18.11.2022 in the local newspaper Muş Şark Haber and the national newspaper Dünya on 18.11.2022 through the Turkish Press Advertisement Agency.

'Yerli-milli kahve' için üniversite-sanayi-çiftçi buluştu

Tarsus OSB'nin altyapısı Haziran 2023'e yetişecek

İŞKUR'DAN ENGELLİ VE ESKİ HÜKÜMLÜLERE HİBE DESTEĞİ

Engelli ve Eski Hükümlü Hibe Desteği başvuruları başladı. Türkiye İş Kurumu Muş İl Müdürlüğü tarafından yapılan duyuruda başvuruların 9 Aralık 2022 tarihine kadar devam edeceği açıklandı.

MUŞ'UN YÜKSEK KESİMLERİNDE KAR VE SİS ETKİLİ OLDU

Muş'un yüksek kesimlerinde kar yağışı, tipi ve sisli hava etkisini gösterdi.

MALAZGİRT'İ GEZEN YABANCI GAZETECİLER KENTİN TANITIMINA KATKI SAĞLAYACAK

Kültür ve Turizm Bakanlığı Tanıtma Genel Müdürlüğüne bağlı Türkiye Turizm Tanıtım ve Geliştirme Ajansı organizasyonuyla destinasyon bazlı markalaşma ve tanıtım çalışması için 8 yabancı gazeteci Muş'un Malazgirt ilçesine geldi.

DOĞU'DA SABAH SAATLERİNDE SİS HAKİM OLDU, YÜKSEK KESİMLERDE KAR BEKLENİYOR

DUYURU
ÇED Sürecine
Halkın Bilgilendirilmesi ve Sürece Katılımı Toplantısı

DUYURU
ÇED Sürecinde
Halkın Bilgilendirilmesi ve Sürece Katılımı Toplantısı

SIĞIRCIKLARIN MUŞ SEMALARINDAKİ DANSI KAMERAYA YANSIDI

Muş'ta sığırcık kuşlarının gökyüzünde dans ederesine uçması görüntülendi.

AFYONKARAHİSAR BELEDİYE BAŞKANLIĞI'NDAN İLAN

SORNOVA VERGİ DAİRESİ MÜDÜRLÜĞÜNDEN İLAN

**Figure VI.1.1.** Newspaper Advertisements dated 18.11.2022

On 01.12.2022 at 10:00 on the date of 01.12.2022, a Public Participation Meeting was held in Dumlusu Neighborhood, where the project area is located, at Dumlusu Neighborhood Condolence House;

- Republic of Turkey Ministry of Environment, Urbanization and Climate Change,
- Republic of Turkey Governorship of Muş Provincial Directorate of Environment,
- Urbanization and Climate Change, Murat Nehri Enerji Üretim A.Ş. and
- Çınar Mühendislik Müşa virlik A.Ş. participated.

Views from the Public Participation Meeting are given below.

**Figure VI.1.2.** Visuals of the Public Participation Meeting

During the meeting, the project was presented by Çınar Mühendislik Müşavirlik A.Ş. for the purpose of introducing the project, informing the public and answering the questions of the public;

- What is Environmental Impact Assessment (EIA)?
- Stages of the EIA Process,
- Introduction and Purpose of the Project,
- Uses in and around the Project Area, Project Area Selection Criteria,
- Project Technology,
- Advantages of Hybrid Power Plants,
- Aspects to be Evaluated in the EIA Process of the Project and Measures to be Taken

The presentation consisting of its content was presented to the public to be listened to by the Provincial Directorate of Environment, Urbanization and Climate Change of the Governorship of Muş, which chaired the meeting, and other institutional participants, and then to receive opinions, suggestions and objections regarding the project. After the presentation, the opinions, objections and suggestions of the public were received and their questions were answered. The Minutes of the Public Participation Meeting prepared by the Provincial Directorate of Environment, Urbanization and Climate Change of Muş Governorship is given in Annex-2.11.

This EIA Report has been prepared to clarify the opinions, suggestions and objections of the public. Following the submission of the EIA Report to the Ministry of Environment, Urbanization and Climate Change, it was deemed sufficient by the commission under Article 12 of the EIA Regulation and the Finalized EIA Report prepared under Article 14 was submitted to the Ministry of Environment, Urbanization and Climate Change for public comments and suggestions. It was opened for consultation by the Governorship of Muşor ten (10) calendar days through suspended announcement and internet. **No positive or negative comments/suggestions or objections have been received** during the Public Announcement Process. The Minutes kept regarding the Suspended Announcement Process are given in Annex-2.21 with the opinion of Muş Governorship, Directorate of Environment, Urbanization and Climate Change dated 25.09.2023 and numbered E.7469791.

**Animal Passageways**

At the Public Participation Meeting held within the scope of the Project, local people requested that a road be left to pass their animals to the MURAT NEHRİ from the planned SPP area within the scope of animal husbandry activities. In this context, the investor has planned to leave two "Animal Passage Roads" within the boundaries of the SPP area. The North Animal Passage Road will be approximately 350 m long and have an area of 14.151 $m^2$ and the South Animal Passage Road will be approximately 525 m long and have an area of 9.971 $m^2$. The animal passage roads and the entire SPP site boundaries will be surrounded by wire fences, and upon the request of the local people at the Public Participation Meeting, no structure such as barbed wire etc. will be added to the wire fences that will harm the animals. Animal Access Roads are shown on all maps and their coordinates are given in Annex-1. The satellite image showing the Animal Access Roads is given in Figure III.1.3.5 in Section III.1.3.

The routes of the Animal Access Roads were clarified in consultation with Dumlusu Neighborhood and local people. Before entering the Animal Access Roads, consent was obtained from the owners of the private land to be used for transportation outside the project area.

## VI.2. Other parties whose opinions should be consulted

The Review and Evaluation Commission (REC) established by the Ministry of Environment, Urbanization and Climate Change for the Project is listed below and the opinions of the relevant commission members have been requested.

- Ministry of Energy and Natural Resources, General Directorate of Mining and Petroleum Affairs
- Ministry of Agriculture and Forestry, General Directorate of Nature Conservation and National Parks) Ministry of Agriculture and Forestry, General Directorate of State Hydraulic Works
- Ministry of Transportation and Infrastructure, General Directorate of Highways
- Muş Municipality
- Ministry of Culture and Tourism, Van Regional Board for the Protection of Cultural Heritage Muş Governorship, Provincial Directorate of Environment, Urbanization and Climate Change
- Muş Governorship, Provincial Directorate of Disaster and Emergency Muş Governorship, Provincial Directorate of Agriculture and Forestry Muş Governorship, Provincial Special Provincial Administration
- General Directorate of Spatial Planning
- General Directorate for the Protection of Natural Assets

Article 6, subparagraph (3) of the "Regulation on Environmental Impact Assessment", which entered into force after being published in the Official Gazette dated 29.07.2022 and numbered 31907, states *that "Unless the "Environmental Impact Assessment Positive" decision or "Environmental Impact Assessment Not Required" decision is taken for the projects subject to this Regulation, incentives, approvals, permits, building and use licenses cannot be granted for these projects, investments cannot be started and tenders cannot be awarded for the project. However, this does not constitute an obstacle to apply for such incentives, approvals, permits and licenses."* Pursuant to the provision, opinions regarding the EIA process have been received from all of the institutions in question, and according to the relevant opinions, all legal requirements will be fulfilled by applying for the necessary permits after the EIA process within the framework of the applicable legislation of the institutions.

## VI.3. Stakeholder Engagement Plan

**(This plan should be a public document that presents plans for the participation of stakeholders directly or indirectly related to the project, affected by the project, communication with stakeholders and sharing of information; should be prepared by the project owner in line with the requirements of environmental and social policies, national and international standards and credit institutions, in the format determined by the Ministry; and should be updated for each stage of the project and according to changing needs and conditions).**

The purpose of the stakeholder engagement plan is to ensure continuous two-way communication between the Investor and different stakeholders and to ensure that information on environmental and social risks and impacts, proposed mitigation measures, resettlement plans, grievance redress mechanisms are regularly shared with project stakeholders. A stakeholder engagement plan has been prepared for the Project and is included in Annex 16.

**PART VII: CONCLUSIONS**
**(Summary of all disclosures made, a general assessment listing the significant environmental impacts of the project and indicating the extent to which the project will succeed in avoiding adverse environmental impacts if realized, the choices between alternatives under the project and the reasons for these choices)**

Murat Nehri Enerji Üretim A.Ş. plans to establish and operate the "Alpaslan II Dam and Hydroelectric Power Plant Auxiliary Source Solar Power Plant Project (41.9916 MWm-62.74 ha)" project in Murat Mevkii of Dumlusu Village and Gölhazal Mevkii of Akkonak Village in Muş province, Merkez district. The coordinates of the usage areas determined within the scope of the planned project are given in the annex of the report (See Annex-1).

The planned project is an auxiliary resource project planned by Murat Nehri Enerji Üretim A.Ş. as an addition to the hydroelectric power plant with a capacity of 280 MWe, which is currently operating within the borders of Dumlusu Village Murat Mevkii and Akkonak Village Gölhazal Mevkii in Muş province, Central district.

With the aforementioned auxiliary resource project, it is aimed to increase the total mechanical installed capacity from 283,520 MWm to 325,5116 MWm without any change in the electrical power of the currently operating 280 MWe hydroelectric power plant.

Alpaslan II Dam and Hydroelectric Power Plant, which is currently in operation, has a production license dated 05.01.2017 and numbered EÜ/6841-5/03642 by the Energy Market Regulatory Authority (See Annex-2.1).

Within the scope of the planned project, within the framework of the Energy Market Regulatory Authority's (EMRA) Decision No. 11234 dated 15.09.2022 (See Annex-2.2); a Solar Power Plant system with a total power of 41.9916 MWm will be added to a total area of 627,441.716 $m^2$ ( 62.74 ha) in the Murat Mevkii of Dumlusu Village and Gölhazal Mevkii of Akkonak Village in Muş province, Central district.

Approximately 10% of the electricity to be generated within the scope of the project will be used for the internal needs of the hydroelectric power plant, which is the main source, and the remaining 90% will be sold within the scope of the license. Within the scope of the project, at least 540 Wp
ELNSM72M-545-HC-HV Series with 20.1% efficiency, si-mono photovoltaic, etc.
76,440 panels will be used. Technical specifications of the solar panels to be used within the scope of the Project are given in the annex of the report (See Annex-2.3).

The energy to be produced in the Auxiliary Source Solar Power Plant will meet the internal needs of the hydroelectric power plant and will meet some of the increasing energy needs of our country. In addition, the region where the project is located will be positively affected by the increase in income, population mobility, education, health and other technical infrastructure services.

The SPP activity is expected to serve for approximately 25 years. However, with technological improvements, the operation period can be extended.

The investment cost of the project is determined as 125.974.800,00 TL. The entire investment and operating cost will be covered by the investor company. If necessary, credit utilization can be provided.

It is planned to employ 40 personnel during the construction phase of the project and 8 personnel during the operation phase. Within the scope of the project, unskilled personnel will be employed from the region as much as possible during the construction phase, contributing to the regional economy.

Within the scope of the planned project, local people will be prioritized as much as possible in the recruitment of personnel and it is planned to contribute to local employment.

The 1/25.000 Scale Land Asset Map showing the Project area and its surroundings i s given in Annex-5. According to the Project 1/25.000 Scale Land Asset Map, although the SPP Area is within irrigated agriculture (insufficient) areas, it is currently within the **"Solar Energy Area qualified"** areas **with non-agricultural use permits**.

The planned project area is located in "Treeless Forest Areas" according to the stand map. In this context, there is no forest area utilization and tree felling specific to the activity (See Annex-6 1/50.000 Scale Stand Map of the Project Area and Surroundings).

The approved Environmental Plan, Legends and Relevant Plan Provisions for the Muş-Bitlis-Van Planning Region with a scale of 1/100.000, where the Project area is located, are given in Annex-3 and the EIA Area and SPP Area are defined as "Dam" in the Environmental Plan with a scale of 1/100.000. However, although the project area appears as "Dam" in the Environmental Plan, it is currently within the **"Solar Energy Area"** areas **that have been granted non-agricultural use permits**.

In addition, part of the project area was previously used as "Construction Site" for the construction of Alpaslan II Dam and Hydroelectric Power Plant.

For the agricultural lands in the project area; within the scope of the Soil Conservation and Land Use Law No. 5403, with the letter dated 20.02.2003 and numbered 2844-002375 of the General Directorate of Agricultural Production and Development of the Ministry of Agriculture and Rural Affairs, a total area of 5469 hectares including the Alparslan II Dam and HEPP project area was given permission for non-agricultural use within the scope of the Regulation on the Protection and Use of Agricultural Lands in force at that time.

The "Non-Agricultural Use Permit Opinion" received by Muş Provincial Directorate of Agriculture and Forestry from the Ministry of Agriculture and Forestry, General Directorate of Agricultural Reform, regarding whether this permit is valid for the planned SPP project is given in Annex-2.4. In the opinion of the General Directorate of Agricultural Reform given in Annex-2.4, it is stated that *"5469 hectares of land with a surface area of 5469 hectares, which was granted permission for non-agricultural use with the letter dated 20.02.2003 and numbered 2844-002375 of the abrogated Ministry of Agriculture and Rural Affairs General Directorate of Agricultural Production and Development, is outside the scope of Law No. 5403, and it is considered that no action can be taken within the scope of Articles 13, 14, 20 and 21 of Law No. 5403 within this area."* In this context, no additional permission, etc. will be obtained for land use.

Muş-Bitlis-Van Planning Region 1/100.000 Scale Environmental Plan Provisions;

**Given under the heading "7.23. Energy Generation Areas and Energy Transmission Facilities";**

*7.23.1. In renewable energy (wind, solar, geothermal, hydroelectric) production areas, within the scope of the permits obtained from the relevant institutions and organizations and the license to be issued by the Energy Market Regulatory and Supervisory Board, provided that the Ministry of Environment and Urbanization's approval is obtained, the master and implementation zoning plans prepared in line with the opinions of the relevant institutions and organizations are approved by the relevant administration without the need for a 1/100.000 scale environmental layout plan amendment, and the plans are sent to the Ministry for information.*

The provisions given under the heading "7.23. Energy Generation Areas and Energy Transmission Facilities" shall be complied with.

In the planned "Alpaslan II Dam and Hydroelectric Power Plant Auxiliary Source Solar Power Plant Project (41,9916 MWm-62,74 ha)", location alternative evaluations have been made while determining the area where SPP panels will be installed and while making these evaluations;

- Distance of SPP areas from settlements,
- Not being on a bird migration route,
- Not being within the areas covered by the Circular dated 03/03/2014 and numbered 2014/1,

- Distance to the existing hydroelectric power plant and infrastructure connections,
- Areas deemed appropriate and/or planned to be deemed appropriate by EMRA,
- The high solar potential of the province,
- The distances to and/or overlaps with mining sites, geothermal water resources, surface water, etc. have been taken into consideration.

Within the scope of the project, in accordance with Article 8- 9 of the "Communiqué on Environmental Impact Assessment Qualification Certificate" published in the Official Gazette dated 29.11.2019 and numbered 30963, Çınar Mühendislik Müş. A.Ş. dated 06.09.2022 and numbered 1038, an information petition was submitted to the Provincial Directorate of Environment, Urbanization and Climate Change of the Governorship of Muş, and land survey studies were carried out in and around the project area on 15.09.2022.

The said Land Survey Petition and Site Investigation Form are given in Annex-2.5.

The location of the Project area in relation to the nearby settlements is shown in the satellite image in Figure I.4.1 and the distances of the settlements to the Project area are given in Table I.4.1. The Project area will be accessible via Erzurum-Muş (D955) highway.

All social and administrative needs of the personnel who will work during the land preparation and construction phase of the Project will be met from the mobile prefabricated construction site, while all needs of the personnel who will work during the operation phase will be met from the existing administrative building of Alpaslan II Dam and HEPP production facility.

During the land preparation-construction phase and operation phase of the Project, the drinking water needs of the personnel will be met by purchasing from the market with carboys. The domestic water needs of the personnel will be met by tanker truck from Dumlusu Neighborhood in accordance with the protocol given in Annex-2.6 during the land preparation and construction phase and from the administrative building of Alpaslan II Dam and HEPP production facility during the operation phase.

Land preparation and construction works are planned to take approximately 18 months. Engineering and preliminary works are planned for 2024-2025, material procurement and construction works are planned to start in 2025, and the planned project is planned to be commissioned in 2026 with assembly and commissioning works. After the equipment procurement and construction works of the planned activity are completed, it is envisaged that the planned activity will be commissioned within 1 month by first test production and then provisional acceptance.

Currently, the Zoning Plans of the project area have been approved, land purchases have been completed, the unification file has been approved, cadastral and expropriation processes are about to be completed. It is planned to start construction by obtaining a construction license after the EIA Decision.

An infirmary will not be established within the project area and in case medical intervention is required for the personnel, they will be referred to the nearest health institution.

Within the scope of the project, it will be necessary to clean the dust on the SPP panels in certain periods in order to utilize solar energy at the best level. Panel cleaning will be done with pure water and no chemicals will be used. Since the panels will be left to dry after the washing process, the washing water will evaporate. In this context, no wastewater generation from panel washing processes is foreseen.

Regarding the wastes that may arise from both personnel and activities during the land preparation, construction and operation phases of the Project, detailed assessments have been made in Section III.1.9 regarding waste sources, estimated annual quantities and disposal methods.

Domestic solid wastes that will be generated during the land preparation, construction and operation phases of the facility will be collected in sealed containers to be placed within the project site as recyclable wastes (metal, cardboard, plastic, etc.) and non-recyclable wastes (organic wastes, etc.). Of these, wastes that can be recovered will be sent to licensed recycling companies.

and wastes that cannot be recovered will be disposed of by the solid waste collection system of the relevant administration (Special Provincial Administration and/or licensed companies).

For all kinds of wastes that may be generated at all stages of the planned project, the provisions of the "Waste Management Regulation" published in the Official Gazette dated 02.04.2015 and numbered 29314, the "Regulation on Landfilling of Wastes" published in the Official Gazette dated 26.03.2010 and numbered 27533, and the "Zero Waste Regulation" published in the Official Gazette dated 12.07.2019 and numbered 30829 will be followed.

The activity subject to the project has been evaluated within the scope of Article-43 *"Solar power plants with a project area of 20 hectares or more or an installed capacity of 10 MWm or more" of* the Annex-1 list of the "Environmental Impact Assessment Regulation" published in the Official Gazette dated 29.07.2022 and numbered 31907 and this EIA Report has been prepared.

During the preparation of the EIA Report, evaluations were made by taking into consideration the positive o r negative impacts of the planned project on the environment, the measures to be taken to prevent or minimize the negative impacts to the extent that they do not harm the environment, and the selected location and technology alternatives.

***Cumulative Impact Assessment***

**Current Situation Studies**

For some environmental components, such as water quality, air quality and noise levels, data collection provides baseline data that also reveals the aggregated impacts of existing actions. Therefore, the methodology to be proposed by experts as baseline data collection becomes an important task for a successful SEIA implementation.

Analyses and measurements were carried out to determine the current situation within the scope of Alpaslan II Dam and Hydroelectric Power Plant Auxiliary Source Solar Power Plant Project (41.9916 MWm-62.74 ha).

The studies carried out for the current situation analysis within the scope of the project are given below.

- $_{PM10}$ measurements at 3 locations,
- Measurements of settled dust at 3 locations,
- 48-hour noise measurements at 3 locations

Additional studies conducted for the assessment of the baseline and impact status of the Project are given below.

- Ecosystem Assessment Report
- Social Baseline and Impact Assessment Report
- Air Quality Modeling Report
- Acoustic Report
- Stakeholder Engagement Plan
- Sustainable Environmental and Social Management Plans (Zero Waste Plan, Traffic Management Plan, Greenhouse Gas Reduction Plan, Environmental and Social Management Plan, etc.)
- Geological-Geotechnical Investigation Report for Zoning Plan

In this framework, the Current Environmental Status Determination Report prepared to determine the existing pollution load of the region is given in Annex-11 and the relevant assessments are given under headings in Section II.2.13.

## Cumulative Evaluation of Air Dispersion Modeling

During the operation phase of the planned project, there will be emissions from vehicle movements during maintenance times. However, since these emissions will be very low, they are not included in the calculations.

The cumulative assessment of PM10 and Sedimentosis emissions that will occur during the land preparation and construction phase of the Project was made by collecting the baseline measurements.

***PM10 and Sediment Measurements***

At 3 points, settled dust measurements and analyzes were carried out for 60 days for one season, and PM10 measurements and analyzes were carried out at 3 points for 30 days for one season.

**Total pollution values** (TKD) were determined by evaluating the ground level concentration values (GLCV) at the points defined in the study areas with the highest GLCV within the scope of Annex-2 of the SDGCC Regulation and in areas with different land use types such as forests, industrial facilities and settlements, and the **total pollution values** (TKD) were determined by evaluating the current status measurement results representing the background and the load on the air quality **of the facilities currently in operation, and** the cumulative evaluation was made separately for each emission parameter below.

**PM10 Concentrations at Ground Level**

The daily and annual PM10 concentrations calculated for the evaluation of the possible impacts of the emissions of the facility planned within the scope of the project on air quality were compared with the limit values defined in the SDGPLR.

The 24-hour maximum and annual maximum values of the annual and 24hour maximum CCC values of PM10 emissions in the model study area are 20.28 $^{\mu g/m3}$ and 5.00 $^{\mu g/m3}$, respectively. The values obtained as a result of modeling studies are below the relevant limit values to be complied with as of 2024.

Within the scope of Annex-2 of the GESCR Regulation, TCDD was calculated for the scenario in which the emissions from the planned projects were modeled at the measurement points with different land use types such as forest areas, agricultural areas and settlements determined in the study areas with the highest HKKD within the scope of Annex-2 and the estimates for long-term PM10 concentrations are given in Table VII.1.

**Table VII.1.** Cumulative Evaluation of Modeling Results and Current Status Measurement Results in terms of PM10 Parameter and Comparison with the SDGPLR Limit Value

| Receiving Media Code | 2024 and Beyond SDGCRG Table 2.2 Limit Value | LONG TERM | | |
|---|---|---|---|---|
| | | Annual Average $_{PM10}$ (Limit Value: 40 µg/m³) | | |
| | | HKKD (µg/m³) | Current Status** (µg/m³) | TKD (µg/m³) |
| | | Modeling Result | | Cumulative Value |
| PM-1 | 40 | 0,016 | 7,87 | 7,886 |
| PM-2 | 40 | 0,011 | 8,96 | 8,971 |
| PM-3 | 40 | 0,006 | 8,77 | 8,776 |

*UVD values: Refers to the arithmetic average of all measurement results.
**UVD values: Refers to the arithmetic mean of the measurement results.

In the sensitive areas examined, no limit exceedance is observed according to the current situation. Emissions of the planned plant are below the annual legal limit value in these regions.

**Concentrations of Settled Dust at Ground Level**

In order to assess the possible impacts of the emissions of the plant planned within the scope of the Project on air quality, the calculated daily and annual settled dust concentrations were compared with the limit values defined in the SDGCCPR.

The maximum 24-hour and annual maximum values of the CCC that will be generated by settled dust emissions in the model study area are 26.07 $^{mg/m2}$ -day and 2.95 $^{mg/m2}$ -day, respectively. The values obtained as a result of modeling studies are below the relevant limit values to be complied with as of 2024.

Within the scope of Annex-2 of the GESCR Regulation, TCDD was calculated for the scenario in which the emissions from the planned projects were modeled at the measurement points with different land use types such as forest areas, agricultural areas and settlements, which were determined in the study areas with the highest HKKD within the scope of Annex-2 of the GESCR Regulation, and the estimates of long-term Settling Dust concentrations are given in Table VII.2.

**Table VII.2.** Cumulative Evaluation of Modeling Results and Current Status Measurement Results in terms of Settling Dust Parameter and Comparison with the Limit Value of SDGPLG

| Receiving Media Code | 2024 and Beyond SDGCRG Table 2.2 Limit Value | LONG TERM | | |
|---|---|---|---|---|
| | | Annual Average Sedimentosis (Limit Value: 210 mg/m²-day) | | |
| | | HKKD (mg/m²-day) | Current Status** (mg/m²-day) | TKD (mg/m²-day) |
| | | Modeling Result | | Cumulative Value |
| CT-1 | 210 | 0,005 | 22 | 22,005 |
| CT-2 | 210 | 0,004 | 27 | 27,004 |
| CT-3 | 210 | 0,001 | 48 | 48,001 |

*UVD values: Refers to the arithmetic average of all measurement results.
**UVD values: Refers to the arithmetic mean of the measurement results.

## Cumulative Assessment of Noise Modeling

The cumulative noise values calculated for the construction phase of the planned project with the current situation measurement results are evaluated and the cumulative noise values calculated for points G-1, G-2, G-3 are given in Table VII.3.

**Table VII.3.** Cumulative Assessment of Planned Project Construction Phase and Current Situation

| Buyers | Modeling Value $_{LDay}$ (dBA) | Measurement Value Average. $_{LDay}$ (dBA) | Cumulative Value $_{LDay}$ (dBA | Limit Value (dBA) | Evaluation |
|---|---|---|---|---|---|
| G-1 | 42,2 | 58,7 | 58,8 | 65 | Suitable |
| G-2 | 43,6 | 54,9 | 55,2 | 65 | Suitable |
| G-3 | 30,0 | 52,7 | 52,7 | 65 | Suitable |

As can be seen from the table above, residential areas are not adversely affected by the possible noise levels during the land preparation and construction works, and the limit value is not exceeded at any point.

The values calculated as a result of the cumulative evaluation of the planned project construction phase and the current situation within the scope of Noise Modeling are below the limit values given in Annex-2 Table 1.1 of the Environmental Noise Control Regulation, which entered into force after being published in the Official Gazette dated 30.11.2022 and numbered 32029, for the nearest settlements.

Noise Modeling maps, results and measures to be taken for the land preparation and construction phases of the Project are detailed in the Acoustic Report presented in Annex-15.

Existing Environmental Assessment Report prepared within the scope of the project is in Annex-11, Ecosystem Assessment Report is in Annex-12, Air Quality Modeling Report is in Annex-13, Reflection and Impact Analysis Report is in Annex-14, Acoustic Report is in Annex-15, Stakeholder Engagement Plan is in Annex-16, Social Baseline and Impact Assessment Report is given in Annex-17, Geological Geotechnical Survey Report for the Development Plan in Annex-18, Environmental and Social Management Plan in Annex-19, Traffic Management Plan in Annex-20, Greenhouse Gas Reduction Plan in Annex-21, Zero Waste Management Plan in Annex-22 and Environmental Monitoring Plan in Annex-23.

## SECTION VIII: NOTES, REFERENCES AND APPENDICES

### VIII.1. Coordinates of the location selected for the project,

UTM 6o ED50 and geographical coordinates of the usage areas identified within the scope of the Project are given in Annex-1.

### The location and alternatives identified for the Project, if any, including the environmental layout plan (with legends and plan provisions), master, implementation zoning plan, site plan or plan amendment proposals, etc. (with legends),

"Alpaslan II Dam and Hydroelectric Power Plant Auxiliary Source Solar Power Plant Project (41.9916 MWm-62.74 ha)" project is planned by Murat Nehri Enerji Üretim A.Ş. in Muş province, Merkez district, Dumlusu Village Murat Mevkii and Akkonak Village Gölhazal Mevkii.

The 1/25.000 Scale Land Asset Map showing the Project area and its surroundings i s given in Annex-5. According to the Project 1/25.000 Scale Land Asset Map, although the SPP Area is within irrigated agriculture (insufficient) areas, it is currently within the **"Solar Energy Area qualified"** areas **with non-agricultural use permits**.

The planned project area is located in "Treeless Forest Areas" according to the stand map. In this context, there is no forest area utilization and tree felling specific to the activity (See Annex-6 1/50.000 Scale Stand Map of the Project Area and Surroundings).

The approved Environmental Plan, Legends and Relevant Plan Provisions for the Muş-Bitlis-Van Planning Region with a scale of 1/100.000, where the Project area is located, are given in Annex-3 and the EIA Area and SPP Area are defined as "Dam" in the Environmental Plan with a scale of 1/100.000. However, although the project area appears as "Dam" in the Environmental Plan, it is currently within the "**Solar Energy Area**" areas **that have been granted non-agricultural use permits**.

For the agricultural lands in the project area; within the scope of the Soil Conservation and Land Use Law No. 5403, with the letter dated 20.02.2003 and numbered 2844-002375 of the General Directorate of Agricultural Production and Development of the Ministry of Agriculture and Rural Affairs, a total area of 5469 hectares including the Alparslan II Dam and HEPP project area was given permission for non-agricultural use within the scope of the Regulation on the Protection and Use of Agricultural Lands in force at that time.

The "Non-Agricultural Use Permit Opinion" received by Muş Provincial Directorate of Agriculture and Forestry from the Ministry of Agriculture and Forestry, General Directorate of Agricultural Reform, regarding whether this permit is valid for the planned SPP project is given in Annex-2.4. In the opinion of the General Directorate of Agricultural Reform given in Annex-2.4, it is stated that *"5469 hectares of land with a surface area of 5469 hectares, which was granted permission for non-agricultural use with the letter dated 20.02.2003 and numbered 2844-002375 of the abrogated Ministry of Agriculture and Rural Affairs General Directorate of Agricultural Production and Development, is outside the scope of Law No. 5403, and it is considered that no action can be taken within the scope of Articles 13, 14, 20 and 21 of Law No. 5403 within this area."* In this context, no additional permission, etc. will be obtained for land use.

Provisions of the 1/100.000 Scale Environmental Plan for the Muş-Bitlis-Van Planning Region;

**Given under the heading "7.23. Energy Generation Areas and Energy Transmission Facilities";**

*7.23.1. In renewable energy (wind, solar, geothermal, hydroelectric) production areas, within the scope of the permits obtained from the relevant institutions and organizations and the license to be issued by the Energy Market Regulatory and Supervisory Board, provided that the Ministry of Environment and Urbanization's approval is obtained, the master and implementation development plans prepared in line with the opinions of the relevant institutions and organizations, without the need for a 1/100.000 scale environmental layout plan amendment, are approved by the relevant administration and the plans are sent to the Ministry for information.*

The provisions given under the heading "7.23. Energy Generation Areas and Energy Transmission Facilities" shall be complied with.

**VIII.3. Information and documents used in the preparation of the Environmental Impact Assessment Report and documents and reports that cannot be presented in the report text from the techniques used in the report,**

The activity subject to the project has been evaluated within the scope of Article-43 *"Solar power plants with a project area of 20 hectares or more or an installed capacity of 10 MWm or more" of* the Annex-1 list of the "Environmental Impact Assessment Regulation" published in the Official Gazette dated 29.07.2022 and numbered 31907 and this EIA Report has been prepared.

Existing Environmental Assessment Report prepared within the scope of the project is in Annex-11, Ecosystem Assessment Report is in Annex-12, Air Quality Modeling Report is in Annex-13, Reflection and Impact Analysis Report is in Annex-14, Acoustic Report is in Annex-15, Stakeholder Engagement Plan is in Annex-16, Social Baseline and Impact Assessment Report is given in Annex-17, Geological Geotechnical Survey Report for the Development Plan in Annex-18, Environmental and Social Management Plan in Annex-19, Traffic Management Plan in Annex-20, Greenhouse Gas Reduction Plan in Annex-21, Zero Waste Management Plan in Annex-22 and Environmental Monitoring Plan in Annex-23.

**VIII.4. Previous documents and studies related to the project (Undergraduate Amendment Application and/or License Amendment Board Decision; EIA Decisions; Ornithological Assessment Report; Landscape Restoration Plan; Geological-Geotechnical Report; Document indicating that all meteorological data used in the report have been obtained for the activity in question -request, receipt, etc.; Document indicating that there is no objection regarding the proximity of the activity to Meteorological Observation Systems (Radar, OMGİ, etc.), etc,**

The distance of the SPP area to be established in the planned project area is approximately 700 meters from the hydroelectric power plant facility currently being operated by the investor company.

In the institutional opinion dated 09.12.2022 and numbered 2022487990 of the General Directorate of Mining and Petroleum Affairs of the Ministry of Energy and Natural Resources of the Republic of Turkey dated 09.12.2022 and numbered 2022487990, it is stated that *"...in the area inquiry made in the system records on 09.12.2022, it has been determined that there is no mining license in force interfering with the project area of 62.74 hectares, and it has been decided by our General Directorate that there is no objection to the construction of Alpaslan II Dam and Hydroelectric Power Plant Auxiliary Source Solar Power Plant project on a total area of 62.74 hectares within the attached coordinates."* (See Annex-2.14).

The project area does not overlap with any current mining area of the General Directorate of Mining and Petroleum Affairs.

In the opinion of Muş Special Provincial Special Administration dated 06.12.2022 and numbered E.10542 and given in Annex-2.15, separate opinions of the Directorate of Culture and Social Affairs, Directorate of Environmental Protection and Control, Directorate of Agricultural Services, Directorate of Road and Transportation Services and Directorate of Zoning and Urban Improvement were taken and as a result, it was found appropriate to realize the SPP investment in the project area.

The Geological Geotechnical Survey Report for the project area is given in Annex-18 and the report was approved by the Provincial Directorate of Environment, Urbanization and Climate Change on 01.12.2022 in accordance with the circular dated 28.09.2011 and numbered 102732.

In the preparation of the sections related to meteorological data within the scope of the Project, in accordance with the opinion of the Republic of Turkey Ministry of Environment, Urbanization and Climate Change, General Directorate of Meteorology given in Annex-2.10, Varto Meteorological Station Long Term Data (1977- 2021) with station number 17778 was used. These meteorological data are given in Annex-2.10.

**VIII.5. Documents previously obtained from relevant institutions related to the project,**

Documents previously received from relevant institutions and organizations related to the project are given in Annex-2.

**VIII.6. Unsigned personnel table showing the departments committed to be employed under the "Communiqué on EIA Qualification Certificate" and for which the EIA Report preparers are responsible,**

Information on the personnel involved in the preparation of the EIA Report and the unsigned personnel table showing the sections of the report for which they are responsible are given in the table under the heading "Description of the Working Group Preparing the EIA Report within the Scope of the Certificate of Competence".

**VIII.7. Power of Attorney Signature Circular and Commercial Registry Newspaper. (E-EIA uploaded to the documents that will not be published in the system (additional file) section),**

By the investor company Çınar Müh. Müş. A.Ş. by the investor company and the Trade Registry Gazette of the investor company have been uploaded to the documents not to be published in the e-CIA system (additional file) section.

**VIII.8. Petition for site inspection by the authorized consultant company in the field of activity, photographs showing the project areas and a report showing that the site inspection was carried out.**

Within the scope of the project, in accordance with Article 8- 9 of the "Communiqué on Environmental Impact Assessment Qualification Certificate" published in the Official Gazette dated 29.11.2019 and numbered 30963, Çınar Mühendislik Müş. A.Ş. dated 06.09.2022 and numbered 1038, an information petition was submitted to the Provincial Directorate of Environment, Urbanization and Climate Change of the Governorship of Muş, and land survey studies were carried out in and around the project area on 15.09.2022.

The said Land Survey Petition and Site Investigation Form are given in Annex-2.5.

During the field survey, it was observed that there are no activities such as studies, land preparation, construction, etc. related to the planned project. Visuals of the site where the Project is planned are given in Section I.3.

## SOURCES


- AFAD, Turkey Earthquake Hazard Map
- EIA and Environmental Permits Branch Directorate, Republic of Turkey Muş Governorship Provincial Directorate of Environment, Urbanization and Climate Change Muş Province 2020 State of Environment Report, MUŞ - 2021
- Dölek, İ. (2014). Muş Earthquakes (September 2013) and the Seismicity of Muş Province. *Makalelerle Muş*, *183*, 204.
- Emre,Ö., Duman,T.Y. and Olgun,Ş., 2012a., 1/250.000 Scale Resisting Fault Map Series, Muş (NJ 37-8) Plate, Series No:39., MTA General Directorate., Ankara-Turkey
- Emre,Ö., Duman,T.Y., Olgun,Ş., Elmacı,H. and Özalp,S., 2012b., 1/250.000 Scale Resisting Fault Map Series, Erzurum (NJ 37-4) Plate, Series No:38., MTA General Directorate., Ankara-Turkey
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- MTA, 1997, 1:100 000 Scale Turkey Geological Maps Series, Erzurum-J 46 Paftası, No:53, Department of Geological Surveys, Ankara
- Şengüler, İ., Neogene Stratigraphy of the Muş Basin and First Results of Coal Exploration Studies in the Region, 67th Geological Congress of Turkey, April 2014, MTA, Ankara

## APPENDICES

**Annex 1** Coordinates of the Project Area

**Annex-2** Official Letters and Documents

- **Annex-2.1** HEPP Production License Certificate
- **Annex-2.2** SPP Amendment Board Decision
- **Annex-2.3** Solar Panels Technical Presentation Document
- **Annex-2.4** Non-Agricultural Use Permit Opinion
- **Annex-2.5** Land Survey Petition and Site Investigation Form
- **Annex-2.6** Construction Phase Water Use Protocol
- **Annex-2.7** Single Line Diagram
- **Annex-2.8** Project Area Property Documents
- **Annex-2.9** Muş Special Provincial Special Administration Zoning Status Opinion
- **Annex-2.10** Meteorological Data
- **Annex-2.11** Minutes of Public Information and Participation Meeting
- **Annex-2.12** DSI General Directorate Opinion dated 12.01.2023 and numbered E.3062356
- **Annex-2.13** Opinion of Muş Provincial Directorate of Disaster and Emergency dated 01.12.2022 and numbered E.435026
- **Annex-2.14** MAPEG Opinion dated 09.12.2022 and numbered E.2022487990
- **Annex-2.15** Muş Special Provincial Administration Opinion dated 06.12.2022 and numbered E.10542
- **Annex-2.16** Opinion dated 14.11.2022 and numbered E.3144597 of Van Regional Board for the Protection of Cultural Assets
- **Annex-2.17** General Directorate of Natural Heritage Opinion dated 05.12.2022 and numbered E.5123821
- **Annex-2.18** KGM, Traffic Safety Department Opinion dated 17.05.2023 and numbered E.1176023
- **Annex-2.19** KGM, Traffic Safety Department Opinion dated 11.07.2023 and numbered E.1226002
- **Annex-2.20** KGM, 11th Regional Directorate Opinion dated 11.08.2023 and numbered E.1261297
- **Annex-2.21** Minutes of Suspended Announcement Process
- **Annex-2.22** General Directorate of Nature Conservation and National Parks Opinion dated 29.09.2023 and numbered E.11447820

**Annex 3** 1/100.000 Scale Environmental Plan, Plan Provisions and Legends for the Project Area and its Surroundings

**Annex-4** 1/25.000 Scale Topographic Map of the Project Area and Surroundings

**Annex 5** 1/25.000 Scale Land Asset Map of the Project Area and Surroundings

**Annex 6** 1/50.000 Scale Stand Map of the Project Area and Surroundings

**Annex-7** 1/25.000 Scale Geological Map of the Project Area and Surroundings

**Annex 8** 1/25.000 Scale Hydrogeology Map of the Project Area and Surroundings **Annex-**

**9** 1/50.000 Scale Hydrology Map of the Project Area and Surroundings **Annex-10**

General Site Plan of the Project Area

**Annex-11** Current Environmental Due Diligence Report

**Annex-12** Ecosystem Assessment Report

**Annex-13** Air Quality Modeling Report

**Annex-14** Reflection and Glare Impact Analysis Report

**Annex 15** Acoustic Report

**Exhibit 16** Stakeholder Engagement Plan

**Annex-17** Social Baseline and Impact Assessment Report

**Exhibit 18** Geological Survey Report for Zoning Plan

**Annex-19** Environmental and Social Management Plan

**Annex-20** Sustainable Traffic Management Plan

**Annex-21** Sustainable Greenhouse Gas Reduction Plan

**Annex-22** Sustainable Zero Waste Management Plan

**Exhibit 23** Environmental Monitoring Plan