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CESE ELEKTRİK ÜRETİM A.Ş.

MAVİ WEIR AND HYDROELECTRIC POWER PLANT (HEPP) PROJECT

ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIA)

TRABZON PROVINCE, MAÇKA DISTRICT

ANKARA-MAY 2012

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PROJECT NAME	**MAVİ WEIR AND HYDROELECTRIC POWER PLANT (HEPP) PROJECT**
MAILING ADDRESS OF PROJECT SITE (PROVINCE, DISTRICT, LOCATION)	**Trabzon Province, Maçka District, Hamsiköy Stream**
PLACE OF THE PROJECT UNDER THE SCOPE OF EIA (ITS SECTOR AND SUB-SECTOR)	**Appendix-II List, Article 32 - River type power plants with installed power between 0-25 MWm**
NAME OF THE ORGANIZATION / WORK GROUP PREPARED THIS REPORT	**ÇINAR MÜHENDİSLİK MÜŞAVİRLİK A.Ş.** **Compliance Certificate No. : 02** **Compliance Certificate Isuue Date: 26.02.2010**
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ABBREVATIONS

AGİ	- Flow Monitoring Station (FMS)
Bkz.	- See
GIS	- Geographical Information Systems
EIA	- Environmental Impact Asssessment
SHW	- State Hydraulic Works (SHW)
EİH	- Energy Transmission Line (ETL)
EPDK	- Energy Market Regulatory Authority (EMRA)
GPS	- Global Positioning System
HES	- Hydroelectric Power Plant
km	- Kilometer
Lt	- Liter (l)
m	- Meter
sn(sec)	- Second (sec.)
Hz	- Hertz (frequency)
dB	- Decibel
TEİAŞ	- Turkish Electricity Transmission Joint Stock Company
TM	- Substation
YSK	- Ground Level Concentration (GLC)

EXECUTIVE SUMMARY

The Environmental Impact Assessment report which includes determination of positive and negative impacts to the environment, prevention of negative impacts or measures for minimization of these impacts, as well as determination of location and technology alternatives, and works for sustainability of monitoring and control of project application.

Construction and operation of Mavi Weir and HEPP Project by utilization of waters of Hamsiköy Stream that is located within the boundary of Maçka district of Trabzon province by CESE Elektrik Üretim A.Ş.

Annual average 2.88 GWh/year firm energy and 25.70 GWh/year secondary energy shall be produced with the commissioning of Mavi HEPP which have 11.60 MWm installed power and this produced energy will be transmitted to the national electricity network by connecting to Maçka Substation via energy transmission line having 4 km length, 33kV and 3.0 AVG section.

Within the scope of this project, construction of Mavi Weir, sedimentation basin, transmission tunnel, headpond, penstock pipe and hydro electric power plant (HEPP) has been planned.

In relation with Mavi Weir and HEPP Project, Electricity Production License numbered EÜ/2452-1/1596 and dated 04.03.2010 from Energy Market Regulatory Authority (EMRA) for 49 years have been obtained within the context of Electricity Market Law numbered 4628. Along with this, water Rights Contract has been signed with General Directorate of State Hydraulic Works (SHW) in 12.01.2010 for 8.287 MWm/8.041 MWe installed power. Theni with the decision of EMRA dated 17.06.2010 and numbered 2600-21 with the amendment of total installed power of Mavi HEPP Project to 11.60 MWm / 11.39 MWe, Supplementary Agreement of Agreement Regarding Water Right and Operating Rules of Mavi Hydroelectric Power Generation Facilities was prepared by the General Directorate of SHW in 17.06.2010.

Regarding Mavi Weir and HEPP project, "Environmental Impact Assessment is not Necessary" decision has been given by Trabzon Provincial Directorate of Environment and Forest dated 22.07.2010 and numbered 940 for 11.60 MWm/11.39 MWe installed power.

This report includes assessment of possible environmental impacts on environment and community of the region during on-going construction and operation phase of the project, and necessary measures for minimizing negative impact. This report has been prepared in accordance with Turkish Legislations and, International Finance Corporation (IFC) and World Bank (WB) policies.

CHAPTER I

LEGAL FRAMEWORK

CHAPTER I: LEGAL FRAMEWORK
I.1. Turkish Environmental Legislations

Laws and regulations to be followed during planning and application phases of the planned project are present within the framework of Turkish Environmental Legislations. Regulations which should be followed during planning and application phases of Hydroelectric Power Plant Projects are listed below:

- Environmental Law numbered 2872 (amended with the law numbered 5491)
- Labour Law numbered 4857
- Meadow Law numbered 4342
- Forest Law numbered 6831
- Soil Conservation and Land Use Law numbered 5403
- Water Products Law numbered 1380
- Environmental Impact Asssessment Regulations

(Entered into force by being published in the Official Gazette dated 17.08.2008 and numbered 26939.)

- Water Pollution Control Regulations

(Entered into force by being published in the Official Gazette dated 31.12.2004 and numbered 25687.)

- Regulation on Pits to be Constructed at Locations Where Construction of Sewer Drain is not Possible

(Entered into force by being published in the Official Gazette dated 19.03.1971 and numbered 13783.)

- Solid Waste Control Regulation

(Entered into force by being published in the Official Gazette dated 14.03.1991 and numbered 20814.)

- Control of Package Wastes Regulation

(Entered into force by being published in the Official Gazette dated 24.08.2011 and numbered 28035.)

- Control of Waste Oil Regulation

(Entered into force by being published in the Official Gazette dated 30.07.2008 and numbered 26592.)

- Control of Waste Plantal Oil Regulation

(Entered into force by being published in the Official Gazette dated 19.04.2005 and numbered 25791.)

- Control of Waste Batteries and Accumulators Regulation

(Entered into force by being published in the Official Gazette dated 31.08.2004 and numbered 25569.)

- Control of Hazardous Waste Regulation

(Entered into force by being published in the Official Gazette dated 14.03.2005 and numbered 25755.)

- Control of Medical Wastes Regulation

(Entered into force by being published in the Official Gazette dated 22.07.2005 and numbered 25883.)

- Regulation on General Principals of Waste Management

(Entered into force by being published in the Official Gazette dated 05.07.2008 and numbered 26927.)

- Regulation on Regular Storage of Wastes

(Entered into force by being published in the Official Gazette dated 26.03.2010 and numbered 27533.)

- Regulation on Assessment and Management of Environmental Noise

(Entered into force by being published in the Official Gazette dated 04.06.2010 and numbered 27601.)

- Excavation Soil, and Construction and Debris Waste Control Regulation

(Entered into force by being published in the Official Gazette dated 18.03.2004 and numbered 25406.)

- Regulation on Control of Soil Pollution and Fields Polluted from Point Source

(Entered into force by being published in the Official Gazette dated 08.06.2010 and numbered 27605.)

- Industrial Air Pollution Control Regulation

(Entered into force by being published in the Official Gazette dated 03.07.2009 and numbered 27277.)

- Air Quality Assessment and Management Regulation

(Entered into force by being published in the Official Gazette dated 06.06.2008 and numbered 26898.)

- Control of Air Pollution due to Heating Regulation

(Entered into force by being published in the Official Gazette dated 13.01.2005 and numbered 25699.)

- Control of Exhaust Gas Emission Regulation

(Entered into force by being published in the Official Gazette dated 04.04.2009 and numbered 27190.)

- Regulation on Permissions and Licenses Required in Accordance with Environmental Law

(Entered into force by being published in the Official Gazette dated 29.04.2009 and numbered 27214.)

- Environmental Auditing Regulation

(Entered into force by being published in the Official Gazette dated 21.11.2008 and numbered 27061.)

- Regulation on Protection and Utilization of Agricultural Fields

(Entered into force by being published in the Official Gazette dated 25.03.2005 and numbered 25766.)

- Water Products Regulation

(Entered into force by being published in the Official Gazette dated 10.03.1995 and numbered 22223.)

- Protection of Wetland Areas Regulation

(Entered into force by being published in the Official Gazette dated 17.05.2005 and numbered 25818.)

- Regulation on Health and Safety during Construction Works

(Entered into force by being published in the Official Gazette dated 23.12.2003 and numbered 25325.)

- Regulation on Structures to be Constructed at Disaster Areas

(Entered into force by being published in the Official Gazette dated 23.12.2003 and numbered 25325.)

Environmental Impact Assessment (EIA) Process in Turkey

Environmental Impact Assessment Regulation was first came into force in Turkey by being published in the Official Gazette dated 07.02.1993 and numbered 21489. The most recent revised revision of the EIA Regulation has come into force by being published in the Official Gazette dated 17.07.2008 and numbered 26939. Along with this, Regulation on Amendment to Environmental Impact Assessment Regulation came into force by being published in the Official Gazette dated 30.06.2011 and numbered 27980.

Within scope of EIA Regulation;

In accordance with the Article 6 of the Regulation, it is necessary to prepare EIA Report and Project Information File (PIF) for the projects listed in Appendix I and Appendix II, respectively.

Environmental Impact Assessment Application File is prepared in accordance with the general format of Environmental Impact Assessment according to Article 8 of the Regulation for the projects listed in Appendix I and this File is presented to the Ministry.

The presented EIA Application File is inspected in the framework of criteria given in Appendix-III of the regulation and a commission composed of relevant organization and institution representatives, Ministry authorities, and project owner and/or its representatives is formed by the Ministry by considering data presented in the application file. Then a Public Participation Meeting is held in order to inform the public regarding the investment, and receive opinion and suggestions of the public in accordance with Article 9 of the Regulation. An announcement specifying the date, time, location and subject of Public Participation Meeting is published at least 10 days before the date of meeting at a national and a local gazette. Following the Public Participation Meeting, Scope and Special Format Determination Meeting to which members of the commission formed by the Ministry is held in accordance with Article 10 of the Regulation. In this meeting, format of the EIA Report and work group to prepare this report is determined by considering main headings of General Format of Environmental Impact Assessment, and opinions and suggesstions of public. The EIA Report is prepared and presented to the Ministry within one year of the determination of special format. The prepared EIA Report is inspected by the members of commission. In accordance with Article 12 of the Regulation, the EIA Report inspected and evaluated by the members of the commission at Inspection and Evaluation Commission Meeting is accepted in its final form, and presented to the Ministry of Environment and Urban Planning. The EIA Report finalized by the commission is presented at the Provincial General Directorate of Environment and Urban Planning, and the Ministry for 10 day in order to receive opinion and suggesstion of public. "Environmental Impact Assessment is Positive" or "Environmental Impact Assessment is Negative" decission is given by the Ministry by considering these opinions as well. In case of failure to initialize the project for 5 years, the "Environmental Impact Assessment is Positive" decission is nullified. If "Environmental Impact Assessment is Negative" decission given for a project, a EIA process can be initiated by applying to the Ministry of Environment and Urban Plannning if all the conditions causing this negative decission has changed.

Project Introduction File is prepared in accordance with the Selection Audition Criteria to which Project Introduction File Preparation will be based on in accordance with Article 16 of the Regulation for the projects listed in Appendix-II, and this file shall be presented to the Ministry. The presented Project Introduction File is examined in accordance with the criteria given in Appendix-IV of the regulation. The Project Introduction File finalized according to examination and evaluations of the Ministry is presented to the Ministry and "Environmental Impact Assessment is Necessary" or

"Environmental Impact Assessment is not Necessary" decission is given. This decission is announced to public by governorship. In case of failure to initialize the project for 5 years, the "Environmental Impact Assessment is not Necessary" decission is nullified. Justified decission for the projects which received "Environmental Impact Assessment is not Necessary" decission, is notified to the Ministry. Projects for which "Environmental Impact Assessment is Necessary" decission is given, are subject to Environmental Impact Assessment according to Article 7 of the regulation. For these projects, Environmental Impact Assessment procedure is initiated within one year according to Article 8 of regulation.

Mavi Weir and HEPP Project is listed in the Appendix-II in accordance with the EIA Regulations that came into force by being published in the Official Gazette dated 17.07.2008 and numbered 26939, and “Environmental Impact Assessment is not Necessary” Decision has been taken from Trabzon Provincial Directorate of Environment and Forestry following preparation of Project Introduction File for Selection-Elimination Criteria and presentation of the file to the Directorate.

I.2. International Environmental Legislations

World Bank (WB) / International Finance Corporation (IFC)

As the proposed project will be financed by the World Bank, it has been evaluated within the framework of relevant guides and source books, and performance standards (PS) of IFC in direction of environmental and social protection policies of World Bank. Furthermore, general Environment Health and Safety (EHS) principles and IFC documents "Environment, Health and Safety Principles for Power Transmission and Distribution" publiched by WB/IFC in April 2007 were also used as technical reference. These documents used as reference during EIA process are summarized below:

WB Protection Policies, Guides/Source Documents

WB has developed a series of protection policies, for the bank and owing personnel, which are used as guide during completion, preparation and application phases of programs and projects. The purpose of these policies is to prevent and reduce damage to people and environment during development process. These policies are composed of "Operational Policies" (OP) present in "Operational Handbook" of WB, and Bank Procedures (BP) and "Best Practices" relevant to execution of bank operations and "Internal Instructions" for personnel.

WB environmental and social protection operational policies and bank procedures are given below:

Environmental Policies;

1. OP/BP 4.01 – Environmental Assessment
2. OP/BP 4.04 – Natural Living Spaces
3. OP 4.09 – Pest Management
4. OP/BP 4.11 – Physical Cultural Resources
5. OP/BP 4.36 – Forests
6. OP/BP 4.37 – Dam Safety

Social Policies;

7. OP/BP 4.12 – Involuntary Relocation
8. OP/BP 4.10 – Local Population

Legal Policies;

9. OP 7.50 International Waterways
10. OP 7.60 Disputed Areas

Environmental assessment of Mavi HEPP Project is within the scope of "OP/BP 4.10:Environmental Assessment" and its appendices (Appendix A, B and C). "OP/BP 4.01:Environmental Assessment" policy defines WB requirements as:

Potential environmental risk and impacts of the project is assessed by EA within area of influence. Project alternatives are investigated, and improvement ways of project selection, design and application are determined via preventing, reducing and recoupment of negative environmental impacts as well as via increasing positive effects. This EA includes reduction and management of negative environmental impacts throughout application of project. The Bank prefers preventive measures to reducing or compensative measuret if applicable. The EA is initialized at the earlies stage of the project as possible and is conducted integrated with economic, financial, institutional, social and technical analyses of the proposed project. The bank reviews EA findings and recommendations, and determines if the projects forms a basis which is sufficient for the bank to finance it.

Category A: The proposed project is classified as Category A if it has sensitive, various and never encountered negative impacts. These impacts may be affecting a larger area than location and facilities subject to physical works. The owner of a project falling within category A is obliged to prepare an EIA report (or regional or sectoral environment assessment report with an appropriate scope).

Category B: If negative impact of a proposed project on areas important in terms of humans and environment - such as wetlands, forests, meadows and other natural living areas - are less than negative effects of a project classified as category A, then this project is classified as Category B. These impacts are limited with the project area, and only very few of them can not be compensated and in most cases, impact reduction measures can be developed much easier than projects classified in category A. EA assessment scope of a project classified in category B can vary from project to project; even though, its scope is limited than that of a category A project. Just as for environmental assessments of category A projects, potential positive and negative environmental impacts of the project is inspected, and measures necessary to prevent, minimize or compensate the impacts and to increase environmental performance are recommended. Findings and results of environmental assessment of a category B project is explained in project documents (Project Assessment Document and Project Information Document).

Category C: If environmental impact of a proposed project is minimum or it does not have any negative impact, then this project is classified in category C. No environmental assessment other than scanning is required for category C projects.

Category FI: If proposed project includes sub-project which may result in negative environmental impacts which utilize investment funds of the bank through financial intermediary institution, then this project is classified under category FI.

Mavi HEPP Project is classified under Category B within the scope of WB "OP 4.01: Environmental Assessment".

In addition to Protection Policies, Environmental Assessment Handbook published in 1991 by the WB and its revisions which include necessary information to manage the EA process within WB requirements are also being used as reference.

IFC Performance Standards (PS) and Manuals

The IFC applies Performance Standards (PS) in order to manage environmental and social risks, and to increase development opportunities in its private sector by providing finance at member states eligable for financing. Performance Standards can also be applied in developing markets by different finance organizations which have decided to apply these standards to projects.

Goals of IFC performance standards are given below:

- Determination and assessment of both positive and negative social and environmental impacts within project area of influence.
- Avoid negative impacts on workers, population and environment of influenced area, or minimize, mitigate or compensate these impacts in cases when avoidance is not possible;
- Enable population of influenced region to give appropriate guarantees for issues which may potentially effect them, and
- Support developed social and environmental performances of companies via effective utilization of management systems.

In general, an investment financed by IFC should meet the below given PS during construction and operation phases of a project:

- PS1: Social and Environmental Assessment and Management System;
- PS2: Labor and Working Conditions;
- PS3: Prevention and Reduction of Pollution;
- PS4: Health, Safety and Security of Community;
- PS5: Land Acquisition and Mandatory Relocation, and
- PS6: Protection of Bio-diversity and Sustainable Natural Resource Management.
- PS7: Local Population
- PS8: Cultural Heritage

In this respect, possible environmental and social impacts of Mavi HEPP Project have been managed on the basis of IFC Performance Standards and relevant manuals.

In addition to performance standards, Environment, Healt and Safety (EHS) manual published in April 2007 by IFC and composed of "General Environment, Health and Safety (EHS) Principles" and "Sectoral Industry Principles" is used a technical reference. EHS manual includes information regarding dangers to be encountered during air emissions, waste water discharges, solid waste management, noise, labor and public healt and safety, and construction, operation and decomissioning phases of project.

CHAPTER II

PROJECT DEFINITION

CHAPTER II: PROJECT DEFINITION

II.1. Planned Project

"Mavi HEPP Project" shall be constructed and operated by CESE Elektrik Üretim A.Ş. which have production company status within the scope of Electrical Market numbered 4628 which came into force by being published in the Official Gazette dated 03.03.2001, and contribute to provision of a part of increasing energy need of Turkey.

Mavi Weir and HEPP Project is located within Black Sea Region, Eastern Black Sea Basin, Trabzon Province, Maçka District and on Hamsiköy Stream which have 151.75 km^2 precipitation (cathment) area.

With the commissioning of the system, annually average total of 28.58 GWh/year energy being 2.88 GWH/year firm energy and 25.70 GWh/year secondary energy shall be produced at the Mavi Hydroelectric Power Plant which have 11.60 MWm/11.39 MWe installed power.

Mavi weir, sedimentation basin, transmission tunnel, 2 approach tunnels, headpond, penstock pipe and power house shall be constructed as primary facilities within the scope of the project. Annually total energy of 28.58 GWh will be produced at the Mavi Weir and HEPP. Utilization of 188 m head difference (fall) between 894th and 706th meters of Hamsiköy Stream is planned with this project. The waters utilized at the Mavi Weir shall be transferred to the headpond via 3,738.045 m transmission tunnel after transferring to the sedimentation basin, and then shall be transferred to the power house via 261.00 m penstock pipe. There shall be two turbines at the power house unit. The energy at 6.3 kV voltage levels produced at the Mavi HEPP generators shall be increased to 33 kV voltage level via transformers and then shall be connected to the Maçka Substation via 4 km long transmission line.

Layout map with 1:25,000 scaled showing project site, units within the scope of the project and layout of vicinity is given in appendix (See Appendix-2).

II.2. Project Objective

Today, studies for application of national programs for ensuring sustainable development via sustainable energy and development of strategies for reaching determined sustainable goals are being executed in many countries. Globalization of energy subject, changing market conditions and followed liberal economic models requires application of energy policies which contribute to economic revival at the utmost level on one hand and which minimize foregn-source dependence on the other.

Ensuring economical development, efficient and reliable energy resources, and a clean environment are stated as most important goals of future in the "Towards Sustainability" subject of the 5th Environmental Action Program of EU.

Hence, Strategic Plan encompassing years 2010-2014 within the framework of energy and natural resources policies was prepared by the Ministry of Energy and Natural Resources. In this plan, Higher Planning Council Decision "Strategy Document of Electricity Market Supply Security" which presents long term goals of Turkey in the electric energy sector is presented in 2009. In the scope of this Strategy Document, inclusion of all domestic coal and hydraulic potential to economy until 2023, attaining 20,000 MW and 600 MW wind and geothermal energy installed power, respectively, and also providing 5% of electricity production from nuclear energy are intended.

Electric energy consumption is one of the most important indicators of economic development and social welfare. Per capita electric energy production and/or consumption in a country present great importance in terms of living standards in that country. Today, Turkey, as a fast developing and industrializing country, requires uninterrupted, high quality, reliable and economic energy.

Per capita electricity consumption is 6,926 in Euro Area, 7,111 in Germany, 6,253 in England, 7,938 in France, 5,669 in Italy, 6,998 in Netherlands, 15,440 in Sweden, 8,510 in Belgium, 6,663 in Denmark, 6147 in Spain, 15971 in Luxemburg, 16,120 in Finland, 5,242 in Greece and 4,663 in Portugal[(1)]; this indicates that the per capita energy consumption is quite low in Turkey. Therefore, necessity of increasing electric energy supply is obvious.

Especially, energy requirement is constantly incerasing in Turkey. Therefore, meeting this requirement is a necessity. Hydroelectric energy constitutes great importance in terms of utilization of our renewable energy resources which are clean, natural, least environmentally harmful energy resources, in meeting this necessity.

Gross hyroelectric potential is at least 433 billion kWh/year for Turkey, and this value is approximately 1% of total global value. The share of Turkey among total European hyroelectric capacity is 14%. In future, utilization of 216 billion kWh/year hyroelectric energy potential which can be technologically utilized will be possible in a high ratio. Economic hyroelectric energy potential identified by SHW in 2009 is approximately 130 billion kWh. It is estimated that additional electric energy between 10 and 15 billion kWh can be produced from small hyroelectric facilities which are not yet surveyed and having 1 to 30 MW capacity throughout the country . Along with this, it is expected to increase the economic hyroelectric potential to 170-180 billion kWh level via conversion of many technically feasible investments which are determined as a result of re-assessment of studies conducted at river basins within the framework of current economic criteria, to economically feasible investments.

There are total of 208 operational hydroelectric power plants in Turkey as of end of 2009. These power plants have approximately 14,300 MW installed power and 50,000 GWh annual average electricity production capacity which corresponds to 38% of total economic potential.

As production of hydroelectric power plants depends on precipitation conditions, its production rate shows variations throughout a year. Hydroelectric power plants have two important characteristics of renewable and peak operation when compared with fossil and nuclear fuel thermal and natural gas power plants when electricity production is considered.

As a result, improvement of renewable sources such as hyroelectric has great importance for Turkey as for all around the world.

In this respect, it is aimed to contribute to increasing energy requirement of Turkey by construction and operation of Mavi Weir and HEPP Project by CESE Elektrik Üretim A.Ş. over Hamsiköy Stream of Maçka district of Trabzon province. The planned Mavi HEPP project having 11.60 MWm / 11.39 MWe installed power shall contribute to national development by producing energy of 28.58 GWh per annum.

[1] Assistant Professor Levent Kösekahyaoğlu, Baseless Relationship between Energy Consumption and Development, Turkey Case, Süleyman Demirel Üniversity (In Turkish)

II.3. Progress of the Project

Environmental Impact Assessment works were started to assess planned project's positive or negative effects to the environment, to prevent or minimize the negative effects of the project to the environment, for evaluation of the chosen project area and technological alternatives and to monitor and control of the implementing project. After the Environmental Impact Assessment works the construction works was started in accordance with the permissions taken and most of the construction period is finalized.

In this context;

- For Mavi Weir and HEPP project, "Environmental Impact Assessment is not Necessary" decision has been given, dated 22.07.2010 and numbered 940 for 11.60 MWm/11.39 MWe installed power (See Appendix-1.1)
- Electricity Production License numbered EÜ/2452-1/1596 and dated 04.03.2010 from Energy Markt Regulatory Authority (EMRA) for 49 years have been obtained within the context of Electricity Market Law numbered 4628 (See Appendix-1.2).
- Along with this, water Rights Contract has been signed with General Directorate of State Hydraulic Works (SHW) in 12.01.2010 for 8.287 MWm/8.041 MWe installed power (See Appendix-1.3).
- With the amendment of total installed power of Mavi HEPP project to 11.60 MWm/11.39 MWe, Supplementary Agreement of Agreement Regarding Water Right and Operating Rules of Mavi Hydroelectric Power Generation Facilities were prepared by the General Directorate of SHW (See Appendix-1.4).
- Final permissions have been taken from Trabzon Regional Directorate of Forestry, General Directorate of Forestry for areas classified as forest within the project area (See Appendix-1.5).

II.4. Project Location

Mavi Weir and HEPP project is located within Maçka district of Trabzon province and on Hamsiköy Stream. The project site is 34 km away from Trabzon province and 11 km away from Maçka district center.

The satellite image showing transportation to the site is given in Figure II.4.1. and location map of the project is given in Figure II.4.2.

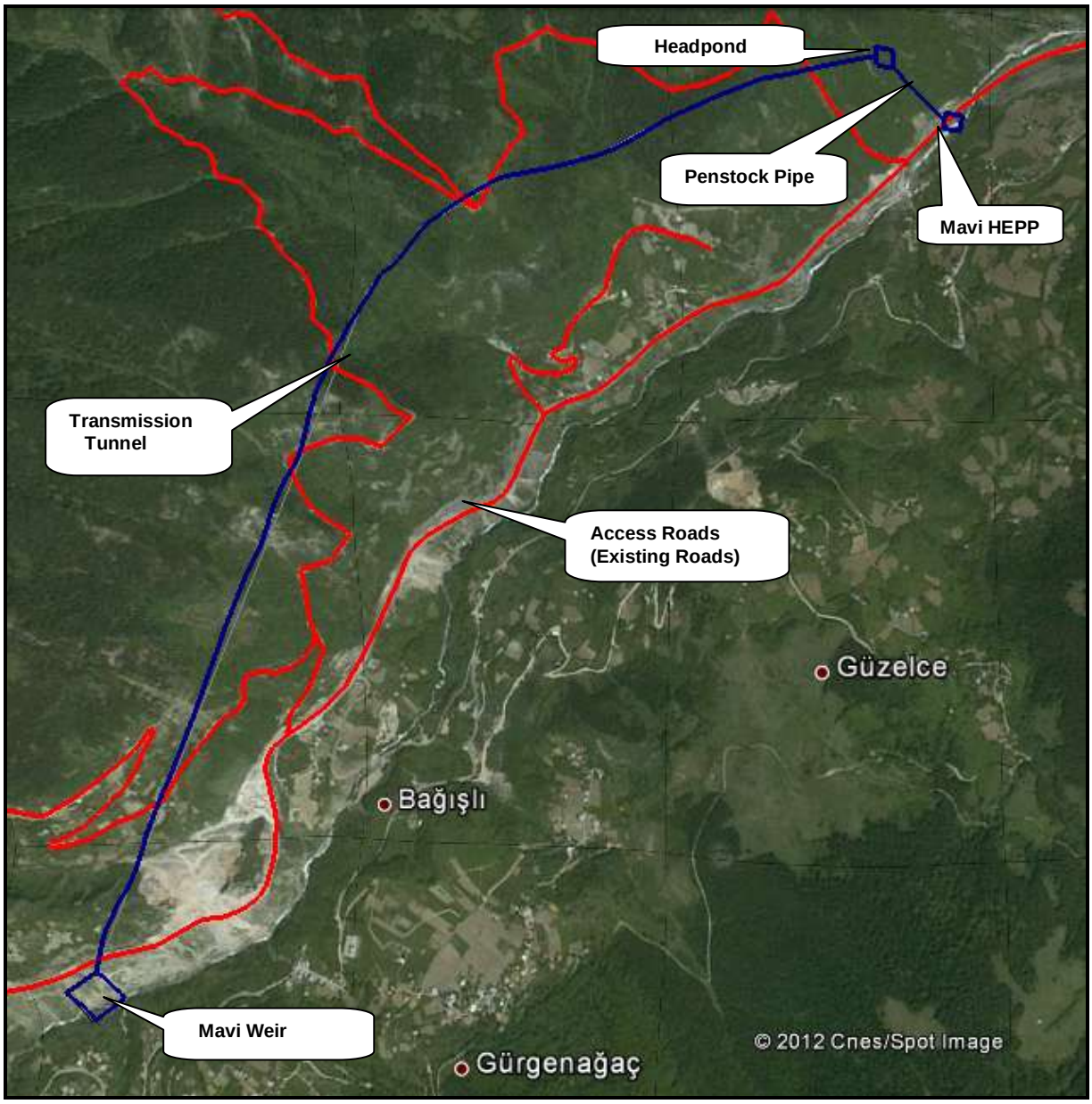


Figure II.4.1. Satellite image showing transportation to the site

Weir that is located over Hamsiköy Stream shall utilize the 188 m head difference (fall) between 894.00 and 706 m elevation of Mavi Weir and HEPP Project that is planned at 885.50 thalweg elevation, and Hamsiköy Stream.

The settlement areas closest to the project site and their distances to the project units are given below, and access to the project site is made through the existing roads of Bağışlı, Gürgenağaç and Güzelce villages.

Tablo II.4.1. Settlement Areas Closest To Project Units

Unit	Settlement Area	Distance (m)	Direction
MAVİ WEIR	Bağışlı Village	940	Northeast
MAVİ WEİR	Gürgenağaç Village	1,100	East
Transmission Tunnel	Bağışlı Village	550	East
Power House	Güzelce Village	1,680	South

Figure II.4.2. Location Map of Project Site

1/25,000 scaled land usage map for the project site is given in Figure II.4.3. As a result of the analysis of the land usage map, all of the project units are located on the lands of “Brown Soil Forest” (M) in terms of the “Great Soil Groups”. Lands of “Brown Soil Forest” are formed on the substrate having the property with high lime content. They have poorly developed layers and they aren’t suitable for agriculture. They are classified as number VI and number VII (soils unfitting for cultivated plot) in terms of land usage capability. When the current land usage was examined; heaths lands (F), forestry lands (O) and nut lands (Zf) have been observed in the project area. Some parts of the project units are located on the fallowless dry farming areas (NM). In the "Regulation on the Protection and Usage of Agricultural Lands”; Lands of dry farming are defined as; lands of which are still not irrigated or not covered in the irrigation projects of the State's investments and crop water requirement can be met only by natural rainfall.

According to the 1/25,000 scaled land usage map; headpond, penstock pipe and power house are located on heaths lands and Mavi weir is located on dry farming areas. Transmission tunnel, on the other hand, passes through heaths, forestry and dry farming areas.

For forest areas within the scope of the project, permissions for two parts of 699 m^2 ve 38,362 m^2 surface areas have been taken from “Hamsiköy Forest Sub-District Directorate” of “Trabzon Regional Directorate of Forestry”. Along with this, expropriation of personal lands within the scope of the project has been completed and list of the expropriated lands are given in appendices (See App.-1.5).

Photographs of the project site are given in Figures II.4.4 through II.4.6.

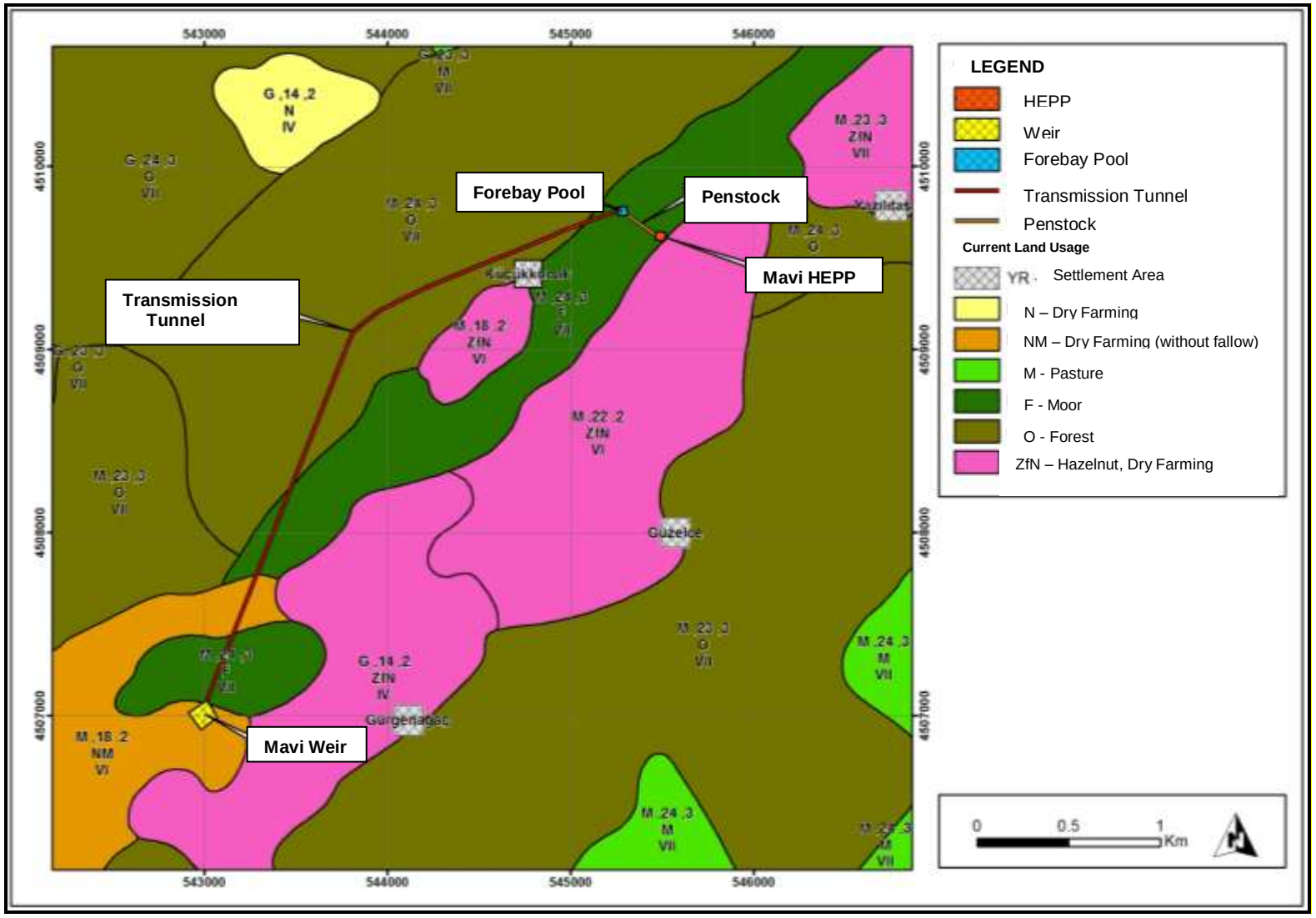


Figure II.4.3 1/25,000 Scaled Land Usage Map of the Project Site

Figure II.4.4. A View from Transmission Tunnel

Figure II.4.5. A View from Power House Construction

Figure II.4.6. A View from Penstock Pipe Route

II.5. LAND USAGE AND OWNERSHIP STATUS

The land at Maçka District is mountainous and rough. Most of the area is covered with forests. There are few agricultural lands. The agricultural lands located at high elevation, sloped lands and which have high slope gradient are lands which do not contribute in terms of economy and these areas are utilized only to meet daily needs of the local population.

All of the project units within the scope of Mavi Weir and HEPP Project is located within Brown Forest Lands according to 1/25,000 scaled Land Usage Map.

Mavi HEPP Project passes through forest and personal lands, and permissions in accordance with Article 17 of Forest Law numbered 6831 has been taken for forest lands within the project's scope. Expropriation of personal lands within the scope of the project has also been completed.

II.6. PHYSICAL PROPERTIES AND TECHNOLOGY OF THE PROJECT

Within the scope of this project, construction of Mavi Weir, water intake structure, transmission system, headpond, penstock pipe and hydro electric power plant (HEPP) has been planned. Waters from Mavi Weir which shall be constructed at 885.50 m thalweg elevation and Hamsiköy Stream shall be transferred to sedimentation basin having 887.60 m base elevation, then shall be transmitted to the headpond with 874.95 m base elevation via 3,738.045 m transmission tunnel. Waters from headpond shall be dropped down to Mavi HEPP via 261.00 m lond penstock pipe and thus energy production is planned.

The facilities proposed to be constructed within the framework of Mavi Weir and HEPP Project shall not have a large dam reservoir as the project is a run of the river type power plant and the water to be utilized for energy production shall be exchanged via weir. Water volume of 75,000 m^3 will be composed behind the weir as of commissioning of all the facilities within the scope of the project.

Mavi Weir

The axis of the Mavi Weir is located on Hamsiköy Stream. The axis is located within 1/25,000 scaled Trabzon G43 - d1 quantile. The weir is selected as filled body, gated (shuttered) forward intake type. Normal water level of Mavi Weir is 894.00 m. Thalweg elevation at weir axis is determined as 885.50 m.

Water Intake Structure and Sedimentation Basin

The water from the weir is transmitted to the sedimentation basin. The sedimentation basin starts at 887.60 m base elevation and terminates at 885.00 m base elevation. The unit width of the sedimentation basin is 5.60 m, its length is 35.00 m and there are two units present.

Transmission Tunnel

The water converted via Mavi Weir shall be transferred to the headpond after the sedimentation basin via transmission tunnel. The transmission tunnel of Mavi HEPP project is designed as a free surface, covered type, modified horse shoe sectioned tunnel. Excavation diameter of the tunnel is 3.60 m which is the economically smallest diameter. Inner diameter of the tunnel which has 30 cm concrete wall thickness is 3.00 m. Total length of the tunnel is 3,738.045 m and its slope gradient is constant and is determined as 0.0004 as a result of optimization works.

Headpond

The headpond of the project have a reservoir which can sustain the flow rate of the project for at least 1.5 minutes in order to compensate sudden changes. The normal water level, minimum water level and base elevation of the headpond is 887.00 m, 881.40 m and 874.95 m, respectively. The headpond have circular section and its inner diameter is 12.0 m. A lift gate of 1.50x1.20 m dimensions shall be constructed at the end of the headpond and entrance of the penstock pipe in order to cut the water entering the penstock pipe.

Penstock Pipe

Penstock pipe entrance axis elevation is 876.75 m. Penstock pipe comes after the sedimentation basin and have 261.00 m length and 1.60 m inner diameter. It shall be constructed from St 37 steel and shall have 10 mm wall thickness.

Mavi HEPP

The purpose of the Mavi HEPP project is energy production. The waters converted via Mavi Weir shall be transferred from sedimentation basin to the headpond via transmission tunnel and then to the power house via penstock pipe, and energy shall be produced at the turbines. Total installed power of the Mavi HEPP is 11.60 MW and it shall produce total energy of 28.58 GWh annually. The dimensions of the power house are 21.50 m, 45.40 m and 23.80 m (WxLxH). Power house shall be constructed on the surface.

Characteristics of the project units are given below:

HYDROLOGY

Weir Location Watershed Area	: 151.75 km^2
Weir Location Ave. Flow rate	: 2.49 m^3/s
Weir Location Ave. Annual Total Flow	: 77.35 hm^3

WEIR AND SEDIMENTATION BASIN

Weir type	: Front Flow, Filled Body, Gated
Thalweg elevation	: 885.50 m
Crest elevation	: 894.50 m
Sedimentation Basin Initial Elev.	: 887.60
Sedimentation Basin Unit Width	: 5.60 m
Sedimentation basin Length	: 35.00 m
Sedimentation Basin Number of Units	: 2

TRANSMISSION TUNNEL

Section	: Modified Horse Shoe
Type	: Free Surface, Plated
Excavation Diameter	: 3.60 m
Inner Diameter	: 3.00 m
Concrete Wall Thickness	: 0.30 m
Length	: 3,738.045 m
Slope Gradient	: 0.0004
Water Height (Q=5,50 m^3/s)	: 2.08 m

APPROACH TUNNEL 1

Section	: Modified Horse Shoe
Type	: Unplated
Excavation Diameter	: 3.60 m
Inner Diameter	: 3.00 m
Concrete Wall Thickness	: 0.30 m
Length	: 256 m

APPROACH TUNNEL 2

Section	: Modified Horse Shoe
Type	: Unplated
Excavation Diameter	: 3.60 m
Inner Diameter	: 3.00 m
Concrete Wall Thickness	: 0.30 m
Length	: 175.5 m

HEADPOND

Pond Diameter	: 12.00 m
Pond Base Elev.	: 874.95 m
Normal Water Level	: 887.00 m
Max. Water Level	: 890.00 m
Min. Water Level	: 881.40 m
Side Sluiceway Crest Elev.	: 889.50 m
Sluiceway Crest Elev.	: 10.00 m

PENSTOCK PIPE

Type	: Buried / Concrete Supported
Material	: St 37
Diameter	: 1.60 m
Average Wall Thickness	: 12 mm
Length	: 261.00 m
Number of Branch Ducts	: 2
Branch Duct Diameter	: 1.15 m

POWER HOUSE

Type	: Surface Construction
Structure Length	: 45.40 m
Structure Width	: 21.50 m
Structure Height	: 23.80 m

ANNUAL ENERGY PRODUCTION

Installed Power (MW)	: 11.60 MW
Firm Power (MW)	: 0.346 MW
Firm Energy	: 2.88 GWh/year
Secondary Energy	: 25.70 GWh/year
Total Energy	: 28.58 GWh/year

TURBINE

Type	: Horizontal Shafted Francis
Number of Units	: 2
Turbine Power (Single Unit)	: 5.80 MW

Material Areas:

Concrete and concrete aggregate material required for reinforced concrete works has been supplied from fields/facilities which have previously acquired “EIA is Not Necessary” Decision and which are present within the project's scope. Excavation materials to be produced during the construction activities have been utilized for cover material at the remedied roads or during rehabilitation of material field.

Crushing-Sieving Facility and Concrete Plant:

The aggregate material required for concrete facility has been acquired from sand-gravel pit and crushing, sieving and washing facility. Crushing-Sieving Facility and Precast Concrete Plant has been constructed which will be operated only during construction stage of Mavi Weir and HEPP Project. “Environmental Impact Assessment is Not Necessary” Decision dated 17.08.2011 and numbered 1216 have been given by the Trabzon Provincial Directorate Environment and Forests for Crushing-Sieving Facility (See Appendix-1.6).

Energy Transmission Line

Annual average 2.88 GWh/year firm energy and 25.70 GWh/year secondary energy shall be produced with the commissioning of Mavi HEPP which have 11.60 MWm /11.39 MWe installed power and this produced energy will be transmitted to the national electricity network by connecting to Maçka Substation and then to the interconnected system via energy transmission line having 4 km length, 33 kV and 3.0 AVG section.

1/25,000 scaled topographic map showing energy transmission line route has been given in Appendix-3. During the transmission line routing and construction, migratory or local bird routes, particularly protected areas and cultural areas have been avoided. Necessary permissions shall be taken for the areas located on the ETL route prior to the initialization of construction of the ETL.

The transmission lines are subject to the provisions of the the Environmental Impact Assessment (EIA) Regulation that came into force by being published at the Official Gazette dated 17.07.2008 and numbered 26939. 154 kV and higher voltage lines with length between 5 to 15 km are listed at the Article 32 of Appendix List II of this Regulation and “EIA is necessary” or “EIA is not necessary” decision has to be taken for these. 154 kV and higher voltage lines with length of 15 km or higher are listed at the Appendix-I of Article 32 of the same Regulation and they can be constructed after taking “EIA is positive” decision. Electric energy to be produced within the scope of Mavi Weir and HEPP Project shall be transferred to the interconnected system via Energy Transmission Line of 33 kV voltage and approximately 4 km length. Accordingly, it is out of the scope of the EIA Regulation due to the negligible environmental effects and EIA is not necessary (See Appendix-1.7).

Site Facilities and Access Roads

Existing Roads of Bağışlı and Gürgenağaç villages that continue through Hamsiköy Stream are being used for access to site facilities and other project units. Access to the project site via these village roads can be achieved throughout the year. Satellite image showing access road to project site is given in Figure II.4.1. The 1,400 m long forest road has been utilized for transportation to the project site tunnel area and necessary permissions for this new road has been taken from the Regional Directorate of Forests. Appendix-1.5). **There is currently no additional road work at the project site.**

Deformation of roads which may occur due to movement of construction machinery to be used during construction of project structures will be compensated by the company. Vehicle traffic due to movement of construction machinery at the access road during construction works is being performed in a manner not to effect local population and safe manner.

II.7. EMPLOYMENT

As a result of construction works of this project and following the commissioning of the project, new employment possibilities has arisen for the local population. 74 persons have been employed during site preparation and construction phases of the project, and employment of 14 persons during operating phase of the project is planned. Personnel requirement has been supplied primarily from settlement areas located in the close vicinity of the project area. Along with this, as the daily trade requirements of the employees are supplied from settlement areas in the close vicinity of the project area, an additional income source has been created for the local population as a result of project activities. In addition to this, local population have learned new field of professions and have found a chance to improve themselves on these subjects.

CHAPTER III

CURRENT ENVIRONMENTAL CHARACTERISTICS OF THE PROJECT SITE AND ITS IMPACT AREA

CHAPTER III. CURRENT ENVIRONMENTAL CHARACTERISTICS OF THE PROJECT SITE AND ITS IMPACT AREA

III.1. PROPERTIES OF PHYSICAL ENVIRONMENT

III.1.1. METEOROLOGICAL AND CLIMATE CHARACTERISTICS

General Climate Conditions of the Region

Mild climate under the influence of sea is dominant in Trabzon. Therefore, summers are generally moderately hot and winters are warm. An important characteristic of Trabzon province is variation of precipitation conditions in short distances due to topographical structure and creation of microclimate areas. Due to this, considerable differences are observed in the annual precipitation amounts between shoreline areas and inner areas of the province. A smooth transition occurs during spring and fall, and considerable amount of rain occurs.

Results of constant meteorological measurements performed by General Directorate of Meteorology has been assessed in order to evaluate meteorological conditions at the project site and its vicinity, and the most appropriate meteorology station results are presented in tables and charts. In this context, meteorological data of Trabzon Meteorology Observation station between 1975 and 2011 (36 year) has been utilized and the records are given in appendix (See Appendix-1.8).

Temperature Distribution

According to Giresun Meteorology Station observation records, average annual temperature is 15.2°C, annual average of maximum temperatures is 18.3°C, and annual average of minimum temperatures is 12.2°C.

The month with the lowest average monthly temperature is January with 7.1°C average values, and the one with the highest average temperature values is August with 25°C average value.

According to observation records of Trabzon Meteorology Station, maximum and minimum temperatures of 35°C and -4.0°C were measured in 23.04.2008 and 27.01.2010, respectively.

Temperature data is presented in Table III.1.1.1. and III.1.1.2. and chart representation is presented in Figure III.1.1.1.

Table III.1.1.1. Long Term Temperature Data

METEOOLOGICAL PARAMETER	MONTHS												
	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	ANNUAL
Average Temperature (°C)	7,1	7,4	9,4	11,1	16,1	21,6	24,3	25	21,6	17,3	12	9,7	15,2
Average of Maximum Temperatures (°C)	10,5	11	13,4	14,1	18,8	24,1	26,6	27,6	24,4	20,4	15,8	13,7	18,3
Average of Minimum Temperatures (°C)	4,3	4,4	6,3	8,3	12,9	18,3	21,3	22,4	18,9	14,6	9	6,6	12,2

Source: 1975-2011 Data of Trabzon Meteorology Station.

Table III.1.1.2. Temperature Data

METEOROLOGIC PARAMETER	MONTHS												
	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Maximum Temp. Day	2	16	24	23	31	2	26	6	8	10	10	2	23
Maximum Temp. Year	2010	2010	2008	2008	2006	2010	2011	2010	2007	2011	2010	2010	2008
Maximum Temp. (ºC)	22,9	25,0	33,1	35,0	34,2	32,0	31,0	31,3	29,5	29,6	28,7	26,0	35,0
Minimum Temp. Day	27	1	4	12	9	4	1	12	28	20	12	28	27
Minimum Temp. Year	2010	2007	2009	2009	2011	2008	2011	2009	2009	2011	2011	2006	2010
Minimum Temp. (ºC)	-4,0	-1,3	0,0	3,2	7,1	11,1	16,0	17,0	9,4	7,6	2,0	-2,3	-4,0

Source: 1975-2011 Data of Trabzon Meteorology Station.

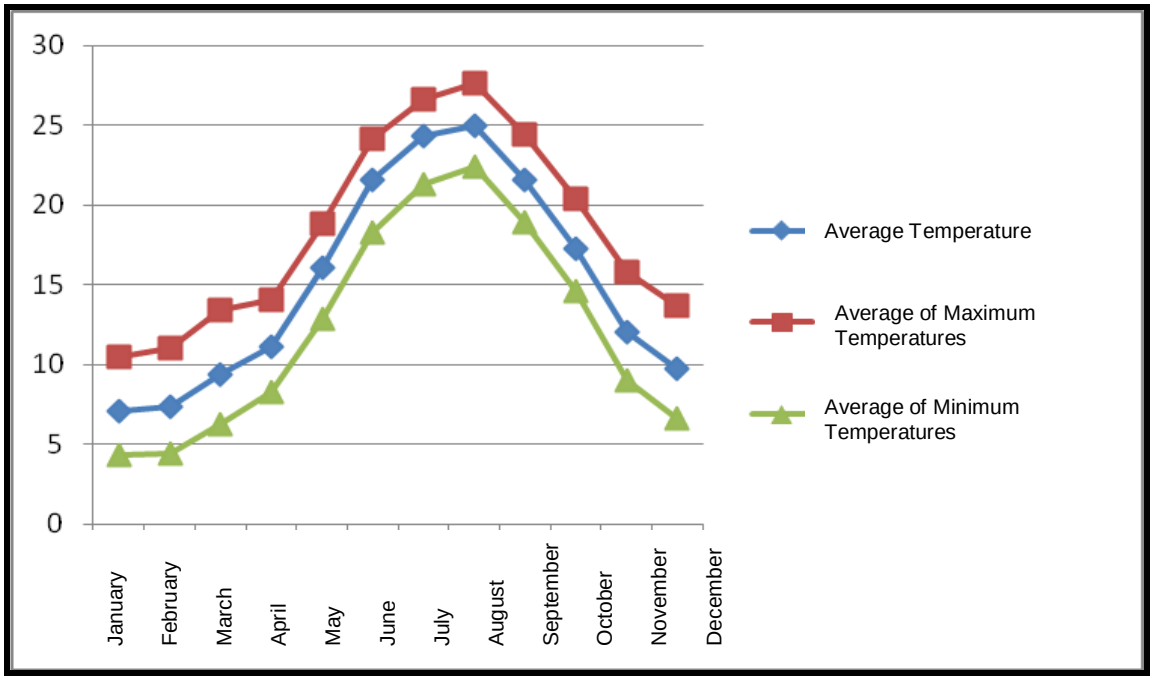


Figure III.1.1.1. Temperature Data Chart

Precipitation

According to observation records of Trabzon Meteorology Station, average annual total precipitation is 825.5 mm. The month with highest precipitation is October with 138.9 mm, and the one with the lowest precipitation is August with 19.7 mm precipitation value. Daily maximum precipitation value is 89.2 mm.

Precipitation data is presented in Table III.1.1.3. and chart representation is presented in Figure III.1.1.2.

Table III.1.1.3. Long Term Precipitation Data

METEOROLOGIC PARAMETER	MONTHS												
	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	ANNUAL
Average Total Precipitation (mm)	83,1	61,6	62,6	66,8	54,8	39,7	44	19,7	86,4	138,9	107,6	60,3	825,5
Max. Precipitation (mm)	33,4	24,1	39,7	23,8	39	20,5	35	14,5	36,7	89,2	71,8	29,6	457,3

Source: 1975-2011 Data of Trabzon Meteorology Station.

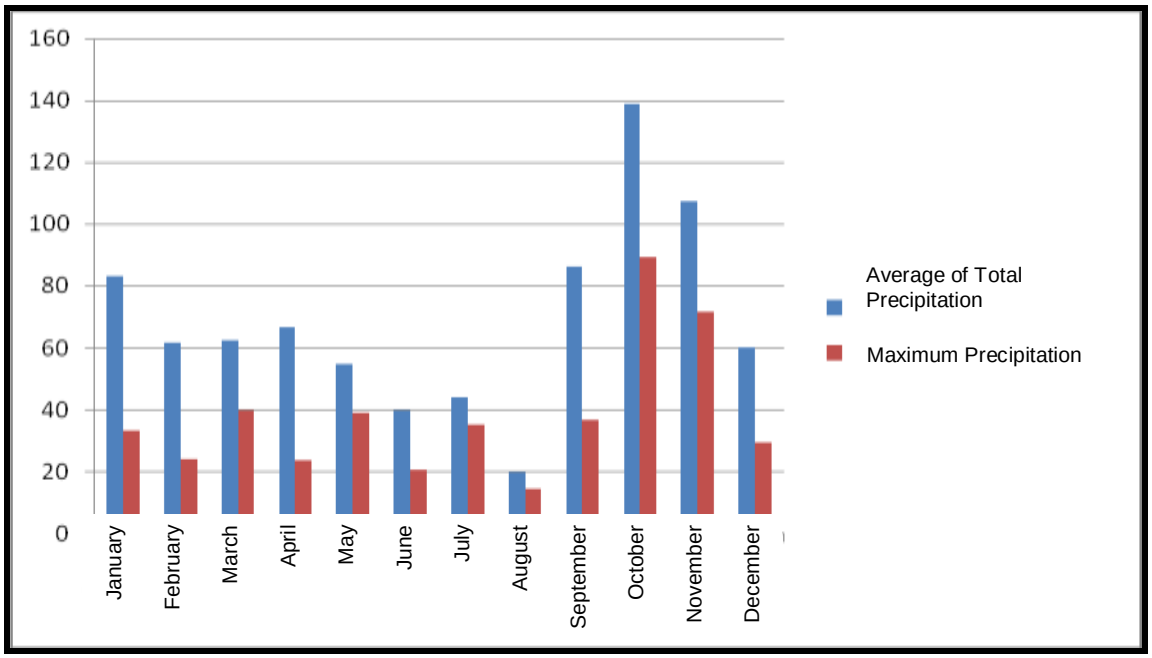


Figure III.1.1.2. Precipitation Data Chart

Number of Days

According to observation records of Trabzon Meteorology Station, number of average annual snowy days is 7.8, and average of annual snow cover days is 4.5. Maximum snow thickness was measured in February with 37 cm. Average number of foggy days is 5.7.

Number of days data is presented in Table III.1.1.4. and chart representation is presented in Figure III.1.1.3 and III.1.1.4.

Table III.1.1.4. Number of Days Data

METEOROLOGIC PARAMETER	MONTHS												
	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	ANNUAL
Number of Snowy Days	3,2	2,7	0,3					0,2			0,2	1,2	7,8
Number of Snow Cover Days	2,3	1										1,2	4,5
Maximum Snow Cover Thickness (cm)	26	37	7								6	17	37
Average Number of Foggy Days		0,3	1,8	2,2	1,2					0,2			5,7
Average Number of Hail Days					0,2					0,2			0,4
Average Number of White Frost Days	3,3	2,3	0,7									2,2	8,5

Source: 1975-2011 Data of Trabzon Meteorology Station.

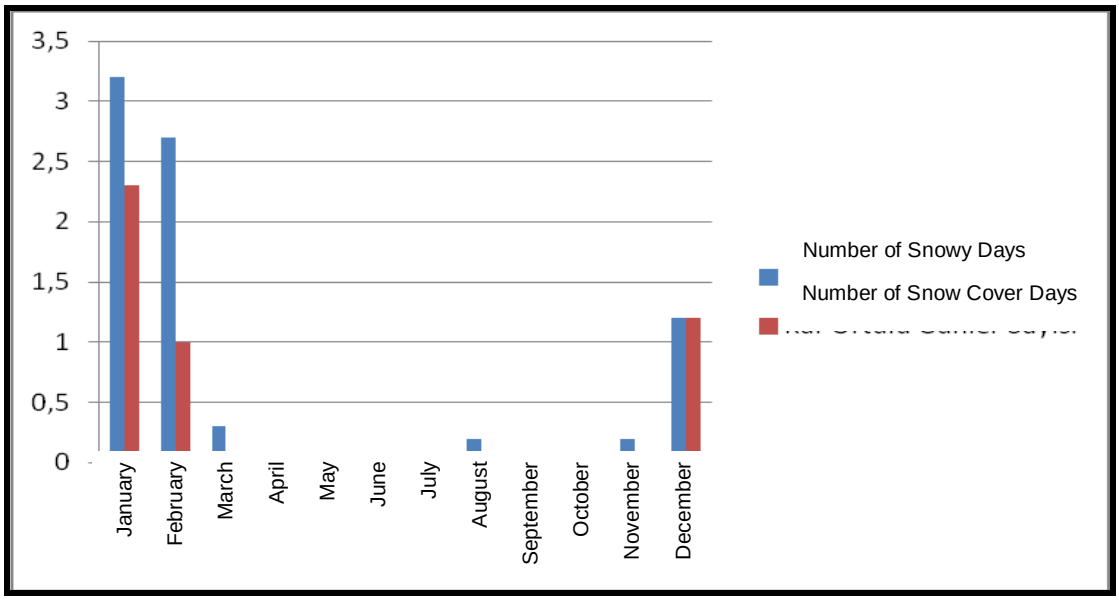


Figure III.1.1.3. Chart of Snow and Snow Cover Days

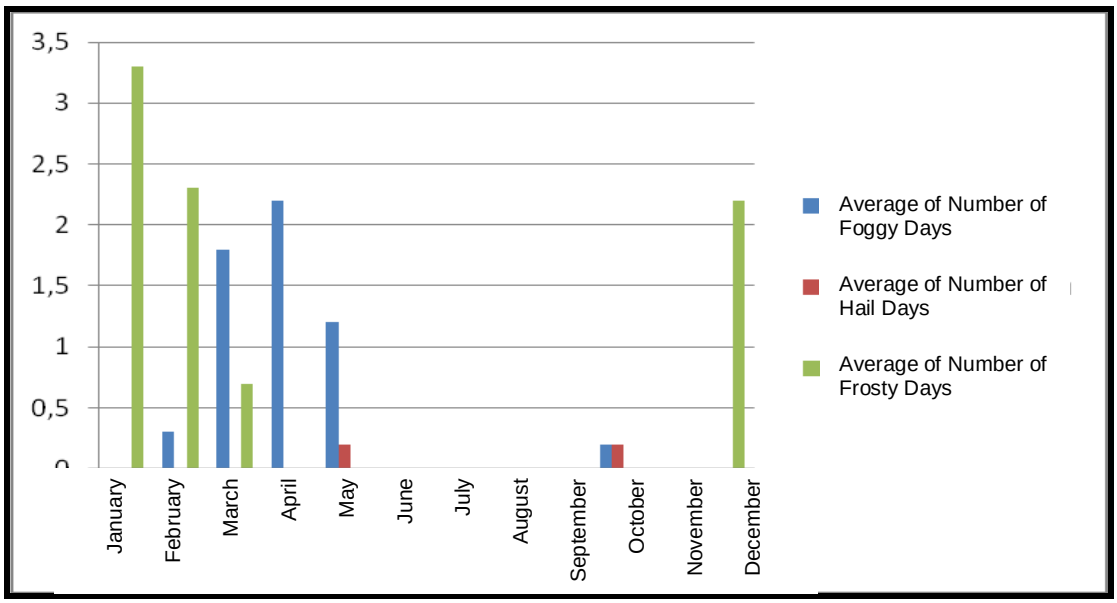


Figure III.1.1.4. Chart of Number of Foggy, Hail and Frosty Days

Humidity Distribution

According to observation records of Trabzon Meteorology Station, annual average relative humidity is 71.4%. The highest monthly average relative humidity is observed as 76.9% in April and the lowest monthly average relative humidity is observed as 65% in December.

Humidity data is presented in Table III.1.1.5. and chart representation is presented in Figure III.1.1.5.

Table III.1.1.5. Humidity Data

METEOROLOGIC PARAMETER	MONTHS												
	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	ANNUAL
Average Humidity (%)	66,2	69,2	69,2	76,9	76,5	74,6	73,8	73,1	71,8	74	67	65	71,4
Minimum Humidity (%)	14	6	3	8	15	28	40	41	42	14	3	5	3

Source: 1975-2011 Data of Trabzon Meteorology Station

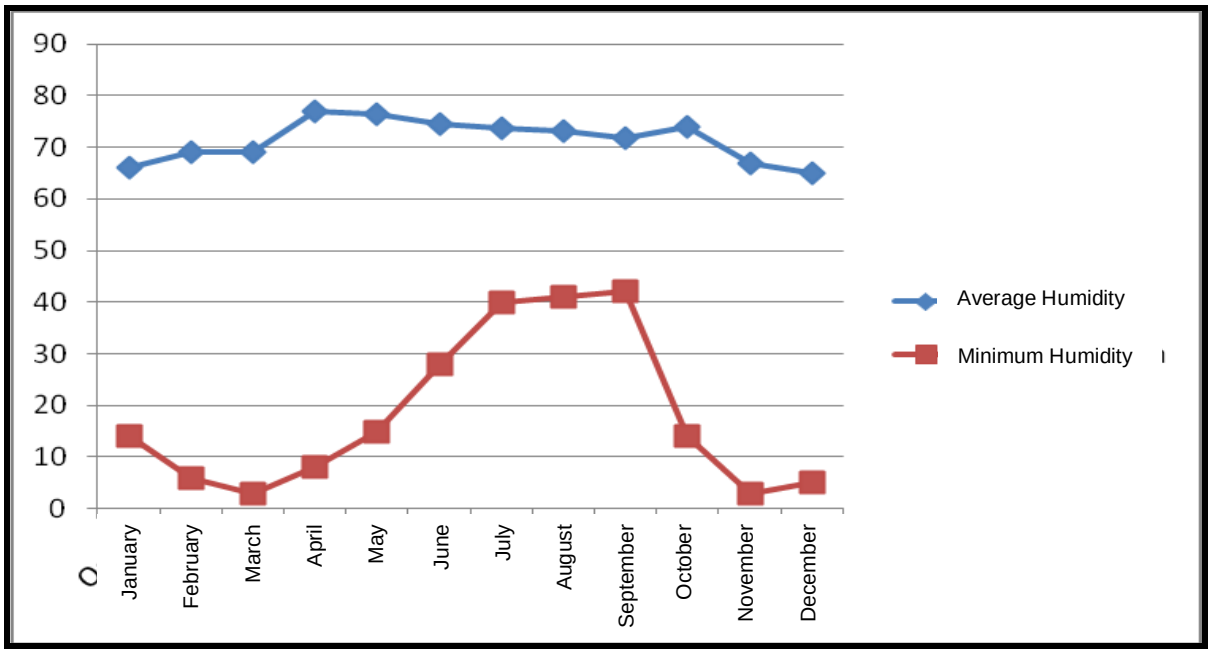


Figure III.1.1.5. Chart Representation of Average and Minimum Relative Humidity Data

Evaporation Status

According to observation records of Trabzon Meteorology Station, average annual open surface evaporation is 98.5 mm. Daily maximum open surface evaporation is determined as 9.5 mm.

Table and chart showing evaporation values of Trabzon province is presented below.

Table III.1.1.6. Evaporation Data

EVAPORATION STATUS	MONTHS												
	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	ANNUAL
Average Open Surface Evaporation (mm)				60	106,4	132,7	144,8	134,5	98,1	63,3	48,7		98,5
Maximum Open Surface Evaporation (mm)				7,5	8,5	8,8	9	9,5	7,2	5	8,8		9,5

Source: 1975-2011 Data of Trabzon Meteorology Station

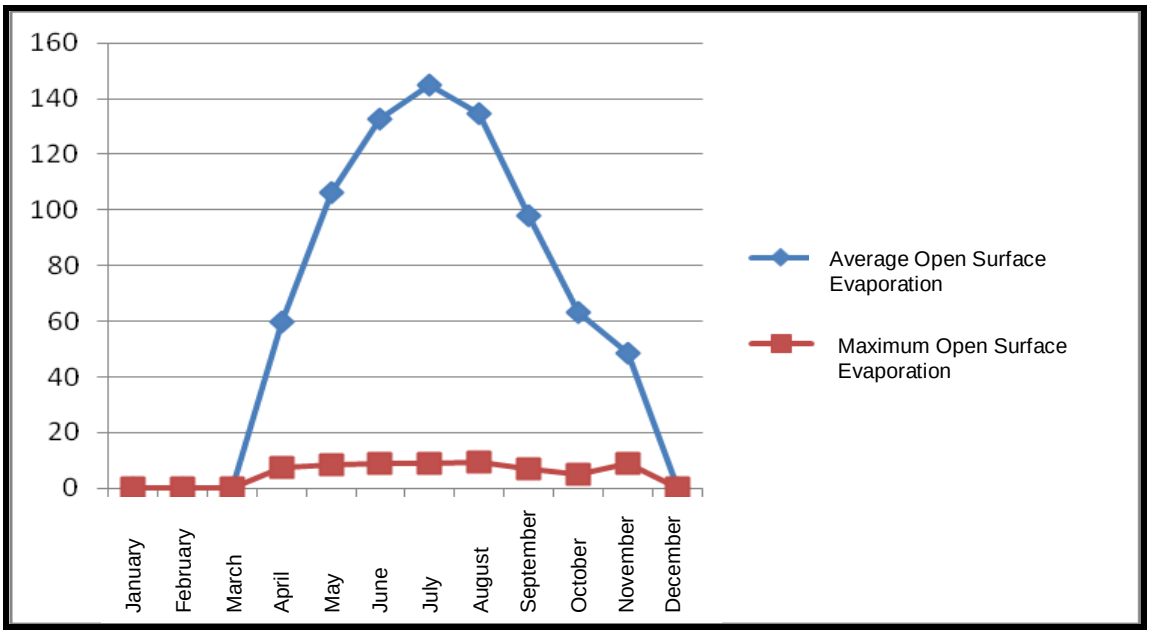


Figure III.1.1.6. Average Open Surface Evaporation Chart

Wind Distribution

- Average Monthly Wind Velocity

According to observation records of Trabzon Meteorology Station, average annual wind velocity is 2.03 m/sec.

Monthly average wind velocity data is presented in Table III.1.1.7. and chart representation is presented in Figure III.1.1.7.

Table III.1.1.7. Average Monthly Wind Velocity Data

METEOOLOGICAL PARAMETER	MONTHS												
	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	ANNUAL
Average Wind Velocity (m/s)	2,1	2,2	2,3	1,9	1,8	1,8	1,9	2	2,2	1,9	2,3	2	2,03

Source: 1975-2011 Data of Trabzon Meteorology Station

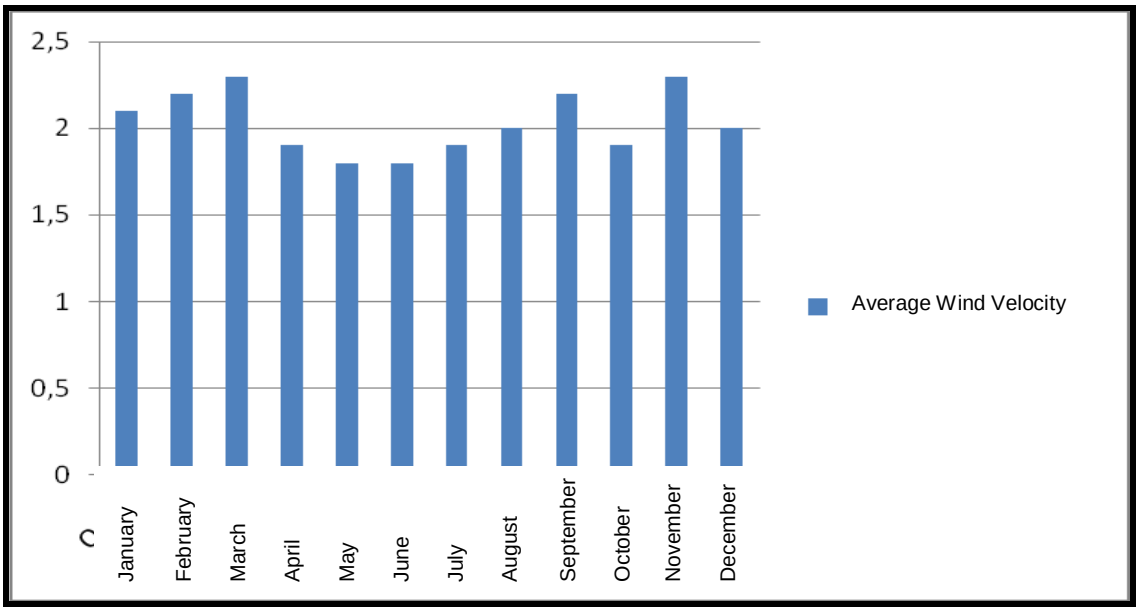


Figure III.1.1.7. Chart of Average Monthly Wind Velocity

Direction and Velocity of Fastest Blowing Wind

According to observation records of Trabzon Meteorology Station, direction of maximum wind observed up to date is NW (south-southwest) and its velocity is 27.9 m/sec.

Maximum wind direction and velocity data is presented in Table III.1.1.6. and chart representation is presented in Figure III.1.1.8.

Table III.1.1.8. Direction and Velocity Data of Maximum Wind

METEOOLOGICAL PARAMETER	MONTHS												
	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	ANNUAL
Maximum Wind Velocity (m/s)	26,2	27,2	23,9	25	27,9	22,2	20,4	19,3	25,3	21,5	26,9	27	27,9
Maximum Wind Direction	WNW	NW	S	WNW	NW	WNW	WNW	NW	NW	NW	NW	WNW	NW

Source: 1975-2011 Data of Trabzon Meteorology Station.

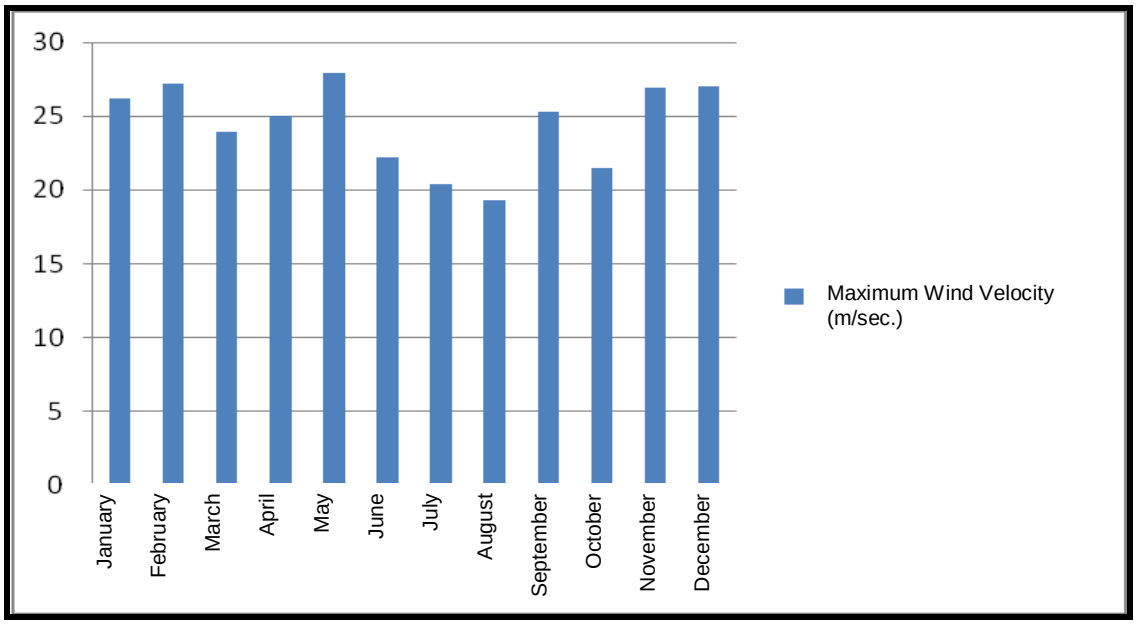


Figure III.1.1.8. Chart of Maximum Wind Velocity

- Number of storm and Strong Wind Days

According to observation records of Trabzon Meteorology Station, annual average number of days with thunder is 34.3 m/sec. Annual average number of strong wind days is 82.8.

Stormy and high windy day data is presented in Table III.1.1.9. and chart representation is presented in Figure III.1.1.9.

Table III.1.1.9. Data of Number of Storm and Strong (High) Wind Days

METEOROLOGIC PARAMETER	MONTHS												
	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	ANNUAL
Average Number of Days with Thunder	4,2	4,8	5,5	2,3	0,7	1,2	0,7	0,7	2,5	2,2	5,3	4,2	34,3
Average Number of Days with Strong Wind	8,7	7,5	9,5	5,8	5,3	6	6,2	5,2	6,5	7,5	5,8	8,8	82,8

Source: 1975-2011 Data of Trabzon Meteorology Station.

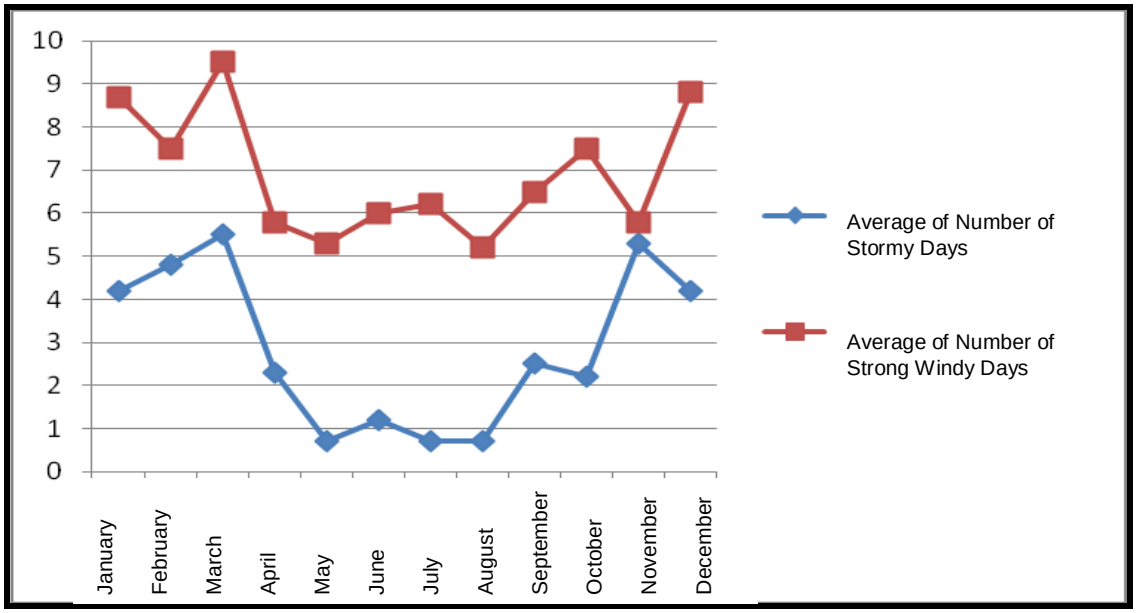


Figure III.1.1.9. Chart of Number of Stormy and Strong Wind Days

- Annual, Seasonal and Monthly Wind Direction Distribution

Average velocities and number of winds based on directions, according to Trabzon Meteorology Station observation records are given in Table III.1.1.10, and annual wind diagram based on number and velocity of winds is given in Figure III.1.1.10.

Table III.1.1.10. Totals for Average Velocity and Number of Winds Based on Directions

Direction	METEOOLOGICAL PARAMETER	MONTHS												ANNUAL
		JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	
N	Total Blows	8	16	21	20	33	20	34	27	23	26	11	7	246
N	Average Wind Velocity (m/s)	0,9	0,8	0,9	1,1	1,2	1,5	1,4	1,2	1,2	1,0	0,7	0,6	1,04
NNE	Total Blows	25	44	63	72	116	148	153	145	111	63	41	20	1001
NNE	Average Wind Velocity (m/s)	0,8	0,9	1,1	1,1	1,1	1,2	1,3	1,3	1,3	1,0	0,8	0,7	1,05
NE	Total Blows	21	45	71	87	119	149	131	128	77	39	40	31	938
NE	Average Wind Velocity (m/s)	1,0	1,0	1,1	1,1	1,2	1,4	1,4	1,4	1,3	1,1	0,9	0,9	1,15
ENE	Total Blows	208	261	540	646	723	503	413	316	242	288	169	156	4465
ENE	Average Wind Velocity (m/s)	1,6	1,8	2,0	1,9	1,8	1,8	1,8	1,9	1,7	1,7	1,4	1,5	1,74
E	Total Blows	301	385	529	524	433	247	118	95	141	263	261	268	3565
E	Average Wind Velocity (m/s)	1,9	2,3	2,6	2,4	2,5	2,6	2,3	2,3	2,4	2,1	2,1	2,0	2,29
ESE	Total Blows	108	149	273	182	160	75	49	35	37	87	100	140	1395
ESE	Average Wind Velocity (m/s)	1,8	2,0	2,1	2,1	2,1	2,1	1,7	2,2	2,1	1,9	1,8	1,9	1,98
SE	Total Blows	46	61	76	67	54	44	25	9	24	59	45	45	555
SE	Average Wind Velocity (m/s)	1,9	1,7	1,9	1,6	1,8	1,8	1,6	2,2	1,7	1,8	1,6	1,7	1,77
SSE	Total Blows	183	165	195	136	110	80	85	92	85	155	135	144	1565
SSE	Average Wind Velocity (m/s)	1,9	1,6	1,5	1,5	1,5	1,7	1,6	1,8	1,8	1,7	1,7	1,5	1,65
S	Total Blows	338	299	249	174	216	260	292	214	257	263	303	290	3155
S	Average Wind Velocity (m/s)	2,1	2,0	2,4	1,4	1,3	1,5	1,5	1,6	2,1	1,9	2,3	1,9	1,83
SSW	Total Blows	1640	1159	875	737	861	1106	1390	1670	1747	1765	1985	2038	16973
SSW	Average Wind Velocity (m/s)	1,9	1,5	1,5	1,3	1,1	1,3	1,5	1,7	1,8	1,5	1,6	1,6	1,52
SW	Total Blows	297	250	131	116	146	185	216	216	281	319	216	238	2611
SW	Average Wind Velocity (m/s)	1,4	1,1	1,3	1,0	1,0	1,2	1,3	1,3	1,5	1,3	1,5	1,3	1,26
WSW	Total Blows	183	136	120	120	102	147	122	105	158	179	178	153	1703
WSW	Average Wind Velocity (m/s)	1,7	1,3	1,3	1,1	1,0	1,3	1,2	1,3	1,6	1,4	1,4	1,4	1,33
W	Total Blows	178	165	157	141	114	89	57	54	93	128	125	170	1471
W	Average Wind Velocity (m/s)	1,6	1,9	1,6	1,5	1,4	1,4	1,5	1,5	1,7	1,7	1,9	1,6	1,60
WNW	Total Blows	469	448	566	538	410	318	302	238	240	292	314	439	4574
WNW	Average Wind Velocity (m/s)	2,7	2,5	2,5	2,0	1,8	2,3	2,3	2,3	2,7	2,5	2,8	2,4	2,4
NW	Total Blows	344	382	461	536	560	693	734	753	595	425	321	272	6076
NW	Average Wind Velocity (m/s)	2,8	2,6	2,5	2,1	2,1	2,6	2,6	2,6	3,0	2,4	2,8	2,4	2,5
NNW	Total Blows	63	85	128	204	275	225	323	305	196	100	51	35	1990
NNW	Average Wind Velocity (m/s)	1,3	1,3	1,3	1,2	1,4	1,5	1,6	1,7	1,5	1,4	1,2	1,2	1,38

Source: 1975-2011 Data of Trabzon Meteorology Station.

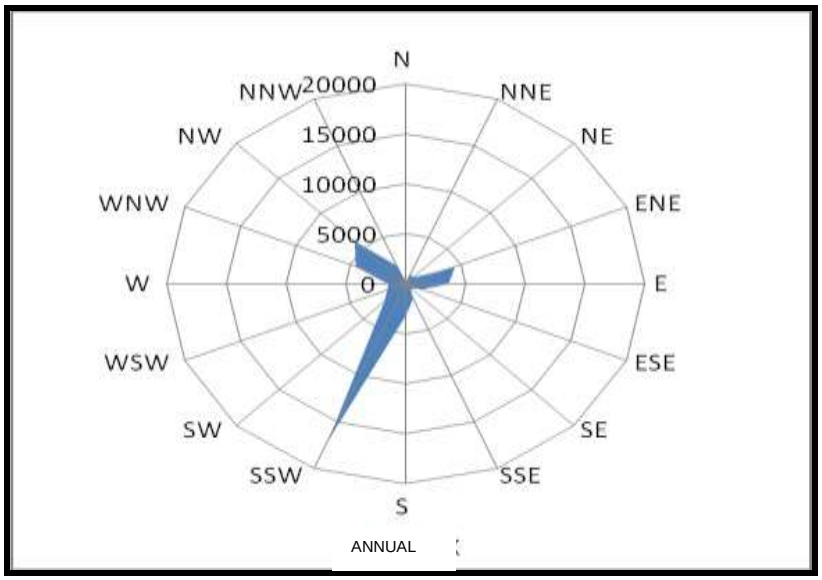


Figure III.1.1.10. Annual Wind Diagram Based on Number of Blows

Based on observation records of Trabzon Meteorology Station, primary dominant wind direction is SSW, secondary dominant direction is NW and tertiary dominant wind direction is WNW.

Annual wind diagram based on average wind velocity is given in Figure III.1.1.11.

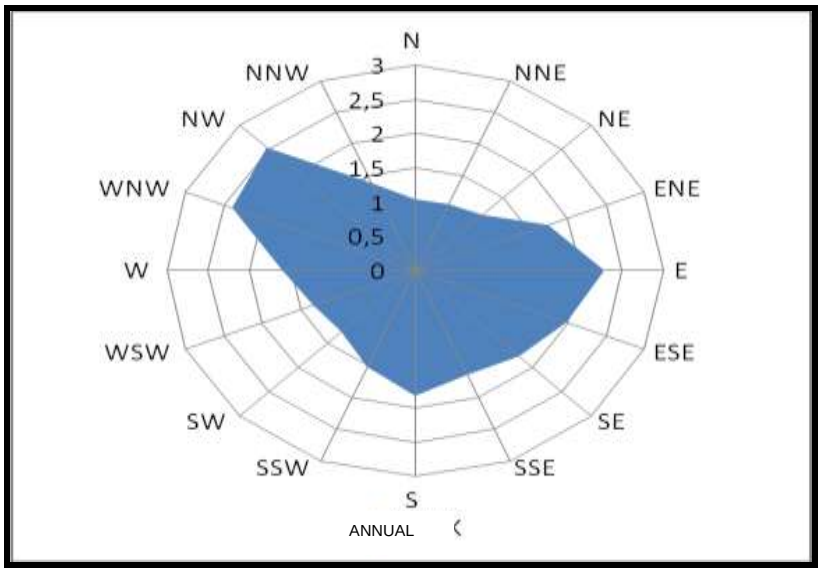


Figure III.1.1.11. Annual Wind Diagram Based on Average Wind Velocity

According to observation records of Trabzon Meteorology Station, total number of seasonal winds according to their directions are given in Table III.1.1.11, seasonal wind diagrams according to blowing numbers are given in Figures III.1.1.12 and III.1.1.13, monthly wind diagrams based on number of blows are given in Figure III.1.1.14 and III.1.1.15.

Table III.1.1.11. Total Number of Seasonal Blowing Based on Directions

METEOOLOGICAL PARAMETER		WINTER	SPRING	SUMMER	FALL
N	Total Blows	44	74	81	60
NNE	Total Blows	100	251	446	215
NE	Total Blows	222	277	408	156
ENE	Total Blows	737	1909	1232	699
E	Total Blows	826	1486	460	665
ESE	Total Blows	302	615	159	224
SE	Total Blows	251	197	78	128
SSE	Total Blows	638	441	257	375
S	Total Blows	2675	639	766	823
SSW	Total Blows	3037	2473	4166	5497
SW	Total Blows	700	393	617	816
WSW	Total Blows	489	342	374	515
W	Total Blows	782	412	200	346
WNW	Total Blows	1189	1514	858	846
NW	Total Blows	761	1557	2180	1341
NNW	Total Blows	148	607	853	347

Source: 1975-2011 Data of Trabzon Meteorology Station.

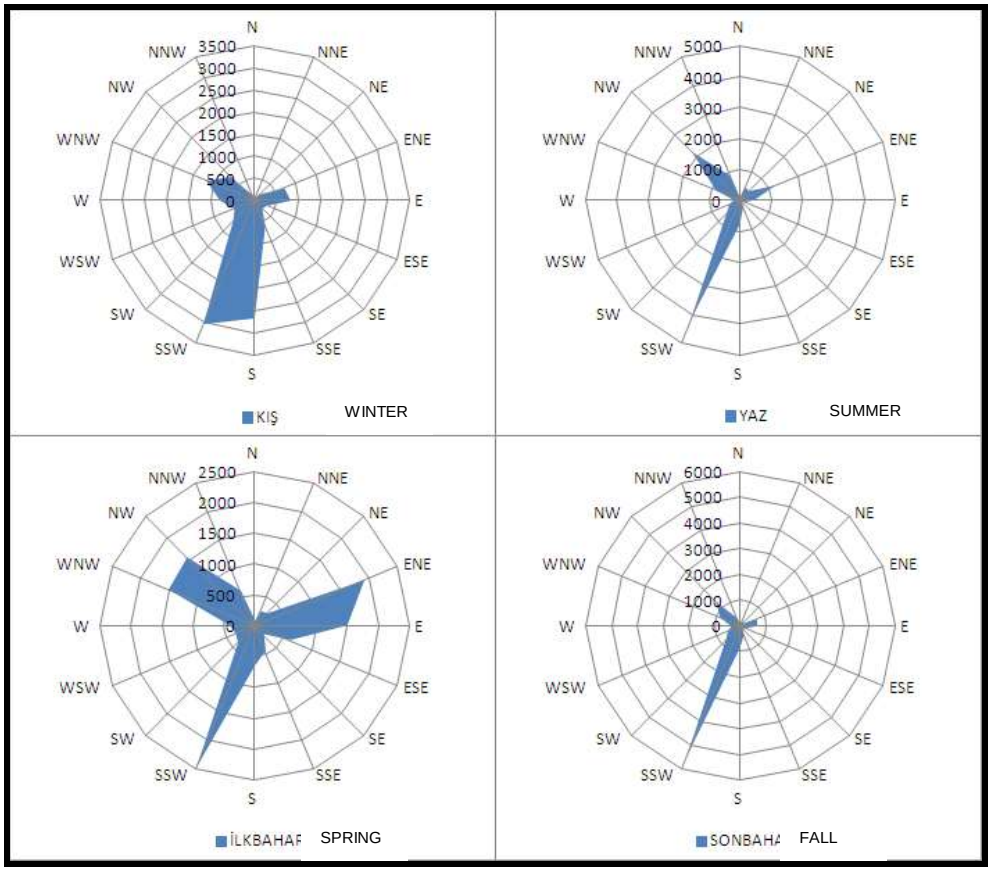


Figure III.1.1.12. Seasonal Wind Diagrams Based on Number of Blows

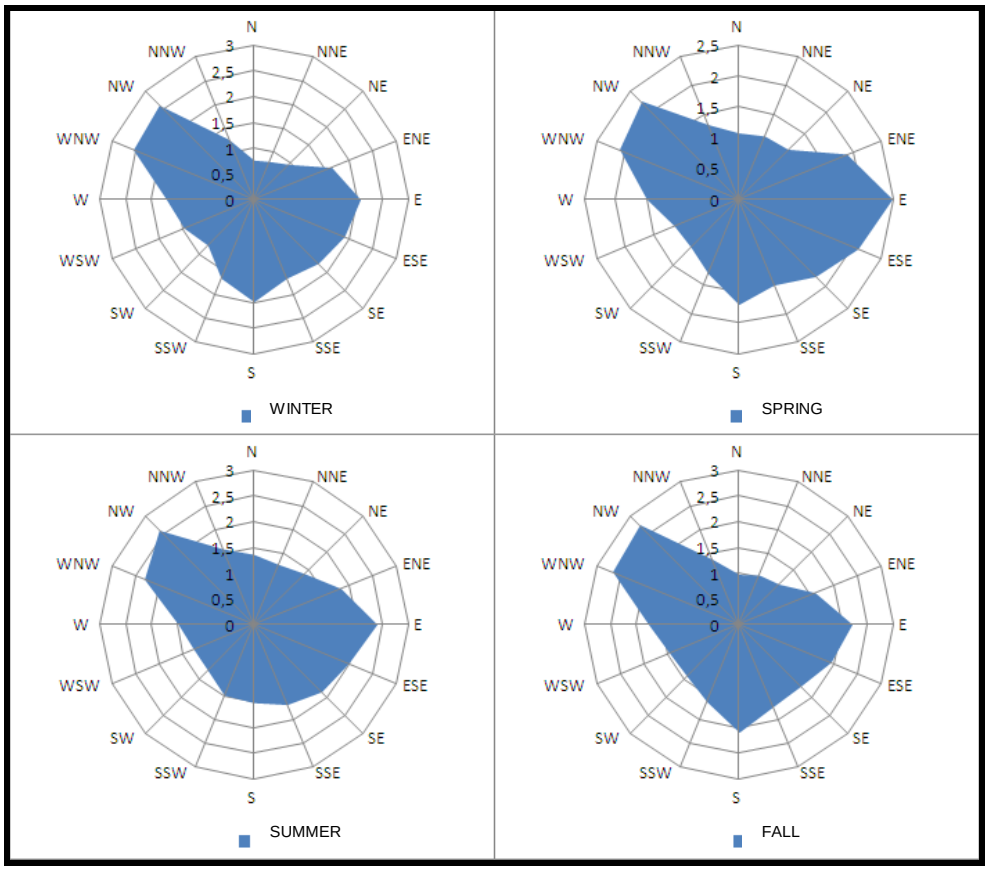


Figure III.1.1.13. Seasonal Wind Diagrams Based on Average Wind Velocity

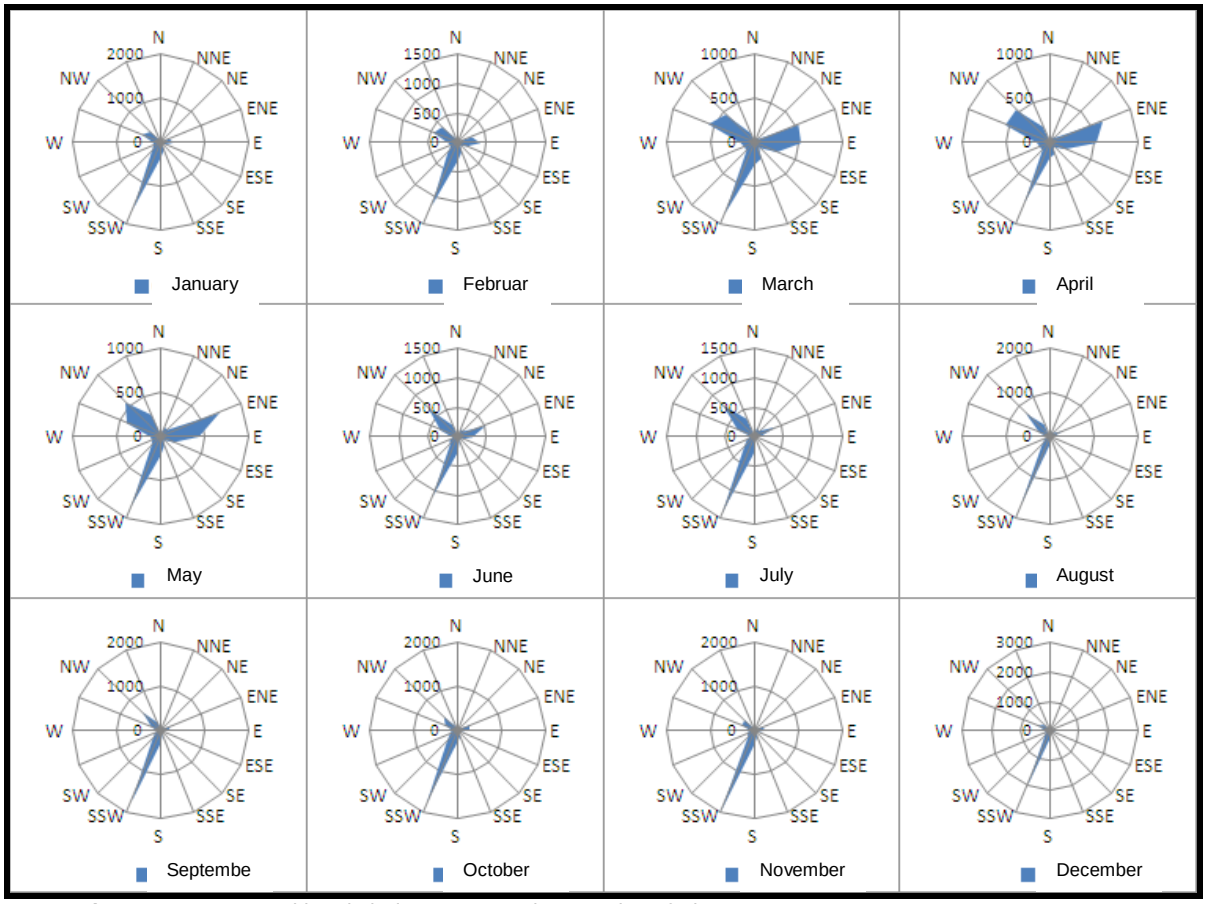


Figure III.1.1.14. Monthly Wind Diagrams Based on Number of Blows

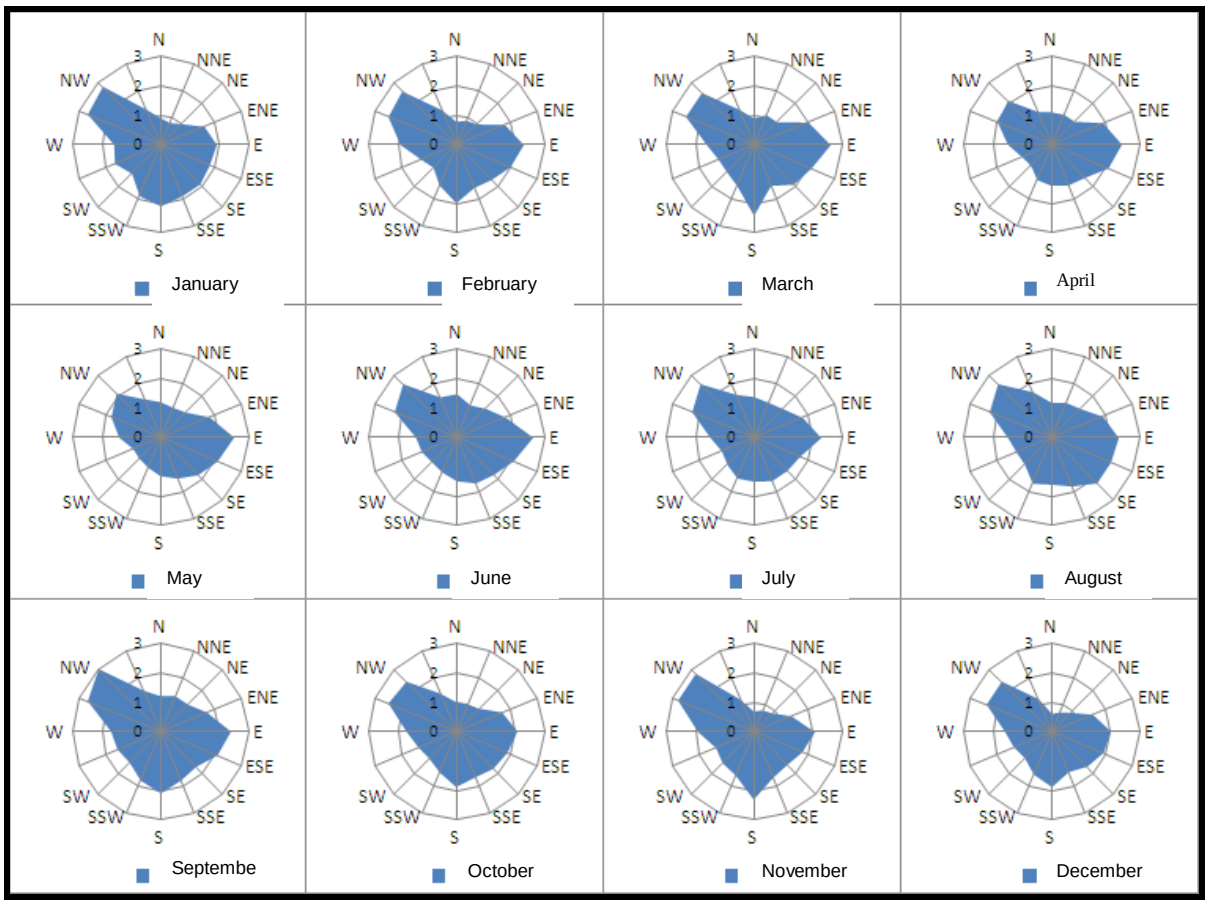


Figure III.1.1.15. Monthly Wind Diagram Based on Average Wind Velocity

III.1.2. GEOLOGICAL PROPERTIES

General Geology

The project site is located within Eastern Pontides at Eastern Black Sea Region. This section of Pontides is divided into two as Northern and Southern Zone in geological studies. Magmatic activity is dominant at the Northern zone while sediment deposition is dominant at the Southern. While the project site is under the influence of the Northern zone, it is close to the Southern zone as well. Mesozoic and Cenozoic rock units are present within and in the vicinity of the project site. Volcanic, volcano-sedimentary and intrusive rock units has become abundant in the region as a result of magmatism that has continued from Lias to late Eocene intermittently and sedimentation dominant during periods while volcanic activity has seized or slowed down.

III.1.2.1 Geological and Geotechnical Properties of the Project Area

According to the observational geological field studies Mesozoic aged volcanic and clastic sedimentary rocks exposes at and around the Mavi HEPP project facilities. At which andesite-basalt lava and pyroclastics of Hamurkesen Formation outcrops at Mavi Weir location, Upper Cretaceous aged andesite-basalt lava-pyroclastics intercalated and interbedded with sandy tuff, marl and sedimentary levels of Çatak Formation outcrops along tunnel route, penstock route and power house location.

The observed detailed lithological description of geological units at and around Mavi HEPP is given below from oldest to youngest. Geological map of project siteand its vicinity is given in Figure III.1.2.1.

Stratigraphy

Liassic

Hamurkesen Formation (Jh)

The unit outcrops at the weir location and its vicinity. It is generally composed of purple, greenish, gray colored andesite, basalt, dacite lava and pyroclastics, and reddish-maroon colored clayey limestone, shale and sandstone intercalated and interbedded unit with its thickness ranging between 3 and 5 meters is observed within the unit. The unit overlain conformably by Upper Jurassic-Lower Cretaceous age limestone units has approximately 1,400 m thickness.

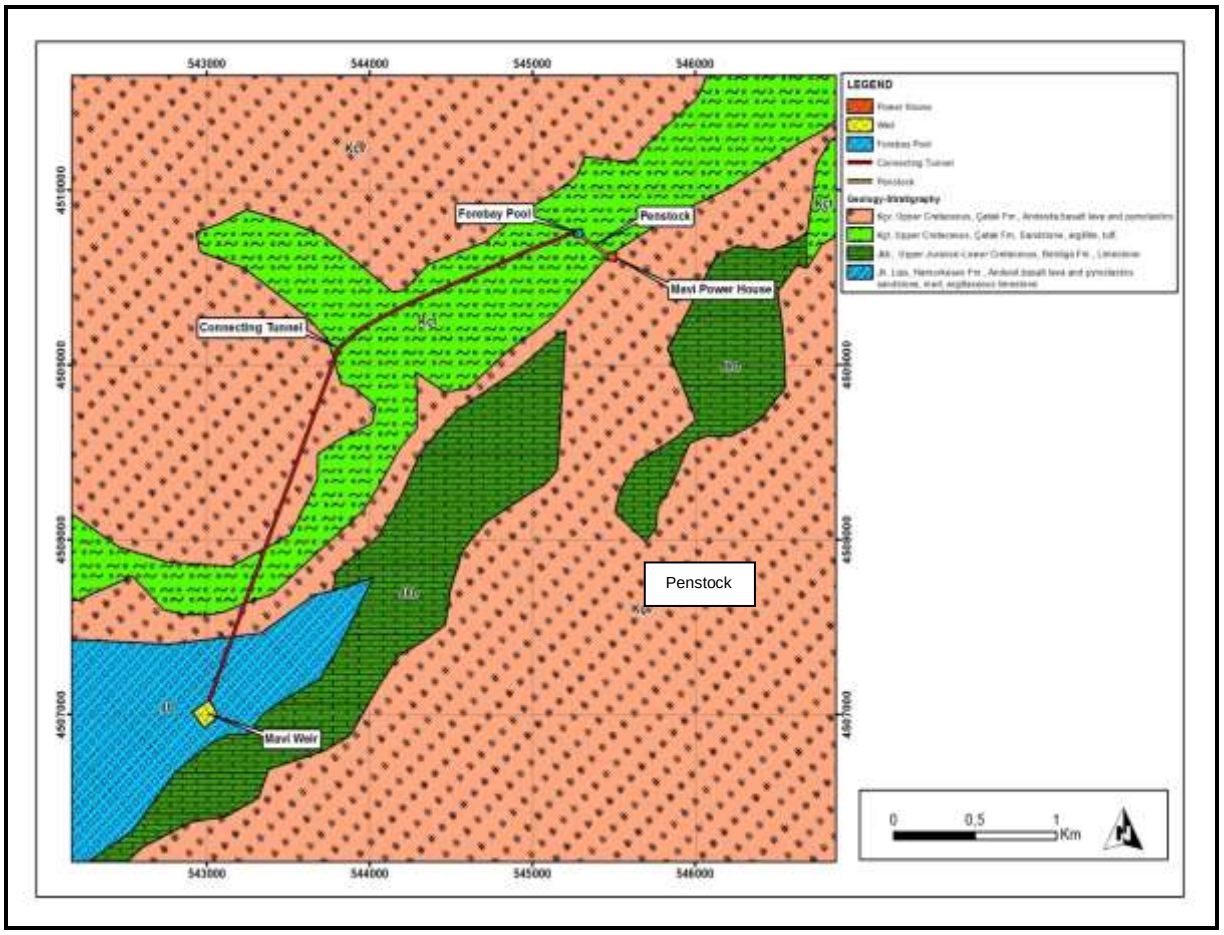


Figure III.1.2.1. Geological map of Mavi HEPP Facilities and Surrounding

Upper Jurassic-Lower Cretaceous

Berdiga Formation (Jkb)

The unit outcrops within the project site as a belt parallel to the valley cross-cut by strike-slip fault at the right bank. The unit composed of clayey limestone, cherty limestone and sandy limestone of neretic and gray colored, moderate bed thickness is generally have massive structure.

The unit presents topographically sharp appearance. The unit have highly fractured structure and presents poor bedding. Mineralization and contact metamorphism can be observed at the boundaries with the granidoidic intrusions and the unit which overlies Hamurkesen formation and conformably underlies Upper Cretaceous age basic volcano-sedimentary Çatak formation.

Upper Cretaceous

Çatak Formation (Kç)

The unit represents basalt, andesite lava and pyroclastic volcanic levels, sandy tuff, marl and red-maroon colored biomicrite intercalated and interbedded sedimentary levels. The formation presents a hard and dark coloured appearance. The unit have grayish greenish, grayish purple color. The volcanic levels are less disintegrated when compared with the volcanics of Hamurkesen formation. According to fossil content within sedimentary interlayers, the unit present successive with acidic series have the Santonian-Campanian age range assigned.

Quaternary

Talus (Qym)

The thickness of the talus observed especially close to the valley basin and composed of clayey, gravelly and blocky material generally ranges between 1 and 3 m, and reaches up to 5 m from place to place.

Alluvium (Qal)

The alluvial material in the project area have generally poor grading, partially moderate grading and generally angular and rarely sub-rounded. The alluvial deposits are generally composed of sub-rounded-sub-angular grains of sedimentary, volcanic and magmatic origin. Alluvium thickness is estimated to be between 1 and 3 meters at the weir and power house location.

Tectonic

Properties of sub-oceanic volcanism developed during Upper Cretaceous are observed at the project site located within Northern Zone of Eastern Pontides. The most abundant geological formation is Upper Cretaceous age volcano-sedimentary series. The units have faulted during surfacing with the Alpine Orogeny but not folded.

Brecciation, kaolinization, chloritization and limonitization can be clearly observed through fracture and joint systems developed generally in NW-SE and NE-SW directions. Bedding and flow structures are apparent at the formations having basic volcano-sedimentary series characteristics at the project site from place to place due to sedimentary stratification.

The details of tectonic structures due to observational geological field studies at and around project area are given below.

Stratification

The crystalline limestones of Berdiga formation presents poor bedding (stratification) while sedimentary levels of Çatak formation presents well bedded structure in the project area.

Folding

The layer strike-dip measurements taken mainly from Berdiga formation throughout Hamsiköy Stream valley at the project site indicates presence of an approximately symmetrical anticline. Limestone units of Berdiga formation, on the other hand, have NW dip direction and indicate presence of a SE syncline following the eastern flank of Hamsiköy anticline.

Jointing

Joints are generally observed clearly at magmatic rocks. Fractures are smooth surfaces but rough generally at all units. Calcite and silica, and primarily clay has been identified as infilling material.

Faulting

The faults identified in the region generally developed in NE-SW and NW-SE direction, and are strike-slip and gravity (normal) faults. It is possible to observe these faults which are assumed to be vertical and sub-vertical in the region. There is no fault present within the project site which can have negative effect on project structures.

Geotechnical Properties of Mavi HEPP Facilities

According to the observational geological field studies and geotechnical studies conducted the geotechnical properties of Mavi HEPP facilities are given below. All geological-geotechnical studies required for structure locations of Mavi Weir and HEPP facilities has been completed and all issues presented at the results and recommendations section of geological-geotechnical investigation report prepared during construction phase is considered throughout the works.

Mavi Weir Site

The baserock at the Mavi weir site is the volcanic levels related with the basic volcano-sedimentary series named as Hamurkesen formation. There are alluvial deposits composed of irregularly deposited and mostly block size material and talus having 1 to 3 m thickness and more than 5 m thickness at the river banks present at the weir location where generally basalt and andesite rock units are dominant. Cooling joints having prism shape and vertical to sub-vertical dip can be observed at volcanic lava. The basalt-andesite lava and pyroclastics related with the series have moderate-weak rock characteristics according to RMR (Bieniawski, 1989) rock classification. Disintegrated part of the bedrock with low bearing capacity and unstable, and alluvium and talus has been cleared and removed from the weir location and slopes during construction, therefore weir has been constructed on bedrock. The bedrock is stable and there are no stability and bearing capacity related problems at the slopes.

Transmission Tunnel

Transmission tunnel has been excavated in Hamurkesen formation and rock units related with Çatak formation. These rock units are volcano-sedimentary deposits composed of andesite and basalt lava and pyroclastics as well as tuff-tuffite sandstone, claystone, marl, limestone intercalation.

Rock types within each formation are horizontally and vertically transitional, and there are volcanic intercalations within sedimentary units just like there are lenses of sedimentary units within volcanic layers. Along with this, both rock types are cross-cut by dykes and sills of various dimensions and dip angles. Rock units cut through tunnel route is classified as moderate to good rock class according to RMR (Bieniawski, 1989) and Q (Barton et al., 1976) rock mass classifications.

Brecciated, tuff containing and loose agglomeratic levels weathered from pyroclastics were passed via complete section surfacing (coating) method during tunnel excavations. Puncture and/or systematic rock bolt was applied at the upper half in order to assist supporting and prevent wedging at the tunnel. At distorted and weathered tunnel sections, single layer (5 cm) and/or two layer (minimum 5+5 cm) shotcrete, wiremash and steel timbering (sheating) as well as necessary support measures were taken at necessary situations.

As a result of geological-geotechnical studies conducted at the transmission tunnel route, engineering properties of the bedrock excavated throughout the route has been determined. As a result of these studies, excavations at the entrance and exit face of the tunnel has been conducted via slope stability analyses and tunnel support systems were determined.

Headpond Location and Penstock Pipe Route

The bedrock at the headpond and penstock pipe route is sedimentary level related with Upper Cretaceous age Çatak formation. There are volcanic inter layers from place to place within these sedimentary deposits which are composed of claystone-marl-limestone intercalation. Talus having thickness ranging mostly between 1 and 3 m, and upto 5 m from place to place has been determined during geotechnical studies at the construction site. Weak-loose levels as well as weathered sections of bedrock has been truncated during construction stage, and abutment (support) of headpond and penstock pipe has been seated on the bedrock having sound, hard and strong characteristics, and fixed to the bedrock via anchors at necessary locations.

Power House Location

While there is alluvium and, at slopes, talus material present at the powerhouse location, bedrock is composed of andesite, basalt lava and pyroclastics of Çatak formation. Loose, weak and low strength material as well as weathered sections of the bedrock has been truncated during construction stage and power house has been placed on bedrock which have no problem regarding bearing capacity. During excavations at the power house location, necessary support measures has been taken by considering slopes, bedding strike and dips.

III.1.3. SEISMICITY

The project site is within 4th Degree Earthquake Zone according to “Earthquake Zonation Map of Turkey” prepared by Obsolete Ministry of Public Works and Settlement. Trabzon province seismicity map is given in Figure III.1.3.1. 4. Peak ground acceleration expected at 4th degree earthquake zones is between 0.06 g and 0.10g.

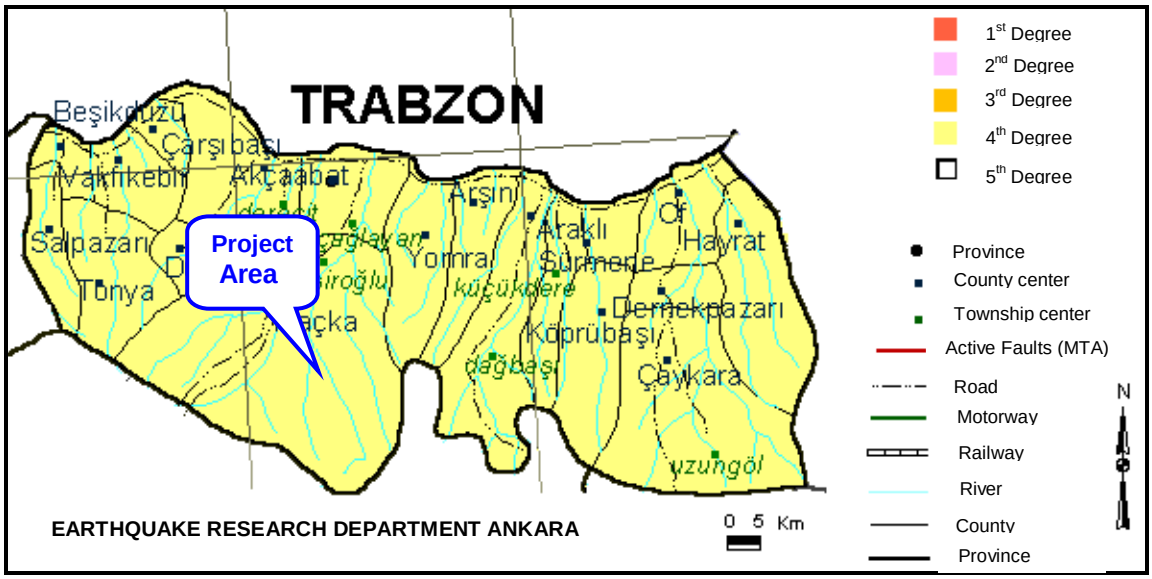


Figure III.1.3.1. Trabzon Province Seismicity Map (Source: deprem.gov.tr)

All construction works within scope of the project has been performed in accordance with "Regulations on Buildings to be Constructed at Earthquake Regions" which came into force by being published in the Official Gazette dated 06.03.2007 and numbered 26454 by Obsolete Ministry of Public Works and Settlement, and provisions of Regulation which came into force by being published in the Official Gazette dated 03.05.2007 and numbered 26511, and which amends the previously mentioned regulation.

III.1.4. HYDROGEOLOGICAL PROPERTIES

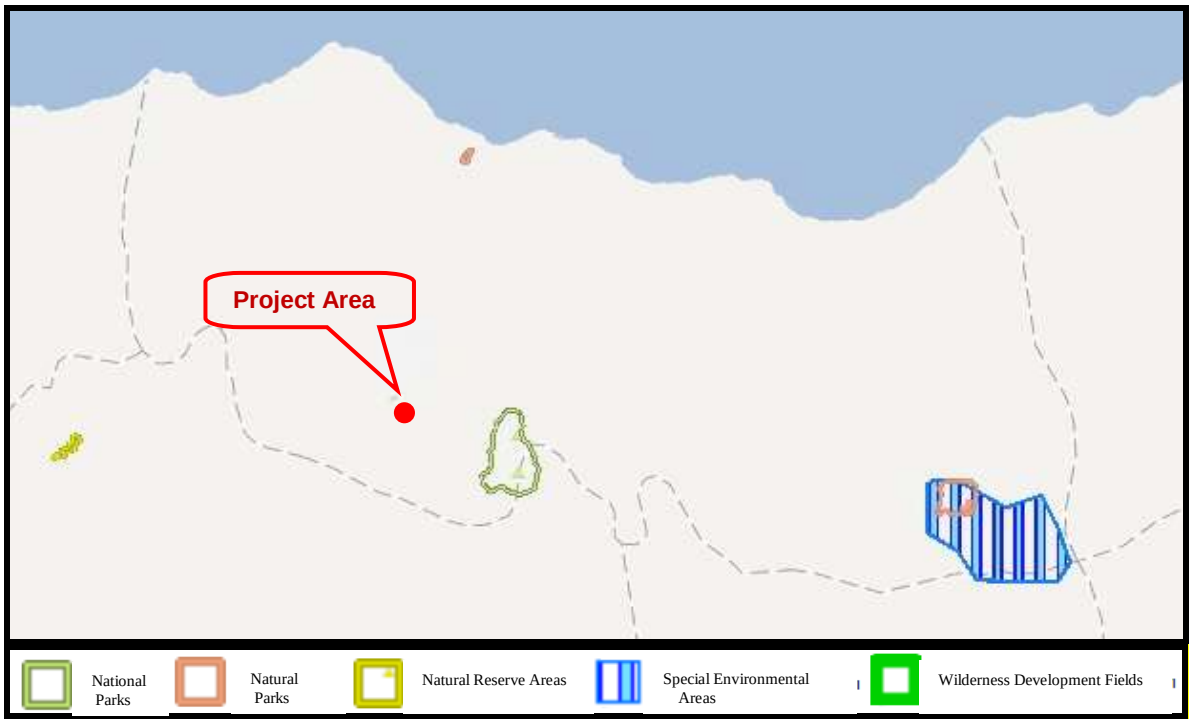
Water source of Mavi HEPP is Hamsiköy Stream. The project area is located within Eastern Black Sea Basin that is one of the basins distinguished in Turkey. Raşi Stream which springs at approximately 2500 m elevation at the western section of Hamsiköy Stream precipitation area is named as Ayeser Stream with the inclusion of branches, and then it named as Bekçiler Stream with the inclusion of Zigana Stream which also springs at approximately 2500 m. Then the Stream reaches Hamsiköy county with the inclusion of many stream branches at the region. The Stream continues to flow in Northeast direction and flows into Black Sea at Trabzon. There are no lake, pond, dams present at the project site and its vicinity, and study area does not fall into a surface water source basin from which intra-continental water is supplied.

Rock units’ outcroping in the project area is of volcanic origin just as at the other regions of Eastern Black Sea region. Sedimentary origin rocks, on the other hand, have formed as intercalation. These volcanic rocks do not present aquifer characteristics and does not contain ground water. The rock units discharge the waters they include at their fracture and fault systems as small springs at upper elevations. Ground water in the region is only present at alluvium which have aquifer characteristics and which have formed at the downstream sections of rivers.

III.1.5. ARCHEOLOGICAL AND CULTURAL ASSETS

There is no inland water which is listed as internationally important wetlands of Turkey and which is under protection status at and in the vicinity of the project site. In addition to this, there is no area which is defined in "Special Environment Protection Areas" heading of Environment Law numbered 2872 and which is defined in "National Parks", "Nature Reserve Areas", "Natural Monument", "Nature Parks" article of National Parks Law numbered 2873 at and within vicinity of the project area (See Figure III.1.5.1.). Furthermore, there are no biosphere reserve areas, biogenetic reserve areas, tourism area and centers, archeological, historical and cultural protection areas.

There is no natural or archaeological site present within the boundaries and in the vicinity of the activity area. There is no high value landscape or recreation area, and unique geological or geomorphologic area present within and in the vicinity of the activity area.



(Source: http://geodata.cob.gov.tr/geodata/index.aspx)

Figure III.1.5.1. Protection areas at Trabzon Province

III.2. PROPERTIES OF BIOLOGICAL ENVIRONMENT

III.2.1. FLORA AND FAUNA,

Flora and fauna studies of EIA Report of CESE Elektrik Üretim A.Ş.'s "Mavi Weir and HEPP Project" which is located within Maçka District of Trabzon Province have been prepared by Dr. Elif Manav Tüfekci and Scientific Expert Biologist Levent Biler in March 2012.

The study area is completely covered with mixed forest vegetation. Also, from place to place open areas are observed. Especially these open areas include more flora species and are often visited by fauna species. The study area and the surrounding indicate similar habitat types. This is especially very important for the fauna species. Because of this, fauna species will find easier alternative habitats at surrounding.

Flora

During preparation of flora list of EIA Report of the project, fieldwork studies and literature information has been utilized. Flora of the area is compiled by utilizing "Flora of Turkey and the East Aegean Islands" source. Along with this, floristic list list has been prepared by utilizing floristic studies performed in the areas showing the same and similar ecologic properties with the area. Flowering plant species which are possible to be present in the project area is given in Table III.2.1.1. In this table, first family, genus and species, then (second column) common name of the plant, in the third colunm Turkish name of the plants (for this identification, "Turkish Plant Names" source book of Turhan Baytop was utilized), habitat of the plant at the forth colunm, endemism and rarity status at the fifth, phytological region (if known) at the sixth colunm, and endangered categories of plant species are given in the seventh colunm (for endangerment status, criteria determined by IUCN and "Red Book of Turkish Plants" prepared by Ekim et al. (2000) and published by Turkey Nature Protection Association). Along with this, TÜBİVES (Plants of Turkey Data Service) was scanned and utilized for flora species. The study areas is located at A7 square (grid) according to the Gridding system (See Figure III.2.1.1).

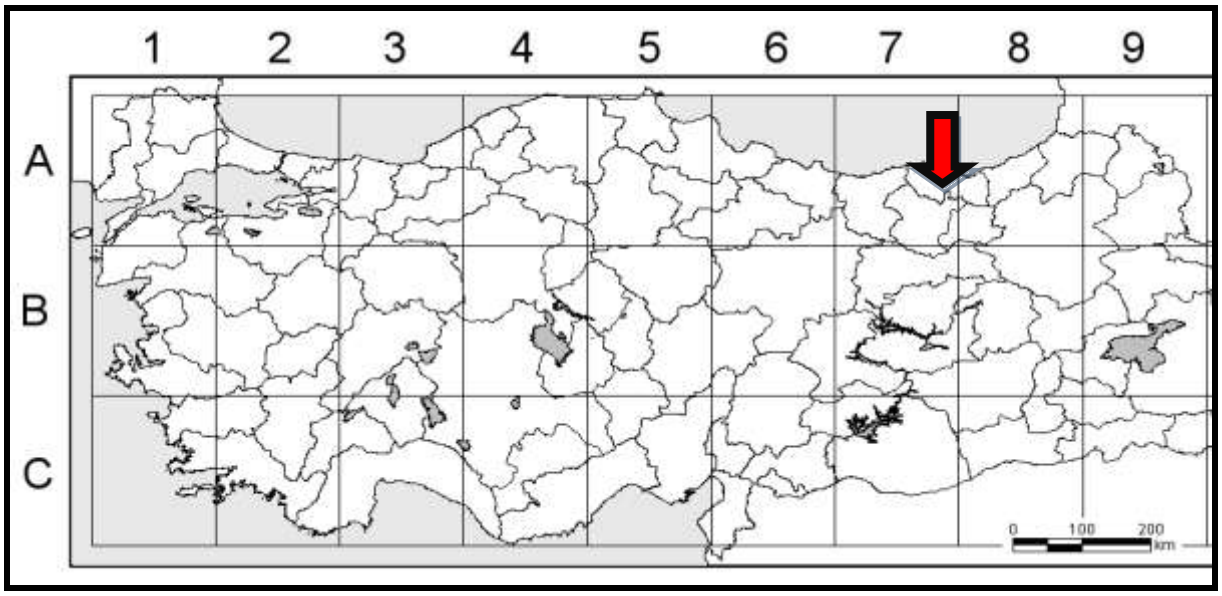


Figure III.2.1.1. Location of Study Area within Grid System

Turkey is under influence of various climates due to its geographical position. Therefore, oceanic climate is governs the northern, and especially Black Sea facing ridges of North Anatolia and Yildiz (Stranja) Mountains at north; Mediterranean climate governs the surroundings of Marmara Sea, Aegean and Mediterranean Regions; and continental climate governs the Central, Eastern and Southeastern Anatolia. Thus, Turkey includes humid-warm climate which dominates west of continents at the east of oceans, at Anatolia and north of Thrace; subtropical at Aegean and Mediterranean; continental climate which dominates central sections of continents, at the central and eastern regions of Anatolia. A cold climate condition which is effective at northern latitudes is observed at high mountaneous areas. Due to this, presence of different areas and phytogeography regions in terms of plant cover is a necessity of natural conditions in Turkey (See. Figure III.2.1.2.) (Atalay, 2002)

This part is may be explained at the climate part, but the reason it is explained again at this part is to clarify why there are 3 different phytogeography regions in Turkey.

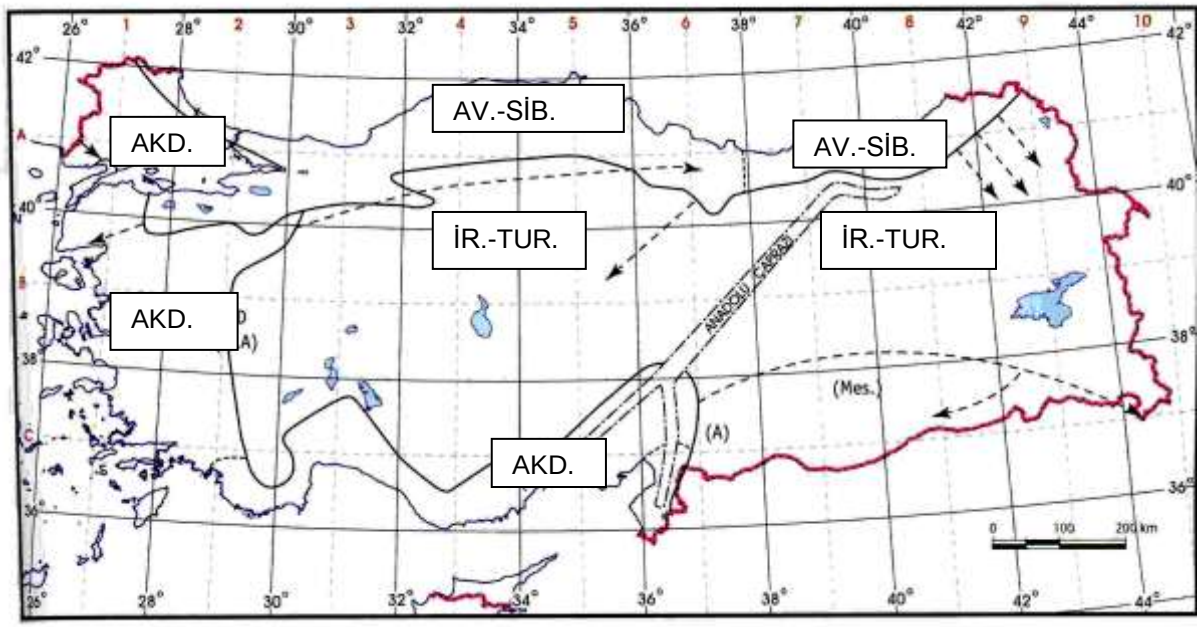


Figure III.2.1.2. Phytogeographic Regions and Anatolia Diagonal at Turkey
(EUR.-SIB.: Europe-Siberia Phytogeography Region; Mes.: Mediterranean Phytogeography Region, IR-TUR.: Irano-Turanien Phytogeography Region)

In a general assessment, northern part of Turkey falls within European-Siberia Flora Region as a whole. Eastern Black Sea Region, starting from east of Ordu Province in the north, falls under kolsch, and western region falls under auxin sub-flora or sections of the same flora kingdom. Northern shores of Marmara Sea, Aegean and Mediterranean Regions forms the Eastern Mediterranean Flora Kingdom. Central and Eastern Anatolia Regions falls within Turanian-ForeAsia or Irano-Turanian Flora Regions, and steppe regions of Southeastern Anatolia falls within Irano-Turanian Flora Region. In short, Turkey is a country where Euro-Siberia, Mediterranean and Irano-Turanian flora regions are present together (Davis, 1985; Davis, 1988).

Along with this, elevation and aspect conditions make distinction of these flora regions from each other with distinct regions difficult. For example, while dry forests are present at the south facing ridges of mountains, xenophytic bushes are present at valleys and depressions of auxin flora region. Similarly, plant groups composed of Auxin elements and bush, shrubs and tree group formations are present at north facing ridges and high elevations just as at Nur (Amanos) Mountains of Mediterranean Region. Therefore, different flora parts which have preserved themselves and continued their existence at appropriate ecological conditions, are present at local areas (Davis, 1985; Davis, 1988).

The study area falls within Euro-Siberia Phytogeographic Region. Euro-Siberia Phytogeographic Region includes Black Sea Region where Black Sea climate is dominant, and Marmara Region except Gallipoli and Biga peninsulas.

Forest vegetation formed of coniferous species is principly dominant within Euro-Siberia Phytogeographic Region, and needle-leaved taxons are included to this group with increasing elevation. In general, summer drought is not a matter in terms of climate at Euro-Siberian Phytogeographic Region spreading in Turkey. Along with this, precipitation and humidity rate perceivably increases towards east of Melet River, and in parallel to this, endemic and relic plant taxons considerably increases. Distribution of Euro-Siberian Phytogeographic Region is divided into two by Melet River of Ordu province as Auxin and Kolsch sub-regions. Auxin Province starts from west of Melet River and extends towards Stranja Mountaions. Kolsch Province, on the other hand, starts from east of Melet River (Daviz, 1985; Davis, 1988; Atalay, 2002).

Table III.2.1.1. Flora Species, Common Names, Turkish Names, Habitats, Endemism and Rarity Status, Phytogeographical Region and IUCN Red Data Book Categories of species with high possibility of existance at the "Mavi HEPP Project" site which is planned to be constructed at Maçka District of Trabzon Province, and its vicinity, due to their habitat characteristics

ID No.	Family and Species Name	Türkçe İsim (*)	Habitat	Endemism and Rarity Status	Phytogeograph. Region	IUCN Red Data Book Categories
	ACERACEAE					
1	֍***Acer campestre***	Maple	Mixed forests and deciduous bushes	-	Eu.Sib. Ele.	-
2	֍***Acer cappadocicum* GLEDITSCH var. stenocarpum YALT.**	Maple	-	Endemic	Blk. Ele.	VU
3	☼***Acer trautvetteri* MEDW.**	Maple	Mixed forests	-	Blk. Ele.	-
	ALISMATACEAE					
4	☼***Alisma plantago-aquatica* L.**	-	Lake and river banks, marshes, wetlands or surface waters, ravines	-	Eu.Sib. Ele.	-
	APIACEAE					
5	☼***Angelica sylvestris* L. var. sylvestris L.**	Wild angelica	Streams, wet and grassy areas	-	Eu.Sib. Ele.	-
6	☼***Conium maculatum* L.**	Hemlock	Groves and stream banks	-	-	-
7	☼***Foeniculum vulgare* MILLER**	Fennel	Dry slopes, pine forests, stream banks	-	-	-
	ARACEAE					
8	☼***Arum maculatum* L.**	Cuckoopint	Deciduous grooves, shrobby, shaded or clear hillsides	-	-	-
	ARİSTOLOCHIACEAE					
9	☼***Aristolochia pontica* LAM.**	-	Humid shaded areas, shaded stream banks	-	Blk. Ele.	-
	ASCLEPIADACEAE					
10	☼***Periploca graeca* L. var. graeca BOISS. ET HELDR.**	Silk vine	Humid deciduous forests, shrubs, river banks, rocks	-	E. Med. Ele.	-
	ASTERACEAE					
11	֍*Carlina acaulis*	-		-	-	-
12	☼***Carpesium cernuum* L.**	-	Shaded groves at water banks	-	-	-
13	☼***Cirsium arvense* (L.) SCOP. subsp. arvense (L.) SCOP.**	Death Cap	Roadsides, stream banks, drains, meadows, plantation area, wheat and corn field, tea plantation area	-	-	-
14	☼***Crepis zacintha* (L.) BABCOCK**	-	Hills, rivers, road sides	-	Med. Ele.	-
15	☼***Inula salicina* L.**	-	Water banks, humid areas, within bushes	-	Eu.Sib. Ele.	-
16	☼***Lapsana communis* L. subsp. adenophora (BOISS.) RECH. FIL.**	-	Forest, shaded shores, river banks, farmland boundaries	-	-	-
17	☼***Pilosella hoppeana* (SCHULTES) C. H. ET F. W. SCHULTZ subsp. lydia (BORNM. ET ZAHN) SELL ET WEST**	-	Rocky slopes	Endemic	-	-
18	☼***Solidago virgaurea* L. subsp. virgaurea L.**	-	River banks and limestone rocks, mostly groves, rarely cultivated soils	-	Eu.Sib. Ele.	-
19	☼***Tanacetum parthenium* (L.) SCHULTZ BIP.**	Feverfew	Walls and openings, stream banks, shaded forests and rock ledges	-	-	-
20	֍***Taraxacum crepidiforme***	Dandelion	Wet alpine meadows, near melting snow cover		Ir.-Tur. Ele.	
21	☼***Telekia speciosa* (SCHREBER) BAUMG.**	Elecampane	Water banks, small tree gaps	-	Eu.Sib. Ele.	-
	BERBERIDACEAE					
22	֍***Berberis vulgaris* L.**	-	Rocky slopes, forests, shrubberies	-	-	-
	BETULACEAE					

ID No.	Family and Species Name	Türkçe İsim (*)	Habitat	Endemism and Rarity Status	Phytogeograph. Region	IUCN Red Data Book Categories
23	֍***Alnus glutinosa* (L.) GAERTNER subsp. barbata (C. A. MEYER) YALT.**	Alder (redwood)	*Piceae orientalis* or mixed deciduous forests, humid scarps, stream banks	-	Blk. Ele.	-
24	֍*Betula lazistanica*	Birch	Shrubbery forest, rock or volcanic slopes	-	-	-
25	☼***Betula medwediewii* REGEL**	Birch	*Piceae orientalis* mixed subalpine forest, Rhododendron bushes	-	Blk. Ele.	-
	BORAGINACEAE					
26	֍***Trachystemon orientalis* (L.) G. DON**	Trachystemon orientalis	Fagus forest, shaded river banks, wet ravines	-	Blk. Ele.	-
	BRASSICACEAE					
27	☼***Cardamine lazica* BOISS. ET BAL.**	-	Water banks	-	Blk. Ele.	-
28	֍***Cardamine raphanifolia* POURR. subsp. acris (GRIS.) O.E. SCHULZ**	-	Marshes, lake sides, water banks	-	Eu.Sib. Ele.	-
29	☼***Orippa sylvestre* (L.) BESS.**	-	Marshes, river banks, cultivated lands	-	-	-
	CAMPANULACEAE					
30	֍***Campanula alliariifolia* WILLD.**	Bellflower	Steep spruce forests and bush sides, bluffs	-	Blk. Ele.	-
	CAPRIFOLIACEAE					
31	֍***Lonicera caucasica* PALLAS subsp. orientalis (LAM.) CHAMB. ET LONG**	Honeysuckle	Needele-leaved or deciduous forests, bush gaps	Endemic	-	-
32	֍***Sambucus nigra* L.**	Elder	Bush gaps, forest edges	-	Eu.Sib. Ele.	-
33	☼***Viburnum orientale* PALLAS**	-	Forests, between bushes	-	Blk. Ele.	-
	CARYOPHYLLACEAE					
34	☼***Saponaria officinalis* L.**	Soapwort	Road sides, wet forest lands, water banks, shaded areas	-	-	-
	CELASTRACEAE					
35	☼***Euonymus europeaus* L.**	***Euonymus europeaus***	Bushes, forests, shores	-	-	-
	CORNACEAE					
36	☼***Cornus sanguinea***	Common dogwood (female)	Limestone slopes, forest areas	-	-	-
37	֍***Cornus mas* L.**	Common dogwood (male)	Broad-leaved forests, bushes	-	Eu.Sib. Ele.	-
	CORYLACEAE					
38	☼***Carpinus orientalis* MILLER**	White hornbeam	Mixed deciduous forests	-	-	-
39	֍***Corylus avellana***	Wild hazelnut	Deciduous-broad leaved forests (Quercus-Carpinus-Fagus) or mixed forests	-	-	-
	CRASSULACEAE					
40	֍***Sedum spurium* BIEB.**	Stonecrop	Rocks	-	Hir.-Blk. Ele.	-
	CUPRESSACEAE					
41	֍***Juniperus excelsa* BIEB.**	Gray juniper	Dry rocky slopes	-	-	-
42	☼***Juniperus oxycedrus* L. subsp. oxycedrus L.**	Cade juniper	Pine forests, oak bushes, maquis	-	-	-
	CYPERACEAE					

ID No.	Family and Species Name	Türkçe İsim (*)	Habitat	Endemism and Rarity Status	Phytogeograph. Region	IUCN Red Data Book Categories
43	☼***Bolboschoenus maritimus* (L.) PALLA var. cymosus (REICHB.) KIT TAN ET OTENG-YEBOAH**	-	Wetlands at gypsum hills, fresh water marshes, river and stream banks	-	-	-
44	☼***Carex capitellata* BOISS. ET BAL.**	-	Wet alpine meadoes, riverbanks (rarely), over sand dunes	-	Blk. Ele.	-
45	֍***Carex digitata* L.**	-	Rocky slopes, dry forest openings, meadows	-	Blk. Ele.	-
46	☼***Carex pallascens* L. var. pallascens L.**	-	Mixed open forests, ranges and river banks	-		-
47	֍***Carex pendula* HUDSON**	-	Forests and other shady areas, stream banks, springs or depressions	-	Eu.Sib. Ele.	-
48	☼***Cyperus glaber* L.**	-	Marshes, river banks, stream beds, channels, rice fields	-	-	-
49	☼***Fimbristylis bisumbellata* (FORSSKAL) BUBANI**	-	Stream and river banks, wet dunes	-	-	-
50	☼***Pycreus sanguinolentus* (VAHL.) NEES**	-	Stream banks, stream mouths	-	-	-
	EBENACEAE					
51	֍***Diospyros lotus* L.**	Black date	At slopes of alnus and chestnut forests	-	-	-
	ERICACEAE					
52	֍***Rhododendron luteum* SWEET**	***Rhododendron***	Fagus-Pinus and Abies forest floors, grassy slopes, rarely above forest line	-	Blk. Ele.	-
53	☼***Rhododendron ponticum* L. subsp. ponticum L.**	***Rhododendron***	Fagus orientalis forests, rarely other forests or forest edges	-	Blk. Ele.	-
54	☼***Vaccinium arctostaphylos* L.**	Bilberry	Rare beech and fir forests, shrubberies	-	Blk. Ele.	-
55	֍***Vaccinium myrtillus* L.**	Blueberry	Acidic habitats, between *Rhododendron caucasicum*, Pinus or Juniperus	-	Eu.Sib. Ele.	-
56	☼***Vaccinium vitis-idaea* L. subsp. vitis-idaea L.**	-		-	-	-
	EUPHORBIACEAE					
57	☼***Euphorbia helioscopia* L.**	Mole plant	Limestone bluffs and slopes, firigana, river banks, ruins, fallow fields	-	-	-
	FABACEAE					
58	֍***Astragalus viciifolius* DC.**	Milk vetch	Mountainous regions	-	-	-
59	☼***Lotus corniculatus***	Bird's foot clover	Mountainous slopes and meadows	-	-	-
60	☼***Lotus corniculatus* L. var. tenuifolius L.**	Bird's foot clover	Over wet, dense soils, stream banks and marshes	-	-	-
61	֍***Trifolium campestre* SCHREB.**	Clover	Barrens, Fields	-	-	-
62	֍***Trifolium canescens* WILLD.**	Clover	Sub-alpine meadows, stream banks, volcanic groves	-	Blk. Ele.	-
63	֍***Trifolium pannonicum* JACQ. subsp. elongatom (WILLD.) ZOH.**	Clover	Meadows, forest openings, steppes	Endemic	-	-
64	֍***Trifolium pratense***	Meadow mulberry	Meadows, Roadsides, forest gaps	-	-	-
65	☼***Vicia balansae* BOISS.**	Vetch	Piceae and *Pinus sylvestris* forests, mountainous areas, shores	-	Blk. Ele.	-
66	֍***Vicia cracca***	Vetch	Sparse forests, rocky ridges, fences, shores	-	-	-
67	☼***Vicia lutea***	Vetch	Fields	-	-	-
	FAGACEAE					

ID No.	Family and Species Name	Türkçe İsim (*)	Habitat	Endemism and Rarity Status	Phytogeograph. Region	IUCN Red Data Book Categories
68	☼***Fagus orientalis* LIPSKY**	Oriental Beech	Deciduous and mixed forests (Quercus-Castanea-Carpinus or Abies, Pinus nigra)	-	Eu.Sib. Ele.	-
69	☼***Quercus hartwissiana* STEVEN**	Oak tree	Broad leaved deciduous (Carpinus, *Fagus, fraxınus*, Quercus, Alnus) and mixed (Pinus, Abies) forests	-	Blk. Ele.	-
70	☼*Quercus dschorochensis*	Çoruh (stream) oak		-	-	-
	GENTIANACEAE					
71	☼***Blackstonia perfoliata* (L.) HUDSON subsp. serotina (W. KOCH EX REICHB.) VOLLMANN**	-	River banks, loose dunes, wet slopes	-	-	-
	GERANIACEAE					
72	֍***Geranium cinereum* CAV. subsp. subcaulescens (L'HERIT. EX DC.) HAYEK var. lazicum (WORONOW) DAVIS ET ROBERTS**	Geranium	Granitic rocky slopes and within clods	Endemic	Blk. Ele.	NT
73	֍***Geranium columbinum* L.**	Geranium	Rocky slopes, sandy shores, road sides	-	-	-
74	☼***Geranium gracile* LEDEB. EX NORDM.**	Geranium	*Piceae orientalis* forests and *Rhododendron luteum*	-	Blk. Ele.	-
75	֍***Geranium sylvaticum* L.**	Geranium	Coniferous forests, meadows, rocky slopes	-	Eu.Sib. Ele.	-
	GROSSULARIACEAE					
76	☼***Ribes biebersteinii* BERL. EX DC.**	-		-	Blk. Ele.	-
	GUTTIFERAE					
77	☼***Hypericum pruinatum* BOISS. ET BAL.**	Centuary	Volcanic slopes and rock sides	-	Blk. Ele.	-
78	☼***Hypericum tetrapterum* FRIES**	Centuary	Marshes and stream banks	-	-	-
	IRIDACEAE					
79	☼***Iris pseudacorus* L.**	Yellow (marsh) iris	Stream banks, puddles, clods, fresh water marshes	-	-	-
	JUNCACEAE					
80	☼***Juncus articulatus* L.**	-	Stream banks, wet lands	-	Eu.Sib. Ele.	-
	JUGLANDACEAE					
81	֍***Juglans regia* L.**	Walnut	Quercus or mixed deciduous forest, limestone slopes, alluvial soils	-	-	-
	LAMIACEAE					
82	֍***Ajuga orientalis* L.**	-	Forests, bushes, rocky scarps, ranges	-	-	-
83	֍*Betonica hirsuta*	-	Wet meadows, marshy lake banks, rocky slopes at open forests	-	-	-
84	☼***Lamium garganicum* L. subsp. reniforme (MONTBRET ET AUCHER EX BENTHAM) R. MILL**	Deadnettle	Shaded limestone and volcanic rocks, rock fractures, bushes, walls, ruins, river	-	-	-
85	֍***Mentha aquatica* L.**	Stream mint	lake and stream banks, shores and marshes	-	-	-
86	☼***Mentha pulegium* L.**	Pennyroyal	Wetlands drying during summers	-	-	-
87	֍***Prunella vulgaris* L.**	-	Fields, groves, road sides and humid edges, streams	-	Eu.Sib. Ele.	-
88	֍*Salvia pontica*	Sage	Broad and needle leaved forests, meadows, sharp edges	-	Blk. Ele.	-
89	☼***Teucrium chamaedrys* L. subsp. trapezunticum RECH. FIL.**	Herba chamaedrys	Rocky slopes and river banks	-	Blk. Ele.	-
	LILIACEAE					

ID No.	Family and Species Name	Türkçe İsim (*)	Habitat	Endemism and Rarity Status	Phytogeograph. Region	IUCN Red Data Book Categories
90	☼***Ruscus aculeatus***	Butcher's broom	Forests, limestones, slopes, bushes	-	-	-
91	☼***Smilax excelsa* L.**	Bindweed	Maquis, bushes, forests	-	Med. Ele.	-
	LINACEAE					
92	☼***Linum catharticum* L.**	-	Stream banks, wet rocks, puddles, azalea bushes	-	Eu.Sib. Ele.	-
	LYTHRACEAE					
93	֍***Lythrum*** *salicaria subsp.* ***tomentosum***	Loosestrife	Wet areas of lakes and streams, dry river beds	-	Eu.Sib. Ele.	-
	OLEACEAE					
94	֍***Fraxinus rotundifolia***	Common ash	Deciduous bushes or forests	-		-
95	☼***Ligustrum vulgare* L.**	Prie	Deciduous forests, mixed forests (Fahus-Abies), sparse bushes, wetlands	-	Eu.Sib. Ele.	-
	ONAGRACEAE					
96	☼***Epilobium hirsutum* L.**	Willowherb	Marshes, river banks	-	-	-
	ORCHIDACEAE					
97	☼***Dactylorhiza urvilleana* (STEUDEL) BAUMANN ET KÜNKELE**	-	Humid areas, deciduous and needle-leaved forests, Picea-Rhodendron schrubs, stream banks	-	Blk. Ele.	-
98	☼***Orchis simia* LAM.**	***Orchis simia***	Grassy hills, bushes, lime soils	-	Med. Ele.	-
	OXALIDACEAE					
99	☼***Oxalis acetosella* L.**	Sorrel	Rocks within forests	-	-	-
	PARNASSIACEAE					
100	☼***Parnassia palustris* L.**	-	Wet meadows, stream banks	-	-	-
	PINACEAE					
101	֍***Abies nordmanniana* (STEV.) SPACH subsp. nordmanniana (STEV.) SPACH**	Caucasus fir	Forest, with Piceae	-	Blk. Ele.	-
102	֍***Picea orientalis* (L.) LINK**	Spurce	Mixed forests	-	-	-
103	֍***Pinus sylvestris* L.**	Yellow pine	Hillsides, forest	-	Eu.Sib. Ele.	-
	PLATANACEAE					
104	☼***Platanus orientalis* L.**	Plane (sycamore)	Forests, valley bottoms, alluvial soils, river banks, culture	-	-	-
	POACEAE					
105	☼***Agrostis stolonifera* L.**	-	Wet meadows, wetlands	-	Eu.Sib. Ele.	-
106	☼***Bromus madritensis* L.**	-	Pinus prutia forest, Quercus coccifera, firigana, dry ranges, sand dunes, sea shores	-	-	-
107	☼***Cynodon dactylon* (L.) PERS. var. dactylon (L.) PERS.**	Quack grass	Dry and rocky slopes, river banks, fresh water marshes and dunes at sea shores	-	-	-
108	֍*Festuca alpina*	Alpine fescue	Groves, bushes	-	-	-
109	֍***Festuca drymeja* MERTENS ET KOCH**	Festuca	Coniferous and mixed forests, Corylus and Rhododendron bushes	-	Eu.Sib. Ele.	-
110	☼***Lolium rigidum***	-	Rocks, steppe, ranges, fallow fields, orchards, beaches, road sides	-	-	-
	POLYGALACEAE					
111	֍***Polygonum bistorta***	Stag's horn clubmoss	Wet areas	-	-	-
112	☼***Polygala major* JACQ.**	Milkwort	Rocky slopes, edges, shores	-	Eu.Sib. Ele.	-
	PRIMULACEAE					

ID No.	Family and Species Name	Türkçe İsim (*)	Habitat	Endemism and Rarity Status	Phytogeograph. Region	IUCN Red Data Book Categories
113	֍***Cyclamen coum***	Sowbread	*Pinus brutia*, Abies and Quercus-Fagus forests under bushes of rocky ridges	-	-	-
114	֍***Primula vulgaris***	March flower	Sparse or shaded slope clods of generally wet areas, alpine grasslands	-	-	-
115	☼***Primula auriculata* LAM.**	Paigle (oxlip)	Wet clods, stream and lake banks	-	Ir.-Tur. Ele.	-
	RANUNCULACEAE					
116	֍***Caltha polypetala* HOCHST. EX LORENT**	Cowslip	Wetlands	-	-	-
117	☼***Clematis vitalba* L.**	Clematis (virgin's bower)	Bushes, forests	-	-	-
118	☼***Helleborus orientalis* LAM.**	Hellaborus	Bushes, forests	-	Blk. Ele.	-
	RHAMNACEAE					
119	֍***Frangula alnus* MILLER subsp. alnus MILLER**	Alder dogwood	Forests, shrubberies, stream banks	Endemic	-.	-
	ROSACEAE					
120	☼***Alchemilla caucasica* BUSER**	Foalfoot	Under pines, mountain slopes	-	Blk. Ele.	-
121	☼***Aruncus vulgaris* RAFIN.**	-	Shrubberies and forest areas, mostly between stream banks and rock gaps	-	-	-
122	֍***Crataegus microphylla* C. KOCH**	Hawthorn	Forests, dense oak shrubberies	-	Hir.-Blk. Ele.	-
123	֍***Geum coccineum* SM.**	-	Marshy slopes and wet forests	-	Eu.Sib. Ele.	-
124	֍***Mespilus germanica* L.**	Medlar	Sparse forests, rocky areas and maquis	-	Hir.-Blk. Ele.	-
125	☼***Potentilla ruprechtii* BOISS.**	-	Meadows and generally melting snows	-	Blk. Ele.	-
126	☼***Potentilla micrantha* RAMOND EX DC.**	-	Forests, rivers	-	-	-
127	֍***Rubus discolor* WEIHE ET NEES.**	Blackcurrant	Deciduous forests and shrubberies, shaded shores, shore plains	-	-	-
128	☼***Rubus sanctus* SCHREBER**	Blackberry	Sparse bushes, rocky areas, river banks, fixed dunes, shore plains, wasteland shores	-	-	-
129	☼***Sorbus aucuparia* L.**	Rowan	Groves, pine forests, rocky volcanic slopes	-	Eu.Sib. Ele.	-
130	☼***Sorbus torminalis***	Mountain ash	Deciduous (mostly oak) forests, solitary or as cluster	-		-
	RUBIACEAE					
131	֍*Asperula* ***odoratum* (L.) SCOP.**	-	Rich based deciduous forests	-	Eu.Sib. Ele.	-
132	☼***Galium album* MILLER subsp. pycnotrichum (H. BRAUN) KRENDL**	-	Stream banks, edges, dry forests	-	Eu.Sib. Ele.	-
	RUTACEAE					
133	֍***Dictamnus albus* L.**	***Dictamnus albus***	Dry shrubberies and pine forests	-	-	-
	SALICACEAE					
134	֍***Populus tremula* L.**	Trembling poplar	Deciduous forests, mixed forests (Fahus-Abies), *Pinus nigra* and *Pinus sylvestris* forests	-	Eu.-Sib. Ele.	-
135	֍***Salix alba* L.**	White willow	Lake shores, stream and river banks	-	Eu.Sib. Ele.	-
136	֍***Salix caprea* L.**	Goat willow	River banks, deciduous forest openings	-	Eu.Sib. Ele.	-
	SAXIFRAGACEAE					
137	☼***Saxifraga cymbalaria* L. var. cymbalaria L.**	-	Stream Sides, Wet Rocks, Wet-Shaded Areas	-	-	-
138	֍*Saxifraga granulata*	-	Rocks	-	-	-
139	☼***Saxifraga sibirica* L. subsp. sibirica L.**	-	Between rocks, stream banks, shaded slopes	-	-	-

ID No.	Family and Species Name	Türkçe İsim (*)	Habitat	Endemism and Rarity Status	Phytogeograph. Region	IUCN Red Data Book Categories
	SCROPHULARIACEAE					
140	☼***Kickxia spuria* (L.) DUMORT subsp. integrifolia (BROT.) R. FERNANDES**	-	Stream banks, fallow fields and moors, road sides	-	-	-
141	☼***Scrophularia scopolii* [HOPPE EX] PERS. var. scopolii [HOPPE EX] PERS.**	-	Forests, rocky ridges, river banks, shrubberies	-	-	-
142	☼***Verbascum thapsus* L.**	Mullein	River banks, forests, Corylus and quercus shrubs, volcanic clods	-	Eu.Sib. Ele.	-
143	֍***Veronica filiformis* J. E. SMITH**	-	Humid forests, humid meadows, barren meadows, stream banks	-	-	-
144	☼***Veronica scardica* GRISEB.**	-	Streams, edges, wet rocky slopes	-	-	-
	TAMARICACEAE					
145	֍***Myricaria germanica* (L.) DESV.**	-	Streams	-	-	-
	TAXACEAE					
146	֍***Taxus baccata* L.**	Yew	Slopes	-	-	-
	THYMELAEACEAE					
147	֍***Daphne glomerata* LAM.**	Laurel (daphne)	Subalpine and alpine shrubs, edges of Pinus forests	-	Blk. Ele.	-
148	֍***Daphne pontica* L.**	Laurel (daphne)	On volcanic rocks, limestone slopes, ables-fagus forests, Rhododendron and Corylus	-	Blk. Ele.	-
	TILIACEAE					
149	֍***Tilia rubra* DC. subsp. caucasica (RUPR.) V. ENGLER**		Mixed deciduous forests or within fir-peanut forests	-	Blk. Ele.	-
	TYPHACEAE					
150	֍***Typha laxmannii* LEPECHIN**	Bullrush	Lakes, rivers, wetlands	-	Eu.Sib. Ele.	-
	ULMACEAE					
151	֍**Ulmus carpinifolia**	Elm		-	-	-
152	֍***Ulmus glabra* HUDSON**		Mixed deciduous forests	-	Eu.Sib. Ele.	-
	VERBENACEAE					
153	֍***Verbena officinalis* L.**		Rough, ruined areas, rocky areas, dry stream beds, dunes, forest, shrubs	-	-	-
	VIOLACEAE					
154	֍***Viola altaica* KER.-GAWL.**		Meadow, bare slopes	-	-	-
155	֍***Viola odorata* L.**		Shaded areas	-	-	-

(*) Plant names taken from "Turkish Plant Names Dictionary" (Baytop T., 1994, TDK, Ankara). No Turkish name and local name can be found for some species. Therefore, plant species are assessed according to the scientific Latin language in accordance with binomial writing rules.

֍: Observation ☼: Literature

Various abbreviations were used for determination of phytogeographic regions of taxons present and possible to be present due to habitat characteristics at the study area and its vicinity. E. Akd. Ele.: Eastern Mediterranean Element; Akd.Ele.: Mediterranean Element; Blk.Ele.: Black Sea Element; Ir.-Tur.Ele.: Irano-Turanian Element; Eu.-Sib. Ele: Europe-Siberia Element; Hir.Blk.Ele: Hirkan-Black Sea Element are explanations for abbrevations. (-) Mark was assigned for wide spread species or species with unknown phytogeographic region.

Distribution of 155 plant taxons present at species and sub-species level according to phytogeographic regions are; Europe-Siberia Element: 32; Black Sea Element: 31; Hirkan-Black Sea Element: 3; Irano-Turanian Element:1; Eastern Mediterranean Elemen:2 and Mediterranean Element: 3. The remaining 83 species falls within cosmopolit or unknown phytogeograpgy region category. Spectrum of identified species at family level is given in Figure III.2.1.3 and spectrum of plant families is given in Figure III.2.1.4.

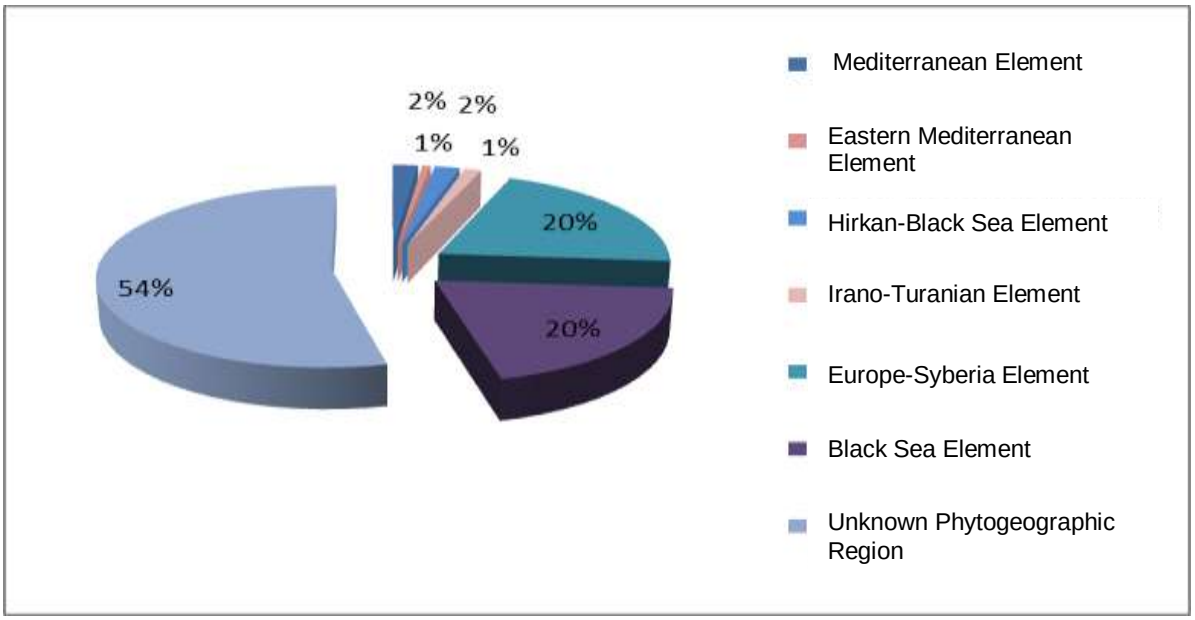


Figure III.2.1.3. Phytogeographic Region Spectrum of Species and Sub-Categories of Plants Given in Flora List

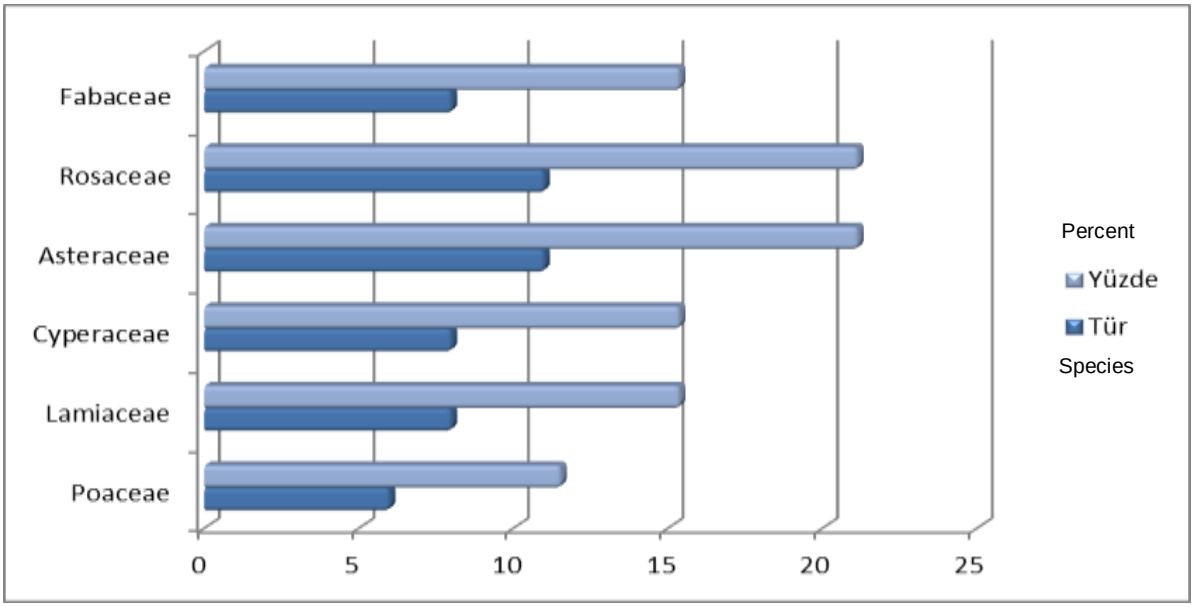


Figure III.2.1.4. Family Spectrum of Plants Given In Flora List

As Turkey is a country located as a transition between continents, it is rich in endemic plants. The 3000 endemic species plants identified in Turkey constitutes approximately 30% or total plant species (Ekim and Friends, 2000).

IUCN Red Data Book categories for endemic plant species utilized in "Red Book of Plants of Turkey" prepared by Ekim et al. (2000) are explained below.

EX : Extinct
EW : Extinct in the Wild
CR : Critical
EN : Endangered
VU : Vulnerable
DD : Data Deficient
NE : Not Evaluated
LR : Lower Risk

There are 3 sub-categories which can be ranked according to future risk.

1) cd - Conservation Dependent: Taxon groups which may fall within above given categories in 5 years.
2) nt - Near Threatened: Plant species falls within this group which are not included into previous category but is a candidate to be placed in VU category.
3) lc - Least Concern: Plant species which does not require any protection and does not have any threat falls within this category.

None of the flora species within and in the vicinity of the project area except *Acer cappadocicum* (VU), *Frangula alnus*, *Lonicera caucasica*, *Trifolium pannonicum*, *Geranium cinereum*, *Pilosella hoppeana* and *Geranium lazicum*, are under national and international protection criteria (ENDEMİC, RARE, IUCN, BERN and CITES).

Fauna

Amphibian species, reptile species, bird species and mammal species of fauna species which are present and possible to be present due to habitat characteristics within and in the vicinity of the study area are given below. In the table, family, Common name, Turkish name, habitat IUCN category, Red Data Book category and to which list of Bern Convention (Appendix-2: definitely protected fauna species and Appendix-3 protected fauna species) do they fall within is given. A (-) mark was used for species which are not listed at Appendix-2 and Appendix-3 of Bern Convention, and IUCN.

Along with this; Appendix-I (Wild Animals Protected by Ministry of Environment and Forestry), Appendix-II (Sport Animals Protected by Central Hunting Commission), Appendix-III (Sport Animals Allow to be Hunter for a Certain Period by Central Hunting Commission) lists of "Central Hunting Commission Decisions of 2011-2012 Period Hunting Season" which came into force by being published in the Official Gazette dated 18.06.2011 and numbered 27968 by General Directorate of Nature Protection and National Parks of Turkish Ministry of Environment and Forestry are also given in the relevant tables.

Wild animals given in Appendix-I are protected by Ministry of Environment and Forestry in accordance with paragraph one of Article 4 of Land Hunting Law numbered 4915. Hunting, handling (dead or alive) and transporting the wild animals given in this list is forbidden.

Birds and mammals given in Appendix-I are protected by Central Housing Commission in accordance with authority given by paragraph one of Article 4 of Land Hunting Law numbered 4915. Hunting, handling (dead or alive) and transporting the wild animals given in this list is forbidden.

Hunting animals given in Appendix-III are animals which are allowed by Central Hunting Commission to be hunted at the periods during 2011-2012 hunting period specified by Ministry of Environment and Forestry in accordance with the paragraph one of Article 4 of Land Hunting Law numbered 4915.

Red Data Book Categories According to Prof. Dr. Ali Demirsoy (1996)

Status of each species or sub-species as far as known or observed in Turkey, in terms of environmental assessment are given according to manner proposed by Wells et al. (1983) and to be practically similar with categories given in IUCN Red Data Book. However, as there are significant differences between regions in Turkey in terms of environmental contamination and disruption, performing this assessment according to regions would be more realistic. In this framework, abbreviations given in Table III.2.1.2 are utilized during assessment. These symbols are not used in the same manner in each country.

Table III.2.1.2. Red Data Book Categories According to Prof. Dr. Ali Demirsoy (1996)

Abbreviation	Definition
E	Endangered
Ex	Extinct
I	Unknown
K	Insufficiently Known
nt	Taxon is not under thread yet
Mo	Taxon is out of threat
R	Rare
V	Vulnerable

Bern Convention

The purpose of the convention is to preserve wild flora and fauna, and their habitat, ensure protection of those especially requiring cooperation of more than one country, and develop this cooperation.

IUCN Red List Categories

IUCN "Red List of Endangered Species" (IUCN Red List) is the most comprehensive Global Protection status inventory of plant and animal species in the world. IUCN Red List, is being compiled by International Protection of Natural Life and Natural Resources Association.

IUCN Red List is being prepared by assessing the extinction risks of thousands of species and sub-species by using definitive measures. These measures are related with all species and all regions around the world. The purpose of Red List is to engage the attention of public and politicians to protection issues, and thus to help international community to reduce extinction of species. IUCN Red List which is prepared based on a strong scientific infrastructure, is accepted to be the most valid guideline for status of bio-diversity.

IUCN Red List Classes and Measures has been developed as an easily understandable system in order to classify the species which have high risk of global extinction. The purpose of this system is to devise an explicit and objective method to classify different species according to their extinction risks. However, although Red List underlines the species with high risk of extinction, it is not the sole method to determine the priorities among protection measures. Comprehensive consultancy and tests performed during development of the system has shown that the system gives sound results for many species. Even though the system classifies the species according to their threat classes in a consistent manner, the utilized criteria does not consider biological characteristics of each species. Therefore, extinction risk can be over- or under-estimated in special cases.

Before 1994, threat classes which are more subjective than IUCN Red Book and Red List are being used for almost 30 years. Although necessity to renewal of these threat classes was known for a long time, the most recent enhancement has initiated with the request of IUCN Species Survival Commission (SSC) Steering Committee for development of a more objective method in 1989. IUCN Council has approved the new Red List system in 1994

Explanations of IUCN Red List Classes and Criteria

- Provide as system which can be utilized by different persons in a consistent manner;
- Increase the objectivity of assessments by providing an easily understandable guideline for evaluation of different factors which effect extinction risk;
- Provide a system for comparability of various species;
- Allow the persons using the threatened species lists to understand the classification of each species.

Categories are classified into 10 groups (Table III.2.1.3 and Figure III.2.1.5), and extinction rate, population size, geographic distribution areas, and population and distribution degree were considered in this classification.

Table III.2.1.3. IUCN Categories and their Explanations

Evaluated	Evaluated species
Not Evaluated (NE)	Not Evaluated species
Adequate data	Adequate data is available
Data Deficient (DD)	Adequate data is not available (missing data)
Extinct (EX)	Species completely extinct
Extinct in the Wild (EW)	Species extinct in the wild
Critically Endangered (CR)	Critically endangered species
Endangered (EN)	Endangered species
Vulnerable (VU)	Species with the risk of extinction if protection measure is not taken
Near Threatened (NT)	Near threatened species
Least Concern (LC)	Species with least concern

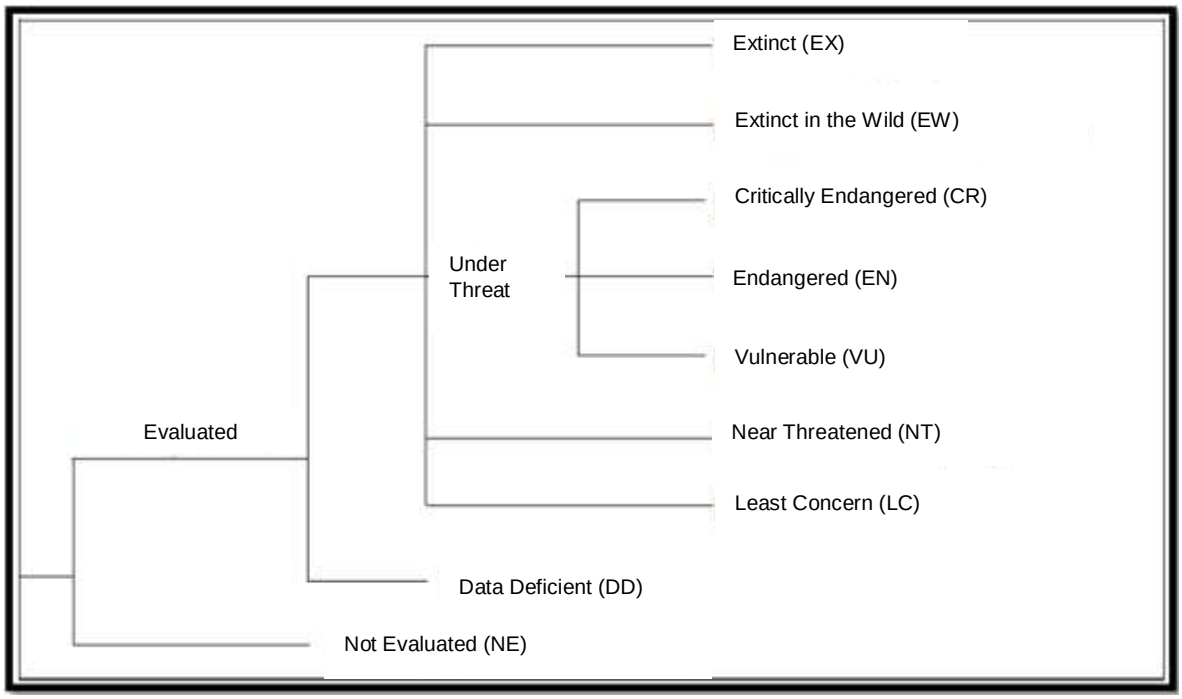


Figure III.2.1.5. Relations between IUCN Categories

Fauna Elements Present in the Project Area

➢ *Fish*

Species identified in the steam where activity area lies as a result of field studies and literature survey is presented in Table III.2.1.4.

Table III.2.1.4. Fish species present at the "Mavi HEPP Project" planned at the Maçka District of Trabzon Province, and its close vicinity and with high possibility of existence due to habitat characteristics

Family and Species Name	Common Name	BERN	*IUCN Red List*	*Habitat*
SALMONIDAE				
♉ *Salmo trutta fario*	Stream trout	-	-	Lives at fast flowing, high oxygen, pebbled-rocky bedded sections of streams
♉ *Salmo trutta labrax*	Sea trout	-	-	Lives at fast flowing, clean, cold and high oxygen bearing mountain waters
CYPRINIDAE				
♉ ***Capoeta tinca***	**School fish**	-	-	Lives at fast flowing, pebbled-rocky bedded sections of streams
♉ ***Barbus plebejus***	**Goatfish**	**III**	LC	Lives at fast flowing, pebbled-rocky bedded sections of streams
♉ *Alburnoides bipunctatus fasciatus*	Spirlin	-	-	Lives at fast flowing, pebbled-rocky bedded sections of streams
GOBIIDAE				
♉ *Neogobius (Ponticola) eurycephalus*	Gobio	-	LC	Streams

♟: Observation ♉: Literature

One of six fish species which are present at the study area and its vicinity and possible to be present due to habitat characteristics (*Barbus plebejus*) is listed in **Appendix-3 of Bern Convention**. Along with this, two of the fish species (*Neogobius (Ponticola) eurycephalus and Barbus plebejus)* is listed in **LC category of IUCN Categories**.

➢ *Amphibians*

Amphibian species present and possible to be present at the study area and its vicinity is given in Table III.2.1.5.

One of six amphibian species which are present at the study area and its vicinity and possible to be present due to habitat characteristics *(Hyla arborea*) are listed in **Appendix-2 of Bern Convention** and other five of those are listed under **Appendix-3 of Bern Convention**.

Although all of the amphibian species are present at IUCN Red List Categories, they are considerably abundant and common in Turkey according to studies executed by Demirsoy (1996), and they are under no threat as well.

Table III.2.1.5. Amphibian Species Present At the "Mavi HEPP Project" Planned At the Maçka District Of Trabzon Province, And Its Close Vicinity And With High Possibility Of Existence Due To Habitat Characteristics

Family and Species Name	Common Name	BERN	Red Data Book	*IUCN Red List*	Habitat
BUFONIDAE					
❦ *Bufo bufo*	Toad	III	nt	LC	They live at humid rocky sections of sparsely vegetated or forested. They hide at rock bottoms, soil burrows and cracks during day.
SALAMANDRIDAE					
♉ *Mertensiella caucasica*	Caucasus newt	III	nt	VU	Observed near tree covered, rocky water courses.
♉ *Triturus (Ommtotriton) vittatus*	Banded newt	III	nt	LC	Lives at densely vegetated, shallow and calm or slowly flowing streams during spring (spawning period). Observed at forested or bare rocky areas near these waters during rest of the year.
RANIDAE					
♉***Pelophylax ridibundus***	Marsh frog	III	nt	LC	They live at densely vegetated ponds, lakes and rivers. They do not leave water usually.
❦ *Rana macrocnemis*	*Rana macrocnemis (Uludağ frog)*	III	nt	LC	Generally lives bare lands or at small streams and edges of these streams located at forested areas.
HYLİDAE					
♉ *Hyla arborea*	Tree toad	II	nt	LC	This species enters into water only during spawning period; lives at trees, tree like plants and similar small plants.

Source: Demirsoy, A., 1996, "Amphibians" in Turkey, Ministry of Environment, General Directorate of Environmental Protection, Project No: 90-K-1000-90. Ankara (In Turkish)

❦: Observation ♉: Literature

➢ *Reptiles*

Reptile species present and possible to be present at the study area and its vicinity is given in Table III.2.1.6.

Seven of 14 reptile species which are present at the study area and its vicinity and possible to be present due to habitat characteristics are listed in **Appendix-2 of Bern Convention** and other seven of these are listed under **Appendix-3 of Bern Convention**.

According to IUCN Red List Categories, three species are listed in LC, two are in NT and one is listed in EN categories. Four of these species (*Hemidactylus turcicus*, *Natrix natrix, Natrix tessellata* and *Elaphe quatuorlineata*) are considerably abundant and common in Turkey according to studies executed by Demirsoy (1996), and they are under no threat as well.

All of the reptile species are listed under Appendix-I (Wildlife Animals Protected by Ministry of Environment and Forestry) according to the most recent lists where "2011-2012 Hunting Season, Central Hunting Commission Decisions" are presented and which came into force by being published in the Official Gazette dated 18.06.2011 and numbered 27968 by Environment and Forestry Ministry of Turkey, General Directorate of Nature Protection and National Parks.

Table III.2.1.6. Reptile Species Present At the "Mavi HEPP Project" Planned At the Maçka District Of Trabzon Province, And Its Close Vicinity And With High Possibility Of Existence Due To Habitat Characteristics

Family and Species Name	Common Name	BERN	Red Data Book	*IUCN Red List*	AKK (*)	Habitat
GEKKONIDAE						
❦ *Hemidactylus turcicus*	Mediterranean House Gecko	Annex-III	nt	LC	Annex-I	Under rocks, rock cracks and houses, and ruins.
ANGUIDAE						
☙ *Ophisaurus apodus*	European Legless Lizard	Annex-II	nt	-	Annex-I	Moors and rock areas.
COLUBRIDAE						
❦ *Natrix natrix*	Natrix Natrix	Annex-III	**nt**	**LC**	Annex-I	Lives at rocky areas near water.
☙ *Natrix tessellata*	Water snake	Annex-II	**nt**	**LC**	Annex-I	Lives at rocky areas near water.
☙ *Coronella austriaca*	Australian snake	Annex-II	-	-	Appendix-1	Lives at road sides and within forests in the Black Sea region at elevations between 0 and 2750 m.
☙ *Coluber caspius*	Capian snake	Annex-II	nt	-	Appendix-1	Meadow areas at the edge of roads and gardens. Sometimes climbs trees. Lives at elevations between 0 and 1,000 m. Common throughout Black Sea region.
TYPLOPIDAE						
☙ *Typhlops vermicularis*	Levant viper	Annex-III	**nt**	-	Annex-I	Lives at sparse vegetated open fields, within wet soils and under rocks.
COLUBRİDAE						
☙ *Elaphe quatuorlineata*	Yellow snake	Annex-III	nt	NT	Annex-I	Sparse forests, shrubberies, rocky areas
☙ *Elaphe hohenackeri*	Caucasus snake	Annex-II	nt	-	Annex-I	Open fields, forested areas, fields, gardens, areas up to 2500 m elevation.
VIPERIDAE						
☙ *Vipera barani*	Turkish viper	Annex-II	-	NT	Annex-I	Lives at the edges of hazelnut gardens and forested areas from Adapazari to Artvin.
LACERTİDAE						
☙ *Darevskia rudis*	Trabzon lizard	Annex-III	nt	-	Appendix-1	Lives at steep slopes, and rocky sections of dry river beds. From Trabzon, Artvin, Ardahan, Bursa to Amasya, and from Sinop to Adapazari.
☙ *Daresvkia clarkorum*	Clark's lizard	Annex-II	-	EN	Appendix-1	Lives at stream banks, large stony and rocky areas at wet shrubberies and forested areas. From Giresun, throughout Eastern Black Sea region shoreline.
☙ *Lacerta armeniaca*	Hemsin lizard	Annex-III	nt	-	Appendix-1	Rocky areas of mountainous regions, high slopes, and up to 2500 m elevation at plain-like areas.
ANGUIDAE						
☙ *Anguis fragilis*	Slow worm	Annex-III	nt	-	Appendix-1	Shrubbery areas, meadows, under rocks or within soft soils of forested areas, locations up to 2000 m elevation.

Source: Demirsoy, A., 1997, Vertebrates, Reptiles, Birds and Mammals" Meteksan A.Ş., Ankara (In Turkish).

Source: Demirsoy, A., 1996, Amphibians in Turkey", Ministry of Environment, General Directorate of Environmental Protection, Project No: 90-K-1000-90. Ankara (In Turkish)

Source: Baran, İ., 2008, Türkiye Amfibi ve Sürüngenleri, TÜBİTAK Popular Science Books, Ankara (In Turkish).

(*)=Ministry of Environment and Forestry of Turkey, General Directorate of Nature Protection and National Parks "2011-2012 Hunting Seasons, Central Hunting Commission Decisions"

❦: Observation ☙: Literature

➢ *Birds*

Bird species present and possible to be present at the study area and its vicinity is given in Table III.2.1.7.

Table III.2.1.7. Bird Species Present At The "Mavi HEPP Project" Planned At The Maçka District Of Trabzon Province, And Its Close Vicinity And With High Possibility Of Existence Due To Habitat Characteristics

Item No.	Family and Species Name	Common Name	Habitat	IUCN Red List	Red Data Book	BERN	Status	AKK (*)
	ACCIPITRIDAE	BIRDS OF PREY						
1	♂ Accipiter brevipes	Levant sparrowhawk	Broad leaved forests with openings, forested river valleys, groves.	LC	A.3	II	G, T	Annex-I
2	♂ *Accipiter gentilis*	Goshawk	Forests near fields, groves.	LC	A.3	II	Y, KZ	Annex-I
3	♂ *Accipiter nisus*	Eurasian Sparrowhawk	They live at large meadows and steppes, open wetlands and bare rocks as well as open and closed forests of coniferous and deciduous trees, woody steppes, agricultural fields divided by woody shrubby boundaries, and all types of woody areas such as parks-gardens.	LC	A.4	II	Y, KZ	Annex-I
4	♂ *Buteo buteo*	Buzzard	Live and breed at woodland areas near clearings, agricultural areas, pastures and marshes	LC	A.3	II	Y, KZ, T	Annex-I
5	♂ *Buteo rufinus*	Long legged buzzard	Live at clearings such as plains, agricultural areas.	LC	A.2	II	Y, KZ	Annex-I
6	♂ *Gypaetus barbatus*	Lammergeiger	Rocky valleys, bare or sparse woodlands and rocky hillsides except covered forest areas are their habitat.	LC	A.2	II	L	Annex-I
7	♂ *Gyps fulvus*	Griffon	They live at rocky and mountainous areas, and nests at rock ledges in colonies. Live at treeless steppes, steep bluffs and high mountains.	LC	A.2	II	Y, G, T	Annex-I
8	♂ *Hieraaetus pennatus*	Booted eagle	Live generally at deciduous and coniferous woodland areas at mountainous areas up to 10 000 m. It is sometimes possible to observe at plains at sea level.	LC	A.2	II	G, KZ, Y	Annex-I
	ALAUDIDAE	**SKYLARKS**						
9	♂ *Eremophila alpestris*	Eared skylark	Breeds at high and forest free areas, rocky sea shores and tundra. Spends winter at sea shores.	LC	A.3	II	L	Annex-I
	ANATIDAE	ANATIDAE						
10	♂ Anser albifrons	Greater white fronted goose	They live at tundra, meadow and moors near rivers, lakes and water puddles, and planted fields; live at rough flood plains, locations with halophyte plants or dry plains during winter.	LC	B.2	III	KZ	Annex-III
11	♂ Tadorna tadorna	Sheldrake	Lives at reeds at the shores of lakes and rivers from England islands to western shores of France, and to the Asia and China.	LC	A.2	II	Y, G, KZ	Annex-I
	APODIDAE	**SWIFTS**						
12	♂ *Apus apus*	Swift	Live at wet land areas, open fields and settlement areas.	LC	A.4	III	G, T	Annex-I
	ARDEIDAE	HERONS						

Item No.	Family and Species Name	Common Name	Habitat	IUCN Red List	Red Data Book	BERN	Status	AKK (*)
13	♂ Nycticorax nycticorax	Night heron	Live at lakes, rivers and dense vegetated marshes.	LC	A.3	II	G	Annex-I
14	♂ Ardea cinerea	Gray heron	Can live at all kinds of shallow water, fresh water, brackish water or salty water, shallow and slow flowing channels, stabile or flowing water areas; prefers shaded and rounded woodland areas.	LC	A.3	III	L	Annex-II
	CAPRIMULGIDAE	**NIGHTJARS**						
15	♂ *Caprimulgus europaeus*	Nightjar	Mainly woodland open field, mood birds, but can be observed at dry forests, shrubberies and plains as well.	LC	A.2	II	G	Annex-I
	CHARADRIIDAE	PLOVERS						
16	♂ Charadrius dubius	Small ring plover	They are observed at sandy and gravelly lake shores and rivers.	LC	A.2	II	G	Annex-I
17	♂ Vanellus vanellus	Green Plover	Open planted fields, paddy fields, lake and river shores are their principal habitats.	LC	A.4	III	Y, KZ	Annex-II
	CICONIIDAE	STORKS						
18	♂ Ciconia ciconia	White stork	Uses reed and wetland areas for feeding purposes, nests at settlement areas, roofs, chimneys, poles and trees near agricultural areas and wetland areas.	LC	A.3	II	Y, G, T	Annex-I
	CINCLIDAE	**AQUEOUS BLACKBIRDS**						
19	♂ *Cinclus cinclus*	Aqueous blackbird	They generally live at high elevations (up to 2500 m), fast flowing, clean, rocky mountain rivers. They descent during winter.	LC	A.3	II	L	Annex-I
	COLUMBIDAE	PIGEONS						
20	♀ Columba livia	Rock pigeon	Moors, fields and rock areas. Nests at rock coves.	LC	-	III	L	Annex-III
	CORVIDAE	**CROWS**						
21	♂ *Corvus corax*	Common raven	Live at high plateaus, rock shores, rocky forests, shrubberies, mountainous areas where animal breeding activities are present.	LC	-	III	L	Annex-II
	CUCULIDAE	**CUCKOOS**						
22	♂ *Cuculus canorus*	Cuckoo	Moors, plains, forests, parks and gardens, tundra and turbaries, shrubberies, marshes and dunes are their main living areas.	LC	-	III	G	Annex-I
	EMBERIZIDAE	**BUNTINGS**						
23	♂ *Emberiza cia*	Rock bunting	Generally prefers steep rocky mountain sides, brier and thorn patched areas.	LC	-	II	Y, G	Annex-I
	FALCONIDAE	**FALCONS**						
24	♂ *Falco peregrinus*	Peregrine falcon	Generally live below mid-belt parallels, Mediterranean region and central Asia neighbour to Western Paleoarctic areas.	LC	A.2	II	Y, KZ	Annex-I

Item No.	Family and Species Name	Common Name	Habitat	IUCN Red List	Red Data Book	BERN	Status	AKK (*)
25	♀ *Falco tinnunculus*	Kestrel	Mountains, valleys, forest edges, plains, agricultural areas, sea shores and even cities.	LC	A.4	II	L	Annex-I
	FRINGILLIDAE	FRINGILLIDAE						
26	♀ Carduelis carduelis	Goldfinch	They live at forested areas where grassy plants are abundant, plains, forest clearings, moors, maquis areas, Siberia steppes, bramble patches, stream heads, gardens and villages.	LC	A.4	II	L	Annex-I
27	♂ Carpodacus erythrinus	Carmen Bullfinch	They usually live outside urban areas, away from settlement areas, at mountain foots and generally live around oak forests and rivers.	LC	-	II	G	Annex-I
28	♂ *Fringilla montifringilla*	Brambling	Prefers open fields and forests during winter. Breeds at northern taigas.	LC	-	III	KZ	Annex-II
	HIRUNDINIDAE	**MARTINS**						
29	♀ *Hirundo rupestris*	Crag martin	Observed at mountainous and rocky regions, shoreline rocky areas and near settlement areas.	LC	-	II	G	-
	LANIIDAE	**STARLINGS**						
30	♂ *Lanius collurio*	Starling	Likes to perch at bushy open areas and fences at the edges of similar areas.	LC	-	II	G	Annex-I
	LARIDAE	GULLS						
31	♂ Larus minutus	Little gull	This species live at sea shores, reservoirs, ponds and lakes, and specially stream and sewer outlets, at sandy and muddy beaches, river mouths and along sea shores.	LC	B.3	II	KZ, T	Annex-I
	MEROPIDAE	**BEE-EATERS**						
32	♀ *Merops apiaster*	Bee-eater	Bee-eaters which prefer hot climate, colonize near wetlands where they can find flying insects which are necessary for their nutrition, by opening small holes in sandy and clayey soil walls.	LC	A.4	II	G	Annex-I
	MOTACILLIDAE	WAGTAILS						
33	♂ *Anthus pratensis*	Meadow pipit	Prefer non-agricultural treeless open fields.	LC	-	II	G, T, KZ	Annex-I
34	♀ Motacilla cinerea	Grey Wagtail	They breed at fast flowing rivers at high elevations, and at pond dams and waterfalls at lower elevations. They are observed at water banks and urban areas during winter.	LC	A.4	II	L	Annex-I
35	♀ Motacilla alba	White Wagtail	**They g**enerally prefer water vicinity and lives around lake, stream or sea.	LC	A.4	II	L	Annex-I
	PANDIONIDAE	OSPREYS						
36	♂ Pandion haliaetus	Fish hawk	They live at water areas within forests, lakes and river and sea shores where old trees are present.	LC	A.1.2	II	G, T	Annex-I
	PASSERIDAE	SPARROWS						

Item No.	Family and Species Name	Common Name	Habitat	IUCN Red List	Red Data Book	BERN	Status	AKK (*)
37	♀ Passer domesticus	House sparrow	They are common in gardens, parks and fields.	LC	-	-	L	Annex-III
38	♂ *Montifringilla nivalis*	Snow finch	Nests at high elevations, 1,500 m and higher, rocky areas.	LC	-	III	G	Annex-I
	PODICIPEDIDAE	LOBED GULLS (DIVERS)						
39	♂ Podiceps (Tachybaptus) ruficollis	Little grebe, marine	Breeding of little grebes occur at densely vegetated lakes, ponds, marshes and slow flowing rivers.	LC	A.3	II	Y, G	Annex-I
	RECURVIROSTRIDAE	AVOSETS						
40	♂ Himantopus himantopus	Black winged stilt	They are common at hot and tropical climate belts. They usually feed at fresh water areas, lake shores, sea shores, marshes, river beds and marsh puddles.	LC	A.3	II	G	Annex-I
	SCOLOPACIDAE	WOODCOCKS						
41	♂ Gallinago gallinago	Marsh snipe	They live at fresh or salty water marshes, or densely vegetated areas, lakes and rivers, wet hay areas, marsh meadows and grasslands or marsh edges, and open and marshy tundra and forests.	LC	B.2	III	T, KZ	Annex-III
42	♂ Actitis hypoleucos	Common sandpiper	They usually nest at ground at woodland areas and between grasses at water banks, they usually prefer rivers, freshwater lakes and protected bays at seaside, and gravelly areas rather than beaches.	LC	A.3	III	G, KZ, T	Annex-I
	STRIGIDAE	**OWLS**						
43	♀ *Bubo bubo*	Eagle owl	They prefer various habitats. They can dwell at mountains, forests and even deserts.	LC	A.1.2	II	L	Annex-I
44	♂ *Otus scops*	Barn owl	Areas with sparse trees, sparse forests, agricultural areas, orchards, parks, gardens, small settlements and ruins.	LC	A.3	II	L	Annex-I
	SYLVIDAE	SYLVIA						
45	♂ Cettia cetti	Cettis warbler	Live at wetland areas where dense bushes and bamboos are present. Slow flowing streams, lakes and marsh shores are ideal living and breeding grounds for this species.	LC	A.4	II	L	Annex-I
	TETRAONIDAE	**SNOWCOCKS**						
46	♂ *Tetraogallus caspius*	Caspian snowcock	Live at high elevation rocks of mountains, over forest line, elevations between 1800 and 4000 m, generally at around 2400 m.	LC	A.1.2	III	L	Annex-I
	TURDIDAE	**FIELDFARE (NIGHTINGALE)**						
47	♂ *Turdus philomelos*	Singing cedar	Forests of various deciduous trees, parks and gardens with dense vegetation.	LC	-	III	KZ, Y	Annex-II

Item No.	Family and Species Name	Common Name	Habitat	IUCN Red List	Red Data Book	BERN	Status	AKK (*)
48	ʁ *Turdus torquatus*	Ring ouzel	Rocky areas, high elevation forests.	LC	-	II	G, T	Annex-I
49	ʁ *Monticola saxatilis*	Rock thrush	Open rocky areas, mostly mountains, rarely lower elevation areas.	LC	-	II	G	Annex-I
50	ʁ *Oenanthe oenanthe*	Wheatear	Live at various treeless and rocky open areas; breed at tundra, rocky slopes, turbaries, fields, treeless hills, rough ranges and dunes.	LC	A.3	II	G	Annex-I
51	ʁ *Phoenicurus phoenicurus*	Redstart	Can be observed at mixed forests, bushes, parks and gardens.	LC	-	II	L	Annex-I
	UPUPIDAE	**HOOPOES**						
52	♗ *Upupa epops*	Hoopoe	Prefers open, short planted and sparse plantation areas.	LC	A.2	II	G	Annex-I

Source: Demirsoy, A., 1997, "Vertebrates, Reptiles, Birds and Mammals" Meteksan A.Ş., Ankara (In Turkish).
Source: Kiziroğlu, İ, 1993, the Birds of Turkey (Species List in Red Data Book), TTKD, Ankara (In Turkish).
(*)=Ministry of Environment and Forestry of Turkey, General Directorate of Nature Protection and National Parks "2011-2012 Hunting Seasons, Central Hunting Commission Decisions"
♗: Observation ʁ: Literature

Bird species' protection status of explanations used at "The Birds of Turkey" Book by Prof. Dr. İlhami Kiziroglu is given below:

A1 : Extinct or nearly extinct species
A1.1 : Extinct species
A1.2 : Species with 1-25 pair all around Turkey
A2 : Species with pair count below 26-50 and under great risk at their habitat
A3 : Species with population pair count between 51 and 200 (500), but highly diminished at certain regions
A4 : Species with high population count, but reduced population count at certain regions
B : Species temporarily visiting Turkey and which may be threatened in case of annihilation of biptopes
B1 : Species present at Anatolia during winter, but not breeding at Anatolia
B2-B3 : Species which pass Anatolia in transit or use Anatolia as winter quarters and which have low risk level
L : Domestic bird species regularly sitting (brooding) in Turkey
G : Species migrating after brooding in Turkey
K : Species using Turkey during transit migration and which does not brood in Turkey
KZ : Species which pass winter months in Turkey and which as winter visitors

Bird species in the table given above are indicated with different symbols which are explained under the table as species obtained from the literature (ʁ) and species observed (♗) in the field. Only two of the species given in the categories of A.1.2 and A2, (*Bubo bubo* ve *Upupa epops*), were observed in the field survey. Other species given in the table were obtained from the literature and they are the species possible to be observed in the field.

38 of 52 bird species which are present at the study area and its vicinity, and possible to be present due to habitat characteristics are listed in **Appendix-2 of Bern Convention** and 13 of these are listed under **Appendix-3 of Bern Convention**.

Along with this; 42 bird species are listed in Appendix-I (Wild Animals Protected by Ministry of Environment and Forestry), 5 bird species are listed in Appendix-II (Sport Animals Protected by Central Hunting Commission), and 4 bird species are listed in Appendix-III (Sport Animals Allow to be Hunter for a Certain Period by Central Hunting Commission) lists of "Central Hunting Commission Decisions of 2011-2012 Period Hunting Season" which came into force by being published in the Official Gazette dated 18.06.2011 and numbered 27968 by General Directorate of Nature Protection and National Parks of Turkish Ministry of Environment and Forestry.

All of the bird species are listed in LC category of IUCN Red List Categories. Species given in LC category are common and are under no threat. But according to the "The Birds of Turkey" Book written by Prof. Dr. İlhami Kiziroglu, some species are listed under risk. In terms of the the field surveys and literature, there is not enough data about species which may exist according to the similar habitat types and their population's status. However, the planned project does not affect the bird species directly.

- ***Mammals***

Mammal species present and possible to be present at the study area and its vicinity is given in Table III.2.1.8.

Table III.2.1.8. Mammal species present at the "Mavi HEPP Project" planned at the Maçka District of Trabzon Province, and its close vicinity and with high possibility of existence due to habitat characteristics

Family and Species Name	Common Name	BERN	Red Data Book	*AKK (*)*	*IUCN* Red List	Habitat
ERINACEIDAE						
♀ *Erinaceus concolor*	*Hedgehog*	-	*nt*	*Annex-I*	*LC*	*They live at sparse woodlands, gardens and generally humid areas.*
SPALACIDAE						
♂ *Spalax leucodon*	Lesser Mole	-	nt	-	DD	They live at orchards and gardens.
MURIDAE						
♂ *Apodemus sylvaticus*	*Wood Mouse*	-	*nt*	-	*LC*	*They live at fields and gardens.*
MUSTELIDAE						
♂ *Martes foina*	Beech Marten	III	nt	Annex-III	LC	Rocky areas, forest edges, rough mixed forests
♂ *Martes martes*	Pine marten	III	nt	Annex-III	LC	Locations with frequent rocks at coniferous and mixed forests, open areas, tall trunked trees near steppes
♂ *Meles meles*	Yew	III	R	Annex-II	LC	Mixed and bush containing forests, occasionally tree containing rocky areas, steppe and semi-steppe areas near fields and meadow edges, water edges.
♂ *Lutra lutra*	Otter	II	V	Annex-I	NT	Still and flowing streams, river, stream and creek edges, river mouths, sufficiently vegetated sections of deltas.
♂ *Mustela nivalis*	*Weasel*	*III*	*nt*	*Annex-II*	*LC*	*They live at hollows, pits, holes, inside bushes, log hollows.*
LEPORIDAE						
♂ *Lepus europaeus*	Hare	III	nt	Annex-III	LC	Grassy, woodland and open fields.
SCIURIDAE						
♂ *Sciurus vulgaris*	Squirrel	III	nt	Annex-I	LC	Coniferous forests, deciduous forests, mixed forests, parks, gardens.

Family and Species Name	Common Name	BERN	Red Data Book	*AKK (*)*	*IUCN* Red List	Habitat
ʁ *Spermophilus citellus*	Ground squirrel	II	nt	Annex-I	VU	Locations of short plants at open areas, fields, abandoned agricultural areas.
CANIDAE						
ʁ *Canis lupus*	Wolf	II	R (V)	Annex-I	LC	Tundra, woodland steppe, open fields, forests, mountaneous areas with hollows.
ʁ *Canis aureus*	Jackal	-	nt	Annex-III	LC	Dense marsh forests, moors, maquis areas, stream valleys, oak barrens.
ʁ *Vulpes vulpes*	Red Fox	-	nt	Annex-III	LC	Tundra, desert, forest, city centers.
URSIDAE						
ʁ *Ursus arctos*	Grizzly bear	II	V	Annex-I	LC	Broad-leaved and mixed forests, barren areas and steppe covered with short plants, steep mountains.
FELIDAE						
ʁ *Felis silvestris*	Wild cat	II	E	Annex-I	LC	Broad-leaved and mixed forests near settlement areas, rarely coniferous forests, shrubbery fields and reedy fields.
SUIDAE						
ʁ *Sus scrofa*	Boar	-	nt	Annex-III	LC	All areas with appropriate vegetation cover, morass, dense shruberries, reed beds, marshes bounded by reed beds, dense bushes at lake and river sides and meadows there bushes are present.
CERVIDAE						
ʁ *Capreolus capreolus*	Roe-deer	-	nt/R	Annex-I	LC	Groves rich in terms of low height plants, coniferous-broad leaved mixed forests and marshes

Source: Demirsoy, A., 1997, "Vertebrates, Reptiles, Birds and Mammals" Meteksan A.Ş., Ankara (In Turkish).
Source: Demirsoy, A., 1996, Turkish Vertebrates "Mammals", Ministry of Environment, General Directorate of Environmental Protection, Project No: 90-K-1000-90. Ankara (In Turkish)
(*)=Ministry of Environment and Forestry of Turkey, General Directorate of Nature Protection and National Parks "2011-2012 Hunting Seasons, Central Hunting Commission Decisions"
ᴥ: Observation ʁ: Literature

Four of 18 mammal species which are present at the study area and its vicinity, and possible to be present due to habitat characterisrics are listed in **Appendix-2 of Bern Convention** and 6 of these are listed under **Appendix-3 of Bern Convention**.

Two of 18 mammal species which are present at the study area or possible to be present at the study area due to habitat characteristics, are listed under Appendix-I (Wildlife Animals Protected by Ministry of Environment and Forestry) according to most recent lists where "2011-2012 Hunting Season, Central Hunting Commission Decisions" are presented and which came into force by being published in the Official Gazette dated 18.06.2011 and numbered 27968 by Environment and Forestry Ministry of Turkey, General Directorate of Nature Protection and National Parks, one of the species are listed under Appendix-2 and 6 of the species are listed under Appendix-3 (protected species).

Fifteen of the mammal species are listed in LC category of IUCN Red List Categories and are under no threat. 1 species is listed in DD, one is VU and one is NT category.

III.2.2. PROTECTION AREAS

There is no inland water which is listed as internationally important wetlands of Turkey and which is under protection status at and in the vicinity of the project site. In addition to this, there is no area which is defined in "Special Environment Protection Areas" heading of Environment Law numbered 2872 and which is defined in "National Parks", "Nature Reserve Areas", "Natural Monument", "Nature Parks" article of National Parks Law numbered 2873 at and within vicinity of the project area. Furthermore, there are no biosphere reserve areas, biogenetic reserve areas, tourism area and centers, archeological, historical and cultural protection areas.

Uzungöl Special Environment Protection Area, Uzungöl Natural Park, Seragölü Natural Park and Altındere Valley National Park is present within the boundaries of Trabzon province. Among these areas, Uzungöl Special Environment Protection Area and Uzungöl Natural Park is 65 km away from the project site, and Seragölu Natural Park is 27 km, Altındere Valley National Park is 12 km away from the project site.

III.3. SOCIO-ECONOMIC PROPERTIES OF THE ENVIRONMENT

III.3.1. DEMOGRAPHIC PROPERTIES

Results of 2011 address based census results of Trabzon province and its districts is given in Table III.3.1.1, and census data of settlement areas in the vicinity of project site is given in Table III.3.1.2.

Table III.3.1.1. 2011 Population Data of Trabzon Province and its Districts

Trabzon	Province/District Centers			Counties/Villages			Total		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
Center	239.704	119.250	120.454	65.527	33.071	32.456	305.231	152.321	152.910
Akçaabat	40.277	20.382	19.895	72.450	35.570	36.880	112.727	55.952	56.775
Araklı	22.345	11.155	11.190	26.296	12.646	13.650	48.641	23.801	24.840
Arsin	10.662	5.376	5.286	16.351	8.001	8.350	27.013	13.377	13.636
Beşikdüzü	12.509	6.117	6.392	9.528	4.540	4.988	22.037	10.657	11.380
Çarşıbaşı	7.295	3.677	3.618	8.539	4.262	4.277	15.834	7.939	7.895
Çaykara	2.086	1.076	1.010	12.168	5.989	6.179	14.254	7.065	7.189
Dernekpazarı	1.736	854	882	1.975	920	1.055	3.711	1.774	1.937
Düzköy	3.431	1.660	1.771	11.852	5.647	6.205	15.283	7.307	7.976
Hayrat	2.995	1.478	1.517	5.433	2.601	2.832	8.428	4.079	4.349
Köprübaşı	2.021	1.008	1.013	3.277	1.615	1.662	5.298	2.623	2.675
Maçka	5.645	2.800	2.845	18.361	8.783	9.578	24.006	11.583	12.423
Of	19.101	9.434	9.667	24.402	11.890	12.512	43.503	21.324	22.179
Sürmene	15.177	7.676	7.501	12.343	5.990	6.353	27.520	13.666	13.854
Şalpazarı	3.215	1.615	1.600	7.795	3.660	4.135	11.010	5.275	5.735
Tonya	7.310	3.534	3.776	8.788	4.198	4.590	16.098	7.732	8.366
Vakfıkebir	13.916	6.944	6.972	12.191	5.823	6.368	26.107	12.767	13.340
Yomra	12.079	5.987	6.092	18.573	9.197	9.376	30.652	15.184	15.468
Total	**421.504**	**210.023**	**211.481**	**335.849**	**164.403**	**171.446**	**757.353**	**374.426**	**382.927**

Source: Official Web Page of Turkish Statistical Institution

Table III.3.1.2. Census data of settlement at and in the vicinity of the project area

		TOTAL	MALE	FEMALE
MAÇKA	Bağışlı	282	150	132
	Gürgenağaç	314	142	172

Source: Official Web Page of Turkish Statistical Institution

Migrations

Migrations based on Address Based Population Registration System data for Trabzon province in 2010-2011 period is given in Table III.3.1.3.

Table III.3.1.3. Migrations at Trabzon Province

Province	ABPRS 2010 Population	Migration Received	Immigration	Net Migration	Net Migration Rate
Turkey	74,724,269	2,420,181	2,420,181	0	0
Trabzon	757,353	24,858	38,446	-13,588	-17.78

Source: Official Web Page of Turkish Statistical Institution

With the commissioning of the planned activity, most of the personnel to be employed at the facility shall be supplied from settlement areas in the vicinity of the project site. This shall contribute even if just a pinch to development rate of the district.

74 persons have been employed during site preparation and construction phases of the Mavi Weir and HEPP project, and employment of 14 persons during operating phase of the project is planned. Considering the information on Trabzon province 2000 House Population Number Information as per House by Turkish Statistical Institute (TSI) is given as 5 persons, 370 people in land preparation and construction stage and 70 people in the operation stage will benefit from the project indirectly. On the other hand, with the start of energy generation by the project following commissioning, new investments in the district and around Trabzon province, which will present new employment oppurtunities and this may be considered as a long-term secondary contribution.

III.3.2. SOURCES OF INCOME AND ECONOMIC PROPERTIES

Income State

Gross national product per capita is around 1,824 million TL in 2001 in Trabzon province. According to 2001 data, Trabzon is 45th according to GNP per capita list. Variation of current prices and GNP per capita in Trabzon province and throughout Turkey between 1995 and 2001 is given in Table III.3.2.1.

Table III.3.2.1. Increase of GNP Per Capita throughout Years (With Current Prices) (Million TL)

YEAR	TRABZON	TURKEY
1995	95	**126**
1996	174	236
1997	328	462
1998	589	823
1999	943	1203
2000	1.210	1847
2001	1.824	2600

Source: Official Web Page of Turkish Statistical Institution

Although Trabzon is developed in terms of culture and social life, the province has not gone through desired economic development. Economy of the province is based on agriculture and animal breeding and source of income for 65% of the population are these activities. The remaining 35% is employed in trade, industry, handicrafts, transportation, construction and other service fields.

Among total production, share of added value in total value is 59% and of input share is 41% in Trabzon. Input rates at Trabzon are higher when compared with nation-wide. This results in increase of cost.

Economic Properties

Agriculture

10% of total fields throughout Trabzon is flat and nearly flat areas, 30% is mountainous, and 60% have the characteristics of gradually increasing elevation from shoreline to inner areas and their slope gradient changes. As geographical structure of province areas are rough, flat areas are used for vegetable and tobacco, low gradient sloping areas are for tobacco, potatoes and hazelnut, high gradient sloping areas are used for hazelnut and tea cultivation. Hazelnut and tea, which are important income source for the region's population, is produced at 59.09% of agricultural fields. 28.87% of agricultural fields are used for cereal (grain), corn and bean plantation, 9.74% for tobacco and potatoes, and 2.30% is allocated for vegetable-feed plant production. Average agricultural area of a farmer family is 12 decare.

Use of tractor and similar vehicles in the province is not quite possible due to structure of the land. Therefore, agricultural production is based on high use of labor. Agricultural businesses of optimal scale are nearly non-existent. Agricultural production other than hazelnut, tea and tobacco is performed for self-utilization of local population. In other words, closed-household economy conditions are present at Trabzon in terms of agriculture. In Trabzon, the first product that comes to mind is hazelnut. Annual product at a normal product period is 50 thousand tones. This amount constitutes 10% of hazelnut production of Turkey and hazelnut harvest in 2008 is 74,307 thousand tones. The second most important agricultural product is tea, and tea is produced only at Araklı, Sürmene and of district of the province. Annual tea production of these areas is 130,000 tones.

Hazelnut and animal breeding are the first two products when agriculture is considered. Garden and field products produced other than these are not for market purposes and utilized completely in consumption of the regional population. Corn production is directed towards meeting the needs of local population and feeding animals. As agricultural lands are rough and located at slope areas, they are cultivated via labor. Therefore, field agriculture in regressing continuously and these lands are being utilized for hazelnut production.

Animal Breeding

Climate conditions of Trabzon are highly convenient for animal breeding. Moors and ranges are covered with dense grass throughout the year as a result of heavy precipitation. Cattle, sheep, hair goat and fowl is bred in the area. Beekeeping is being developed in the province.

Agricultural businesses at Maçka district is composed of small family businesses. Animal breeding is performed nearly at every village and activities increase as elevation of villages increase. Animal and animal product marketing is not developed. Dominant species in animal breeding is jersey. Businesses market their products with their own means.

Most of the animal breeding activities are performed for needs of families, and surplus products are offered at local markets, therefore provides contribution to the family economy. Animal breeding is performed densely at higher elevations and transhumance is common. All of the cattle at the district has been tagged and registered at Türkvet program.

Beekeeping

As geographical structure and climate of Maçka district is not appropriate for beekeeping, this activity is performed as migratory beekeeping. Increasing honey productions has become a source of income for the farmers in the area. There are 9500 professional beehive present in the district. Approximately 89.600 kg professional hive honey is being produced annually from these colonies. Migratory beekeeping is quite common in the district. Approximately 6000-7000 bee are annually taken to Bayburt, Iğdır, Kars, Ağrı, Erzurum and Ardahan provinces for plateau honey production.

Forestry

Forest existence at Trabzon province constitutes 0.9% of total forest existence of Turkey. Forest existence of Trabzon province is given below.

Total forested area : 196,934.4 ha
Fruitful forested area : 151,549.8 ha
Fruitless forested area : 45,384.6 ha
Grove area : 196,934.4 ha

Mining

Yomra-Kayabaşı Village Copper mine and Maçka-Gümişki copper mine are present at Trabzon. There is asphalt, lignite, petroleum, natural vapor, anthracite, thorium, bituminous shale is present as energy mines in the province.

Transportation

There is an airport 6 km away from city center of Trabzon. But land and sea transportation traffic is highly active. State highway extending from Sinop to Hopa parallel to the shoreline passes from Trabzon.

Industry

Industry of Trabzon is not developed regardless of its present potential. The province has fallen behind industrialization in Turkey; therefore contribution of industry is low to employment. Its economy is mainly based on agriculture and does not have a completely industrialized structure. Industry comes after agriculture, trade, transportation, communication and public services in terms of GDP. Large scale production facilities nearly non-existent in the province. The most important for this is inconvenience of land structure for large scale industrial facilities to be constructed. The most important industrial enterprise is cement factory of 455 thousand tons/year production capacity that has been privatized in 1992. There are 370 companies registered to industrial registry in the province. Eight tea factory having 36.410 tones/year fresh tea leave processing capacity belonging to Çaykur and twelve hazelnut processing facility having 93.407 tones/year hazelnut and hazelnut kernel processing capacity indicates that the industry of the province small and moderate scale industry profile based on agriculture.

Main fields which can be named as production industry in the province are flour and bran, dairy products, fish oil and flour, ready-made clothing, furniture, shoe, lumber, concrete pole, rubber and plastic products, PVC pipe, copper, zinc, lead, aluminium, lead products, pipe, galvanized sheet, brick, metal, automobile sub-industry and medical stitching material production.

Distribution of industrial fields at Maçka district is given in the table below.

Table III.3.2.2. Distribution of Industry at Maçka District

Industry Group	Number
Food, beverage and tobacco industry	**5**
Other production industries	**2**
Rock and soil	**4**
Chemistry, Petroleum	**1**

Tourism

Trabzon culture which includes humankind since ancient ages of history has a very rich history. Hagia Sophia Museum, Gülbaharhatun Mosque, Atatürk Manor, Keep Walls, Bedestan (Covered Bazaar), Ortahisar Mosque as well as Kuştul, Vazelon and Sumela Monastery which is a history and nature monument are among the most important historical artifacts remaining from Rome-Byzantine-Ottoman. Each season thousands of domestic and foreign visitors rushes to Trabzon to see these historical artifacts. Approximate amount that domestic and foreign tourists, who has visited Trabzon province in 2009 is 1,016,846.00.

Along with historical monuments, social and cultural life also constitutes a very important tourism potential for region and province. Business tourism, health tourism, conference tourism, sports tourism, youth tourism, sea tourism, cave tourism and trade tourism are among these.

III.3.3. SOCIAL AND INFRASTRUCTURE SERVICES

Education

There are 8 eight year primary school 2 of them at district center, 3 of them at counties and 3 of them at villages, and 8 five year primary school present at the district. There are 6 secondary education institutes at the district of which two of them are Anatolian high schools, two General High School and two of them Vocational High School. Five of these are at the district centre and one of them is at Esiroğlu County.

Number of students per teacher and classroom for the last five years at the district is given below.

Table III.3.3.1. Number of Students per Teacher and Classroom for the Last Five Year Period at Maçka District

YEAR	Number of Teachers			Student Number of gen.	Number of Classroom	Number of Students per Classroom
	Female	Male	Total			
2006-2007	**27**	**46**	**73**	**902**	**55**	**16**
2007-2008	**28**	**48**	**76**	**958**	**55**	**17**
2008-2009	**34**	**48**	**82**	**1.115**	**58**	**19**
2009-2010	**35**	**52**	**87**	**1.157**	**58**	**15**
2010-2011	**33**	**43**	**76**	**1.155**	**61**	**19**

Source: http://macka.meb.gov.tr

Along with these, there is one Public Education Centre, two dormitories one of them serving high school and one higher education, one private teaching institution and one MTSK training-education centre are present in the district. Maçka Higher Vocational School linked to Karadeniz Technical University serves in Education-Training field in the district as well.

Ratio of literacy in Trabzon province has constantly increased for both species as throughout Turkey. While 28% of men and 3.7% of women are literate in 1935, this ratio has increased to 97.5% for men and 83.8% for women in 2008.

Ratio of literacy is 90.56% according to results of 2008 General Census of Address-Based Population Registration System and number of illiterates is 9.44%. 52.94% of literate population (587,498) is men and 47.06% is women, and 12.99 of illiterate population (61,242) is men and 87.01% is women.

Health

There are 213 family medical practice, 191 health house, 1 tuberculosis control dispensary, 2 AÇS/AP and one health centre throughout the city. 215 doctors, 104 nurses and 208 midwife serves at these facilities.

There are total of 20 hospitals at Trabzon 17 of them being public hospitals, 1 of them affiliated to Black Sea Technical University and 2 of them private. There are total of 2020 beds, 321 specialist physicians, 124 general practitioner and 2149 auxiliary health personnel are at these 17 public hospitals.

3 specialist physicians, 48 general practitioners, 77 nurse and 101 midwives serve at Health Department, Public Health Centers, Oran and Dental Health Centre, Public Health Laboratory and 112 Emergency Health Services. Throughout Trabzon, there is one doctor per 540 persons, and one actual bed per 255 persons. There is one public hospital at Maçka district.

Culture

Trabzon and its vicinity is a settlement area which has a history that goes a long way back in time (4000 B.C.). Numerous nations has settled in Trabzon and its vicinity throughout history, and socialized with each other and exchanged culture with each other. The city has preserved its property of being a port and trade center throughout history as a result of its shoreline. Goods arriving to Trabzon via ships used to be transferred to Central Asia and Far East through Iran and Caucasus via caravans. Goods arriving from there are also used to be transferred to west. One of the most important evidence of this is Trabzon being on the Silk Road.

Trabzon and its vicinity has been a meeting place for merchants coming from different regions due to this important property. Trabzon has been a influence area between different cultures as a result of this property. Trabzon region, being a blending environment of different cultures, is rich in terms of tradition and belief.

CHAPTER IV

ENVIRONMENTAL IMPACTS OF THE PROJECT

CHAPTER IV. ENVIRONMENTAL IMPACTS OF THE PROJECT

IV.1. IMPACT ON PHYSICAL ENVIRONMENT

IV.1.1. WATER USAGE AND WASTEWATER,

Construction Stage:

Water usage locations, quantities, supply locations, wastewater quantities and disposal methods of wastewater during the construction stage of the project is provided in Table IV.1.1.1.

Table IV.1.1.1. Water Usage Locations, Quantities, Supply Locations, Wastewater Quantities and Disposal Method of Wastewater during Construction Stage of the Project

WATER USAGE	WATER QUANTITY	WATER SUPPLY LOCATION	WASTEWATER QUANTITY	DISPOSAL METHOD OF WASTEWATER
Drinking and Potable Water for a total number of 74 persons in construction stages	74 persons x 130 lt/person-day = 9.62 m^3/day	Drinking and potable water for the staff is supplied to the site facilities from Maçka district network	9.62 m^3/day	Domestic wastewater due to activities of the personnel is connected directly to the existing Maçka Municipality sewage system and disposed in accordance with Water Pollution Control Regulation (WPCR). According to the Regulation, connection of all types of wastewater to the sewage network in places where sewage system exists is an obligatory and right in principle.
Dampening process for prevention of dust in work area and roads to be used	Approximately 5.00 m^3/day	Water required to prevent dust is supplied from Hamsiköy stream	-	In dampening process, no wastewater is generated as water is kept in soil

Note 1: Water amount that a person shall require is taken as 130 lt/person-day[2]
Note 2: Turkish Statistical Institute Trabzon Province Municipality Wastewater Statistics, 2010

It is assumed that all water to be used will be returned as wastewater. Domestic wastewater to be generated during the project can be classified as medium-polluted domestic wastewater. Total pollution loads regarding domestic wastewater characteristics obtained from lengthy researches are provided in Table IV.1.1.2.

Table IV.1.1.2. Total Pollution Load of Domestic Wastewater to be generated during Construction Stage

PARAMETER	Unit load (mg/l)	Total load (kg/h)
BOD5	**220**	0.20625
COD	**500**	0.46875
SS	**220**	0.20625
Oil-grease	**100**	0.09375
Total P	**8**	0.0075
Total N	**40**	0.0375
Total Cl	**50**	0.046875
Total sulphide	**30**	0.028125
Total organic carbon	**160**	0.15
pH	**6-9**	

Source: Metcalf and Eddy, (2004), Wastewater Engineering; Treatment, Disposal and Reuse, Mc Graw Hill Book Company, New York, ABD.

Domestic wastewater to be generated during the construction stage is disposed by direct delivery to the Maçka Municipality sewage system.

[2] Kaynak: Türkiye İstatistik Kurumu, Trabzon ili Belediye Atıksu İstatistikleri, 2010

Dampening works are performed to prevent dusting in roads in the work area by using water from Hamsiköy Stream and no wastewater is generated in this process as water is preserved in soil.

Operation Stage

Drinking and potable water requirement of the personnel during the operation stage of the project will be provided from Maçka district water network. Total drinking and potable water requirement for the staff of 14 persons during operation stage, assuming the 130 lt/day, requirement of one person is;

14 persons x 130 lt/person-day = 1,820 lt/day = 1.82 m^3/day.

Total quantity of domestic wastewater, assuming that all used water will return as wastewater, will be 1,82m3/day.

Domestic wastewater to be generated by the personnel during operation stage will be disposed of by directly delivery to Maçka Municipality sewage system in compliance with "Water Pollution Control Regulation" which came into force in Official Gazette numbered 25687 and dated 31.12.2004. According to the Regulation, connection of all types of wastewater to the sewage network in places where sewage system exist is an obligatory and right in principle. Beneficiaries of this service, are obliged to charge all expenses of benefiting the sewage system.

IV.1.2. SOLID WASTE, PACKAGING WASTE, HAZARDOUS WASTE, MEDICAL WASTE

Construction Stage

Excavation waste due to excavation works to be performed, domestic solid wastes due to personnel to be employed and construction wastes will be generated during the construction works of the project.

Domestic Solid Wastes;

Domestic solid wastes (organic wastes etc.) due to the total number of staff of 74 persons to be employed during the construction stage and wastes due to construction works (wood, rebar, cement bag etc.) will be generated during the construction stages of the project.

With the assumption of 0.73 kg [(3)] of daily solid waste per person;

74 persons x 0.73 kg/person-day = 54.02 kg/day domestic solid waste will be generated.

Domestic solid wastes to be generated by the personnel to be employed in the project are collected in closed waste bins placed in several locations of the areas used as construction site. Solid wastes collected in containers are disposed of in the solid waste storage area of Maçka Municipality at certain intervals.

[3] **Kaynak:** Turkish Statistical Institute, Trabzon Province Municipality Solid Waste Results, 2010

As part of the project domestic solid wastes shall be separately collected in compliance with Article 8 of Solid Waste Control Regulation in force upon issue in Official Gazette no.20814 dated 13.03.1991 in order to enable disposal and recycling of solid wastes without damaging the environment, to prevent environmental pollution and contribute to economy. According to the Article 8 of the relevant regulation, medical wastes, used accumulator, battery and medicine wastes, scrap tires and recyclable solid wastes such as packaging wastes are disposed separately from domestic solid wastes. Disposal of solid wastes by generators or transporters to the seas, lakes and similar receiving environments, to the streets, forests and to the sites causing negative effects to the environment are also obliged.

In compliance with Article 18 of Chapter 4 of the same regulation, attention shall be paid not to spill the domestic wastes to prevent negative effect of solid wastes on environment and solid wastes shall be collected in closed standard waste bins. Solid wastes shall be collected in trucks suitable for preventing polluting factors such as appearance, smell, dust and leakage and shall be disposed of the same in accordance with Article 20 of the same regulation.

According to the regulation, people or institutions which are generating domestic solid waste and domestic type industrial waste are obliged to get ready their waste at the source like households or commercial buildings in accordance with the rules of the municipality or the highest local authority of the region. The municipality is responsible from the collection and disposal of the wastes generated by facilities within the boundaries of the municipality. Industrial facilities established on the regions which are outside the boundaries of the Municipality and Municipal Area are responsible from the transportation of their wastes by themselves. Generators of the wastes are obliged to keep garbage containers closed to not harm the environmental health and to get ready on the road during garbage collection.

Rebar, steel, sheet, packaging material and similar solid wastes are also generated due to construction works and no quantity can be determined for such solid wastes as the quantities of these wastes may vary. However, wastes are collected as scrap items stored in a convenient location in the project area and disposed of by delivery to licensed companies. Solid wastes to be generated during the construction stage are; material to be generated during excavation, steel rebar, timber wastes used for formwork, packaging materials and similar other solid wastes. Among these; rebars, steel, metal and similar materials which can be recycled are separately collected and sold as scrap. Timber wastes for formwork are collected periodically. Collected timber wastes are given to villagers in the vicinity, if requested. Wastes not suitable for recycling are collected by Maçka Municipality.

Consequently;

Solid wastes (food residue, etc.) to be generated during the project Employees have been warned that disposal to sea, lakes and other similar receiving environments as stated in Article 18 of “Solid Waste Control Regulation” no.20814 dated 14.03.1991 and this prohibition along with “Solid Waste Control Regulation” and provisions of this regulation;

Official Gazette no.20834 dated 03.04.1991;
Official Gazette no.20834 dated 22.02.1992;
Official Gazette no.20834 dated 02.11.1994;
Official Gazette no.20834 dated 15.09.1998;
Official Gazette no.20834 dated 18.08.1999;
Official Gazette no.20834 dated 29.04.2000;
Official Gazette no.20834 dated 25.04.2002;
Official Gazette no.25777 dated 05.04.2005.

Waste Oil and Accumulators;

Maintenance and repair activities of vehicles to be utilized in the project are performed in authorized services, and at times when this is not possible and such maintenance-repair activities are performed in the facilities and any waste oil is generated, such waste oil shall be collected in a closed and impermeable metal container and delivered to a recycling company licensed under "Waste Oil Control Regulation" in force upon issue in Official Gazette no.26852 dated 30.07.2008 under a contract to prevent mixing with soil and/or water. In the case that maintenance and repair of vehicles are performed within facilities, these activities shall be performed in an area where floor impermeability is ensured and the location is sheltered within the construction site while ensuring compliance with "Soil Pollution Control and Sites Polluted with Point Source Regulation" in force upon issue in Official Gazette no.27605 dated 08.06.2010.

Waste oils shall be delivered to companies licensed to transport hazardous wastes to deliver the waste oil to licensed disposal or recycling facilities upon preparation of National Waste Transport Forms, collected in oil collection barrels and "storage in impermeable ground" shall be ensured until delivery.

According to the Article 9 of the relevant regulation, waste oil generators are obliged to take the necessary precautions to minimize their waste oil generation and to analyze or make analyze their waste oils in accordance with the Article 15 of the relevant regulation. They have to store waste oils temporarily in accordance with the Article 18 of the relevant regulation separately according to their categories. They are obliged not to mix the waste oils produced in various categories in their facility with each other and to dispose waste oils polluted with hazardous wastes in accordance with the provisions of the control of hazardous wastes regulation.

In case of any leakage or spillage, etc. in the project site, sawdust will be laid on the soil or ground and leakage will be soked before spreading. Sawdust mixed with dangerous waste, will be temporarly stored in closed and impermeable containers in accordance with the "Hazardous Waste Control Regulation" until submitting to the licensed company. For temporary storage of the dangerous wastes in project site, project owner will take necessary permissions from Governership (Provincial Directorate of Environment and Urbanization) in accordance with the 9th Article of the relevant regulation. (Please see Section VII.2.4. Emergency Response Plan for details)

Furthermore, in the case that maintenance and repair activities of machinery to be used in the project are performed in the activity area; possible waste accumulators shall be stored in closed areas where ground impermeability is ensured and disposed of by delivery to licensed recycling companies in compliance with Waste Battery and Accumulator Control Regulation in force upon issue in Official Gazette no.25569 dated 31.08.2004 and revisions of Waste Battery and Accumulator Control Regulation in force upon issue in Official Gazette no.25744 dated 03.03.2005.

Medical and Hazardous Wastes;

An infirmary unit for ambulatory care without any beds has been established for responding to health problems of the personnel to be employed during the land preparation and construction works of the project. Exact quantity of wastes generated in the infirmary unit cannot be determined; however the quantity is very low.

All medical wastes possible to be generated in the infirmary unit are collected in red plastic bags resistant to tear, punching, bursting and handling, made of medium density polyethylene, impermeable, double-based, seamed and not-bellowed, with a double-layer thickness of 100 microns, and minimum 10 kg carrying capacity, having the visible amblem of “International Biohazard” with “CAUTION – MEDICAL WASTE” on both sides. Bags are filled at the maximum ratio of 3/4, tied tightly and impermeability is ensured with placing the bag in another bag with the same properties where required.

Wastes with cutting and perforating properties are collected in watertight and impermeable laminated cardboard boxes or containers resistant to punching, tearing, breaking and bursting, with the sign of “CAUTION! CUTTING and PIERCING MEDICAL WASTER" with "International Biohazard" sign on them. These containers are filled at the maximum ratio of 3/4 and put in red plastic bags after closing them.

Medical wastes stored temporarily in the facilities as per Medical Waste Control Regulation are disposed of by the workplace doctor working in the infirmary unit by delivery to hospitals in city/district center.

Compliance with the provisions of “Medical Waste Control Regulation” in force upon issue in Official Gazette no. 25883 dated 22.07.2005 is ensured during temporary storage, handling and disposal of medical wastes possible to be generated within the facilities.

In the case that hazardous wastes are generated during the project, such hazardous wastes will be temporarily stored in a constantly closed location to ensure that no chemical reactions occur as stated in Hazardous Waste Control Regulation in force upon issue in Official Gazette no.25755 dated 14.03.2005. Temporarily stored hazardous wastes will be disposed of by delivery to companies licensed by Ministry of Environment and Urbanization. Licensed vehicles will be used during temporary storage, handling and disposal, and compliance with provisions of Hazardous Waste Control Regulation in force upon issue in Official Gazette no.25755 dated 14.03.2005 shall be ensured.

Excavation Wastes;

A certain portion of the excavation surplus material to be generated during the construction works of main and ancillary units of Mavi HEPP Project has been used in filling works and the remaining quantity will also be used in leveling and landscaping works. There will be no extra excavation waste to be deposited in or out site of the project area.

Excavation works of the construction works of the planned project are being performed in compliance with “Excavation Soil, Construction and Debris Waste Control Regulation” in force upon issue in Official Gazette no.25406 dated 18.03.2004 and the remaining works shall also be performed in compliance with “Excavation Soil, Construction and Debris Waste Control Regulation”.

Compliance with the following shall be ensured during the Ecological Landscaping and rehabilitation works to be performed.

- Natural appearance on site will be ensured by rehabilitation works.
- Use of structure and new area by the project will be in full compliance with environmental conditions and an indisputably safe area will be ensured for all living creatures.

- All slope surfaces will be reinstated in accordance with its natural structure using landscape repairing applications without any retaining walls after the recountoring activities.

- If sloped surfaces are present in outer perimeter of the area; precautions will definitely be taken against rockslides and landslides.

- If slope angles of wastes are to be changed during rehabilitation works, new slope angle to be applied shall allow laying vegetable soil, growth of plant cover and prevention of erosion and surfacing of wastes.

- Area perimeter will be made safe for water traffic.

- Area will be covered with vegetable top soil depending on the planting works to be performed and reforested.

Additionally, compliance with the provisions of Ecological Landscaping Report shall be ensured (see Appendix-6).

Operation Stage

Domestic solid waste will be generated due to the personnel of 14 people to be employed in the operation stage of the project. With the assumption of 0.73 kg [4] of daily solid waste per person;

14 persons x 0.73 kg/person-day = 10.22 kg/day of domestic solid waste will be generated.

These wastes to be generated during the operation stage of the project shall be collected in closed waste bins located in areas where project units are placed and disposed of periodically by delivery of Maçka Municipality solid waste collection system.

Recyclable packaging wastes to be generated in HEPP facilities shall be collected separately from other solid wastes within the plant area and delivered to contracted company licensed to collect packaging wastes in compliance with Packaging Wastes Control Regulation in accordance with the provisions of “packaging wastes generated due to consumption, regardless of the material used and its source, shall be collected separately in locations where they are generated in order to reduce environmental pollution, maximum use of regular storage facilities and contribution to economy. Packaging waste owners shall collect these wastes separately from other wastes” given in Article 26 of Packaging Waste Control Regulation in force upon issue in Official Gazette no.26562 dated 24.06.2007.

Solid waste generators segregating their wastes as stated in the relevant regulation at the source, within the boundaries of the district municipality have to give their packaging wastes to the municipalities which are responsible from the collection of wastes and/or to the collection and separation facilities which have environmental license and agreement with the Municipality.

In the disposal of all solid wastes to be generated in the facility, “Solid Waste Control Regulation” and revisions of this regulation issued in below-mentioned Official Gazette are complied with:

[4] **Source:** Turkish Statistical Institute Trabzon Province Municipality Solid Waste Statistics, 2010.

Official Gazette no.20834 dated 03.04.1991,
Official Gazette no.21150 dated 22.02.1992,
Official Gazette no.22099 dated 02.11.1994,
Official Gazette no.23464 dated 15.09.1998,
Official Gazette no.23790 dated 18.08.1999,
Official Gazette no.24034 dated 29.04.2000,
Official Gazette no.24736 dated 25.04.2002,
Official Gazette no.25777 dated 05.04.2005.

Disposal of waste oil possible to be generated during the operation stage of the project shall be in compliance with Section 2 Article 9 of "Waste Oil Control Regulation" in force upon issue in Official Gazette no.26952 dated 30.07.2008. Delivery of wastes to disposal facility shall be made by licensed carrier vehicle. Conditions in Articles 4 and 5 of "Waste Oil Control Regulation" will be ensured until delivery to disposal facility and temporarily stored in warehouses constructed in accordance with standards stated in "Waste Oil Control Regulation". Next, waste oils will be recyclyed by selling to companies licensed from Ministry of Environment and Urban Planning.

IV.1.3. IMPACTS ON AIR QUALITY

Excavation works of all project units planned under Mavi Weir and HEPP Project have been completed and reinforced concrete works are being performed at the moment. No emission shall occur except the dust due to vehicles to be utilized during landscaping works at the end of the construction stage of the project.

As the project is planned to be a HEPP project and it does not generate any emission or chemical waste, it will not have any negative impact on the environment.

Furthermore, the closest settlement to the project site is Bağışlı Village at a distance of 550 m and it is located at the northeast of the project area. In accordance with the data of Trabzon province provided in Chapter III.1.1, predominant wind direction is south-southwest and settlements surrounding the project area shall not be affected by the distribution of dust emission.

Roads throught the villages will not be used for transportation during the project activities. In case of using village roads, to minimize generation of dust, rehabilitation of roads, covering of dampers of trucks during material transport with canvas and keeping the top layer of material at 10% humidity will be taken. As the project area has typical Black Sea Region characteristics, the area has a rainy and humid climate which is an advantage to prevent negative effects of dust emissions.

To minimize emissions due to vehicles used within the project, in accordance with Article 7 of "Exhaust Gas Emission Control Regulation" in force upon issue in Official Gazette no.27190 dated 04.04.2009; routine checks of all vehicles and equipment shall be performed, vehicles requiring maintenance will be taken to maintenance and different vehicles will be used until maintenance of these vehicles are completed. Furthermore, warning will be given to perform in accordance with Traffic Law and attention will be paid to loading in compliance with loading standards.

IV.1.4. NOISE

Construction Stage

Tools and equipment such as loaders, excavators, dozers, vibratory rollers, graiders, concrete mixers and dumper trucks are planned to be used during the activities to be performed in the construction stage of the project.

Machinery, vehicles and equipment to be utilized in the construction stage of the project are provided in Table IV.1.4.1.

Table IV.1.4.1. Machinery and Equipment Used in Construction Activities

NAME OF MACHINERY AND EQUIPMENT	QUANTITY
Loader	3
Excavator	2
Dozer	2
Vibratory Roller	1
Grader	2
Concrete Mixer	3
Dumper Truck	10

SoundPLAN 6.5 software has been used to determine the noise level during planned construction stages. In calculations performed, information on noise level of the machinery and equipment selected have been obtained from the database present in the library of the software.

In this regard, information on noise levels from SoundPLAN 6.5 software database for the machinery and equipment to be utilized in the construction stage of the project is provided below

a) Wheeled loader (< 110 kW)

Total noise level by loader (Loader: wheeled loader < 110 kW) is 113 dBA and its distribution per frequencies is given in Figure IV.1.4.1. Figure IV.1.4.1.

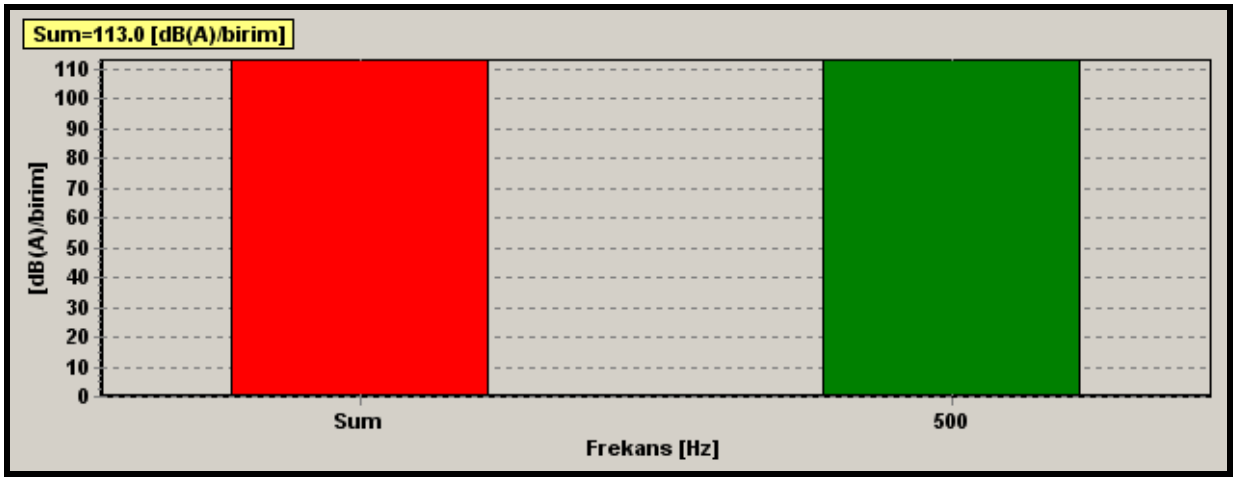


Figure IV.1.4.1. Frequency Analysis of Noise Level of Loader

d) Excavator (Trench excavator)

Total noise level by excavator (Excavator: Total noise level by the excavator (Excavator:Trench excavator) is 105 dBA and its distribution per frequencies is given in Figure IV.1.4.2.

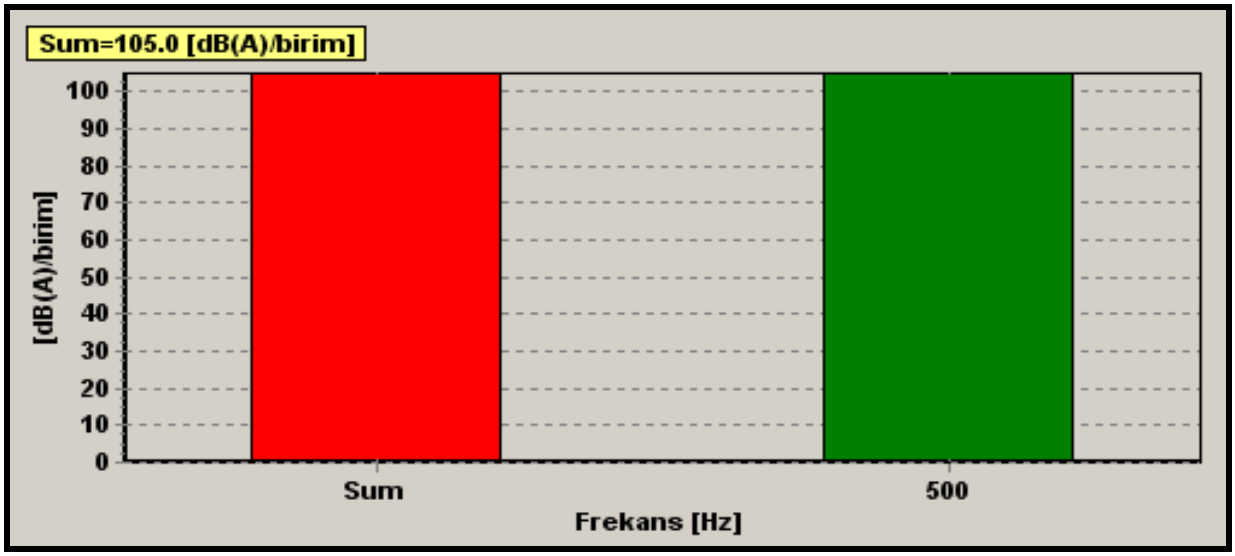


Figure IV.1.4.2. Frequency Analysis of Noise Level of Excavator

c) Dozer (Working cycle)

Total noise level by dozer (Dozer, working cycle) selected in SoundPLAN 6.5 software is 116.6 dBA and its distribution per frequencies is given in Figure IV.1.4.3.

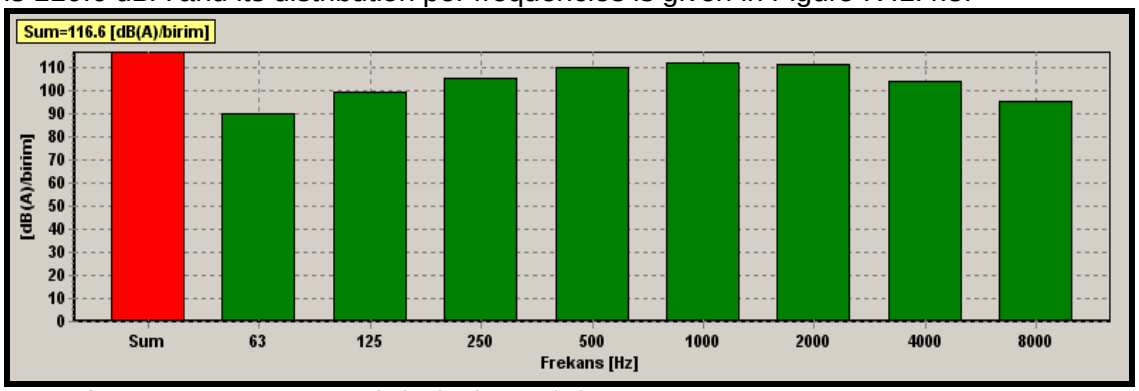


Figure IV.1.4.3. Frequency Analysis of Noise Level of Dozer

d) Road Roller

Total noise level by the road roller selected in SoundPLAN 6.5 software is 105 dBA and its distribution per frequencies is given in Figure IV.1.4.4.

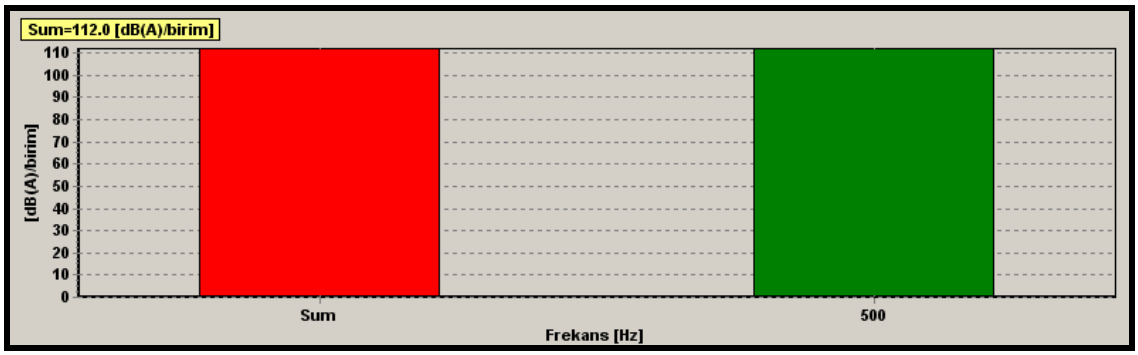


Figure IV.1.4.4. Frequency Analysis of Noise Level of Roller

e) Grader (Bulldozer ca 150 k)

Total noise level by the grader (Bulldozer ca 150 kW) selected in SoundPLAN 6.5 software is 114 dBA and its distribution per frequencies is given in Figure IV.1.4.5.

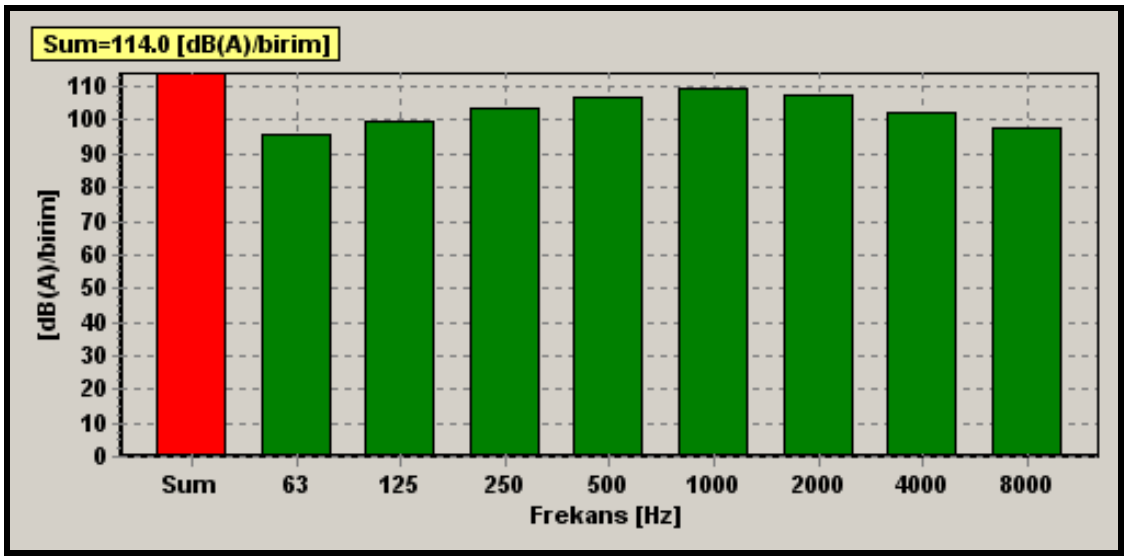


Figure IV.1.4.5. Frequency Analysis of Noise Level of Grader

f) Concrete mixer (150 - 500 l, mec.filling)

Total noise level by concrete mixer (Concrete mixer: 150 - 500 l, mec. filling) is 108,0 dBA and its distribution per frequencies is given in Figure IV.1.4.6.

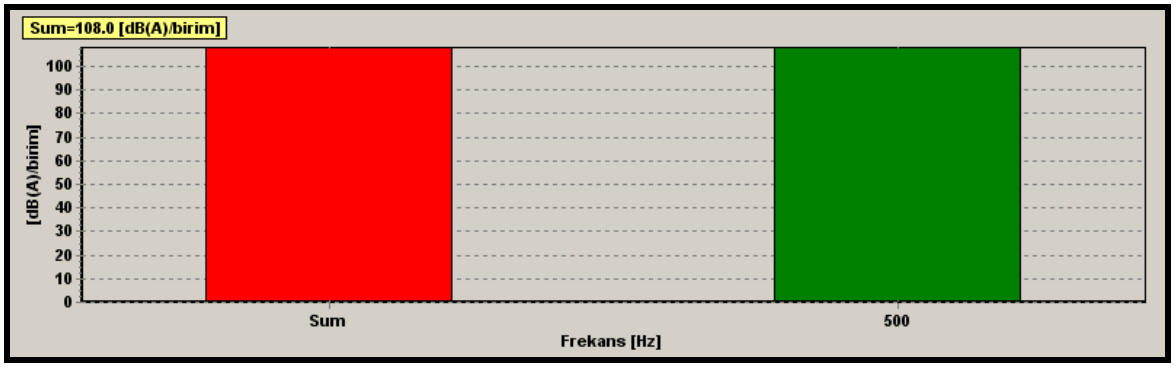


Figure IV.1.4.6. Frequency Analysis of Noise Level of Concrete Mixer

g) Truck (Neutral)

Total noise level by truck (Truck: neutral) is 94 dBA and its distribution per frequencies is given in Figure IV.1.4.7.

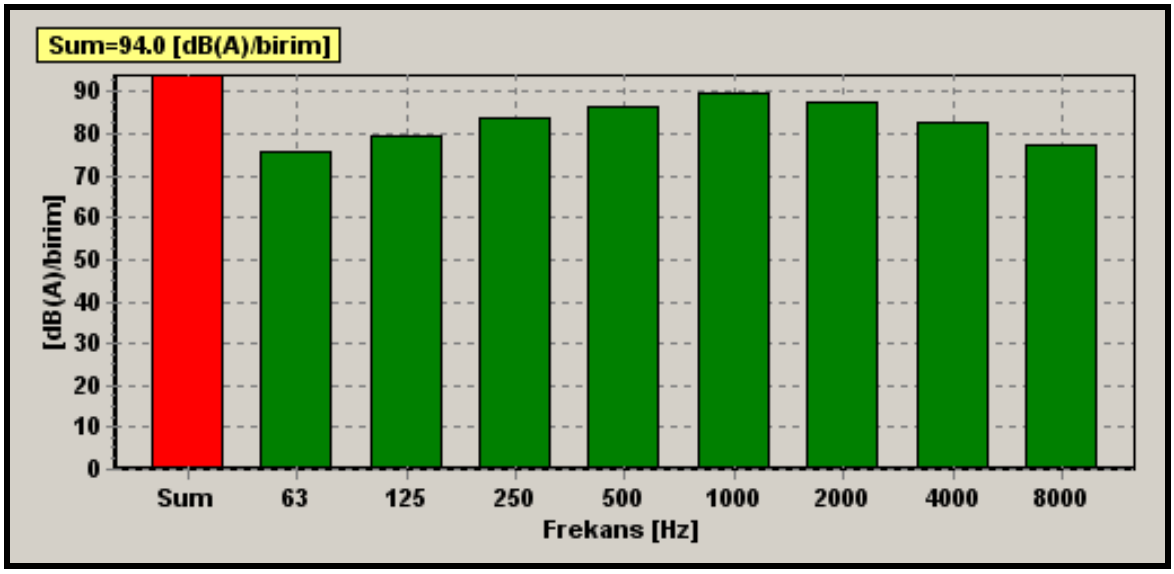


Figure IV.1.4.7. Frequency Analysis of Noise Level of Truck

Machinery and equipment given in the table will work in a specific sequence and in performed noise level calculations, worst case scenario is taken as basis and it is assumed that equipment to be utilized in Mavi Weir and HEPP Project locations will work simultaneously.

First, altitude model of natural ground profile affecting noise distribution is generated in the software. During reflecting natural ground profile on the software, contour lines with 10 m intervals present on 1/25,000 scaled topographic map have been digitized.

Following digitalization of contour lines, Temporary NSM (numerical soil modeling) has been generated for the software to detect digitized altitude values. Following the formation of temporary SZM, vehicles to be utilized during the construction works have been defined and located in the facility plan. In performed calculations, it is assumed that equipment to be utilized in the construction works will work on the same spot simultaneously.

Upon this study, area where noise level will be calculated has been defined and noise levels due to the machinery and equipment to work in this area have been calculated. Identification information (coordinate, altitude and noise levels in various frequency intervals) of identified machinery and equipment in calculations is given in Table IV.1.4.2. below.

Table IV.1.4.2. Information on Noise Sources

Source	X	Y	Z	Lw	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	4 kHz	8 kHz
Loader-1	542983.34	4506994.43	901.11	109.6	78.2	87.2	93.2	98.2	100.2	92.2	81.2
Loader-2	545286.51	4509752.54	892.77	109.6	78.2	87.2	93.2	98.2	100.2	92.2	81.2
Loader-3	545489.84	4509625.68	710.00	109.6	78.2	87.2	93.2	98.2	100.2	92.2	81.2
Excavator-1	545292.86	4509758.90	892.72	105				100.2			
Excavator-2	543008.73	4507000.80	897.24	105				100.2			

Source	X	Y	Z	Lw	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	4 kHz	8 kHz
Dozer-1	543015.04	4507051.61	926.46	116.6	85.2	94.2	100.2	105.2	107.2	99.2	90.2
Dozer-2	545496.19	4509625.69	710.00	116.6	85.2	94.2	100.2	105.2	107.2	99.2	90.2
Vibratory Roller-1	545362.77	4509701.79	816.93	112				107.2			
Grader-1	545419.95	4509663.73	766.70	114	90.8	94,8	98.8	101.8	104.8	97.8	92.8
Grader-2	542989.68	4507007.14	907.85	114	90.8	94,8	98.8	101.8	104.8	97.8	92.8
Concrete Mixer-1	542976.96	4507019.83	919.39	108				103.2			
Concrete Mixer-2	545280.16	4509752.54	896.81	108				103.2			
Concrete Mixer-3	545502.55	4509625.70	710.00	108				103.2			
Truck-1	545496.27	4509528.31	738.42	94	70.8	74.8	78.8	81.8	84.8	77.8	72.8
Truck-2	545388.18	4509682.76	794.64	94	70.8	74.8	78.8	81.8	84.8	77.8	72.8
Truck-3	545016.23	4508890.72	877.94	94	70.8	74.8	78.8	81.8	84.8	77.8	72.8
Truck-4	544732.67	4508742.31	882.43	94	70.8	74.8	78.8	81.8	84.8	77.8	72.8
Truck-5	544362.47	4508413.89	882.15	94	70.8	74.8	78.8	81.8	84.8	77.8	72.8
Truck-6	543383.44	4506994.75	956.83	94	70.8	74.8	78.8	81.8	84.8	77.8	72.8
Truck-7	543019.30	4507026.21	910.91	94	70.8	74.8	78.8	81.8	84.8	77.8	72.8
Truck-8	545265.35	4509739.82	900.18	94	70.8	74.8	78.8	81.8	84.8	77.8	72.8
Truck-9	545481.39	4509610.86	710.00	94	70.8	74.8	78.8	81.8	84.8	77.8	72.8
Truck-10	544563.44	4508587.64	883.96	94	70.8	74.8	78.8	81.8	84.8	77.8	72.8

Software screenshot on formation of numerical altitude data and transfer of project area and noise sources to the geographical database is provided in Figure IV.1.4.8.

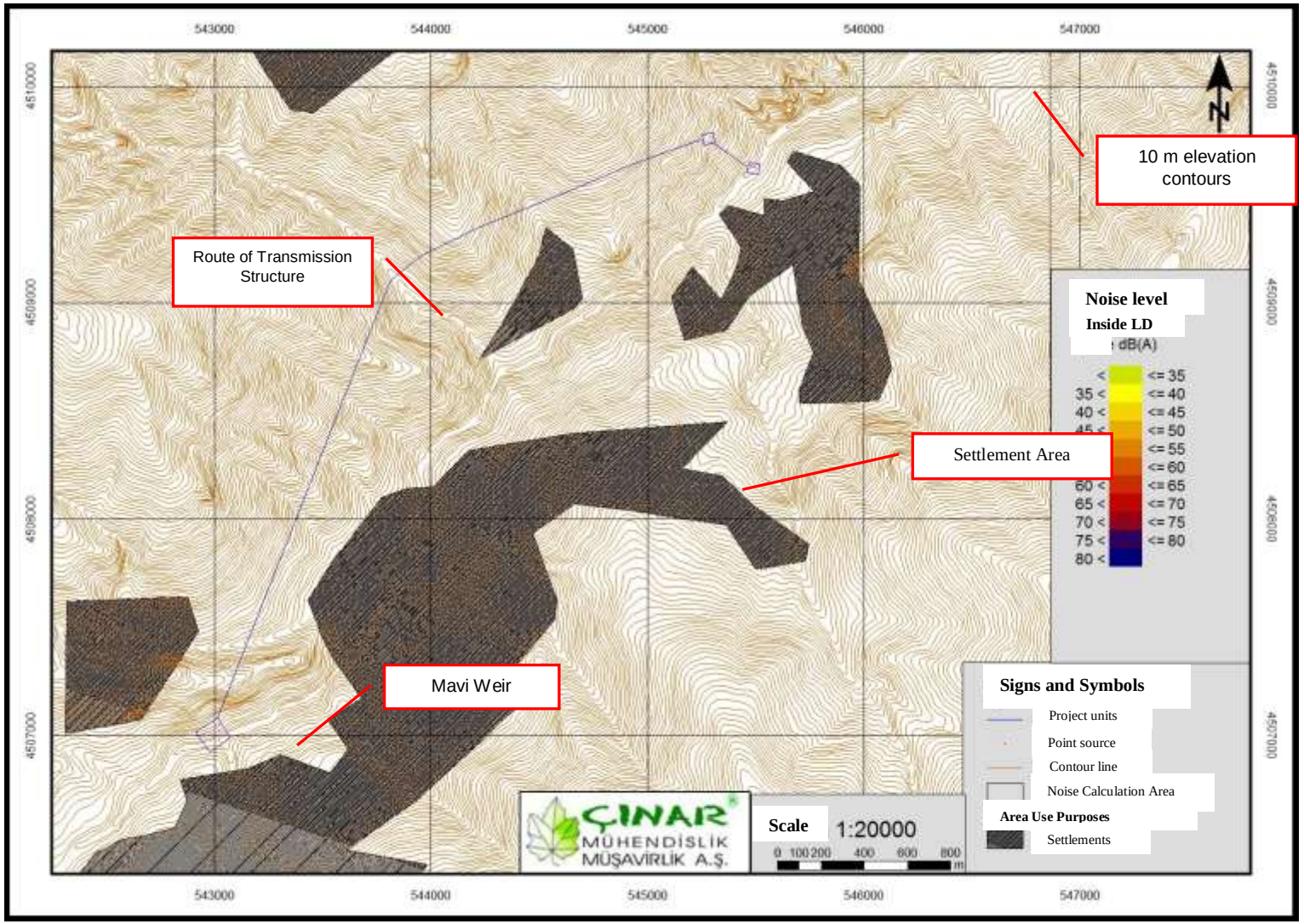


Figure IV.1.4.8. Demonstration of Noise Sources and Altitude Model in SoundPLAN Software

Noise map generated as per noise level calculations in the area is provided below.

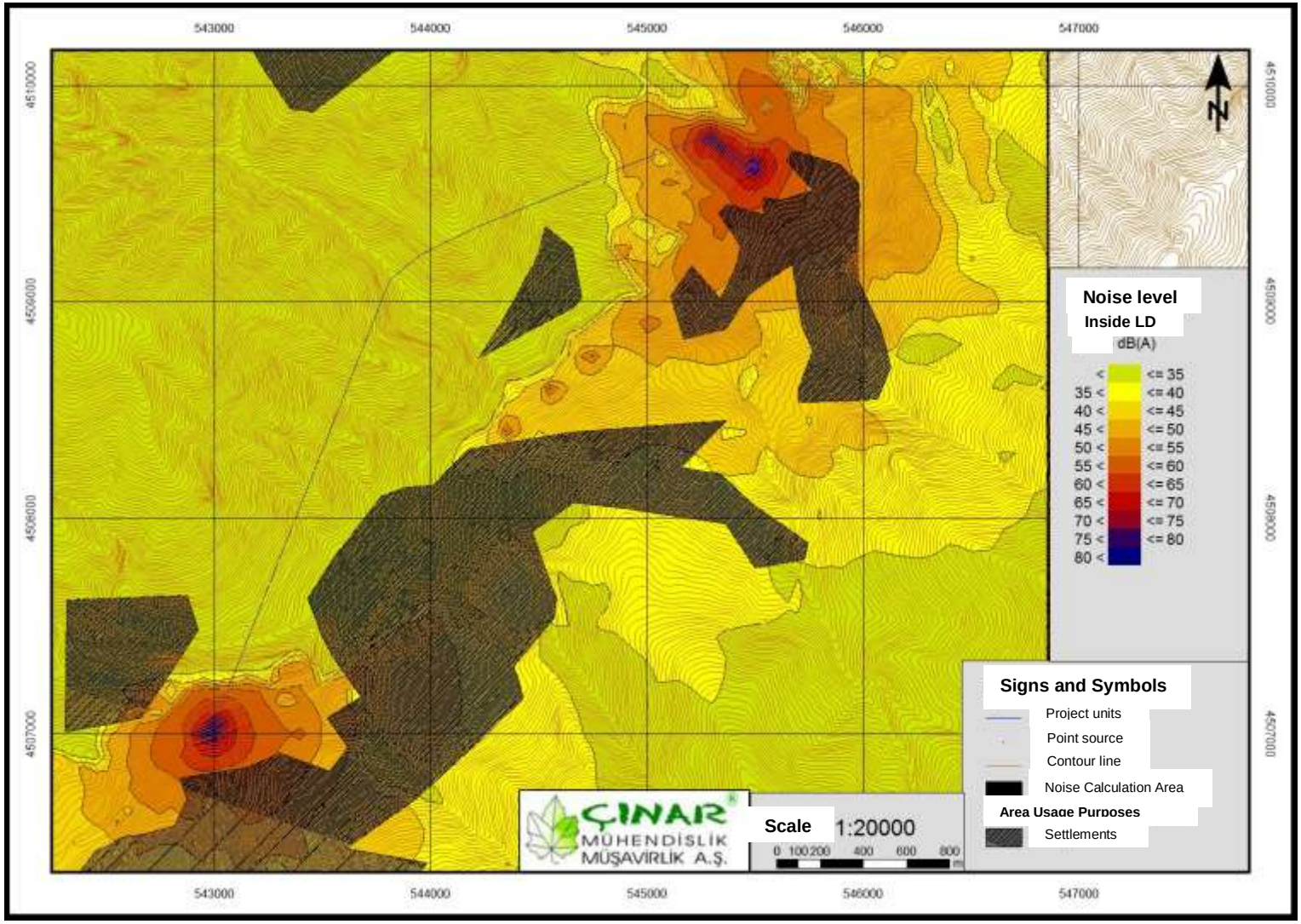


Figure IV.1.4.9. Noise Map

As observed from the calculations and the noise map given above, noise level reach to high values especially in the regions where construction machinery work during the construction stages.

Calculations have been made considering that machinery and equipment to be utilized during construction works would work at the same location simultaneously. However, as all machinery and equipment does not work at the same location during land preparation and construction stages, these machinery and equipment does work in a specific sequence. Therefore, no noise lower than the noise levels calculated during the construction works of the project shall be generated

Environmental noise limit values for construction site given in Appendix-VII Table-5 of ENAMR (Environmental Noise Assessment and Management Regulation) in force upon issue in Official Gazette no.27601 dated 04.06.2010 are given in Table IV.1.4.3.

Table IV.1.4.3. Environmental Noise Limit Values for Construction Site

Activity Type (construction, demolition and repair)	**$L_{daytime}$ (dBA)**
Building	70
Road	75
Other Sources	70

When the noise levels given in Table IV.1.4.3 are compared with the noise map given in Figure IV.1.4.9, it is observed that noise levels are lower than the limit values given in the regulation in the vicinity of dwelling areas. These dwelling areas shall not be negatively affected from possible noise levels during the construction works. The noise will be decreased to minimum level, especially in the period of reproduction and nesting times of animal species. Some local fauna components will be affected from the working devices during the construction and from different kinds of noise during operation. There can be species that already begin nesting or later on will begin nesting according to the start of the operation. If the produced level of noise is high, there is risk for those species to quit nesting and looking after the off springs. With suitable conservation measures it can be possible to keep that noise level low enough to prevent migration of the species inhabiting the region. Or else, since the breeding period of all, at least conserved species is known by the experts, a break can be given to the vehicles that cause that kind of noise for only in nesting period. Moreover, there are similar kinds of habitats in the vicinity of project area and those species can move there.

In project site, provisions of Article 23 on “noise criteria for construction sites” in section four of “Environmental Noise Assessment and Management Regulation” on noise to be generated during the construction stage are complied with and vehicles with vehicles whose vehicle inspections, exhaust emission measurements and maintenance activities are performed.

Protection of employees from noise to be generated by the machinery and equipment to be utilized in the construction stage shall be ensured and necessary precautions are taken to protect the workers from health and safety risks, especially auditory risks, due to exposure to noise in accordance with article 78 of Labor Law no.4857. Employees are provided with protective equipment such as safety helmet, earbuds or earplugs to employees working with machinery and equipment during construction stages and thus, employees are protected from effects of noise. As a result, noise and vibration levels due to construction machinery and equipment utilized during construction works have been reduced to a convenient level. Furthermore, noise and vibrations generated has been kept at a minimum by ensuring compliance to values provided in the regulations. Since village roads will not be used for accession to the construction site, settlements will not be affected due to the vibrations from

trucks. In the case that vibration measurements taken during construction works of the project exceed the values given in Table 9 of ENAMR; necessary technical precautions starting with vibration insulation shall be taken for the machinery and equipment generating vibration and vibrations measured in the buildings shall be ensured to be below limit values.

Operation Stage

Only noise sources during the operation stage of the project shall be the generators and turbines inside the plant buildings. As plant buildings shall insulate the noise, no noise emission shall be observed outside the building. Protection of employees to work in the plant building from main noise sources within the structure shall be ensured by providing protective equipment such as earbuds, ear plugs etc. in accordance with Labor Law no.4857.

IV.1.3. EFFECTS ON ARCHEOLOGICAL AND CULTURAL ELEMENTS

There is no inland waters which is listed as internationally important wetlands of Turkey and which is under protection status at and in the vicinity of the project site. In addition to this, there is no area which is defined in "Special Environment Protection Areas" heading of Environment Law numbered 2872 and which is defined in "National Parks", "Nature Reserve Areas", "Natural Monument", "Nature Parks" article of National Parks Law numbered 2873 at and within vicinity of the project area (See Figure III.1.5.1.). Furthermore, there are no biosphere reserve areas, biogenetic reserve areas, tourism area and centers, archeological, historical and cultural protection areas.

There is no natural or archaeological site present within the boundaries and in the vicinity of the activity area. There is no high value landscape or recreation area, and unique geological or geomorphological area present within and in the vicinity of the activity area.

Uzungöl Special Environment Protection Area, Uzungöl Natural Park, Seragölü Natural Park and Altındere Valley National Park is present within the boundaries of Trabzon province. Among these areas, Uzungöl Special Environment Protection Area and Uzungöl Natural Park is 65 km away from the project site, and Seragölu Natural Park is 27 km, Altındere Valley National Park is 12 km away from the project site. Therefore, the project planned to be realized does not have any effect on these areas.

IV.2. EFFECTS ON BIOLOGICAL ENVIRONMENT

IV.2.1. POSSIBLE EFFECTS ON FLORA DURING CONSTRUCTION AND OPERATION STAGES AND PRECAUTION SUGGESTIONS

- In the construction stage of HEPP facilities, plant cover will be partially damaged. This damage will occur only in the weir, forebay pool, pressured pipe, plant, excavation material storage area and construction site areas. Loss of biomass might occur due to stripping of topsoil in the said areas. Acer cappadocicum (VU), Frangula alnus, Lonicera caucacasia, Trifolium pannonicum, Geranium cinereum, Pilosella hoppeana (Endemic) ve Geranium lazicum exist in the project site and its surroundings. None of the plant species other than the above are subject to any national and international protection criteria (ENDEMIC, RARE, IUCN, BERN and CITES). When national and international protection critera which the project area and its surrounding areas are subject to are considered, it is observed that these species possess significant characteristics for this region. In consideration of this situation, for those plants existing in the area during the HEPP project works in the region, a biologist will collect the seeds of those plants; send those seeds to the seed depository. Planting those seeds in similar habitats to obtain young trees shall increase the biological diversity. Damage of other species will also be temporary and they will reform their population once the construction is completed.

Deformations which will occur in habitats should be guaranteed to be restored in accordance with the principles of "Ecological Restoration". It is priority to protect sinecological (phytosociological) structures of units formed by plant species in habitats dominant in Physiognomy. Therefore, these activities should be controlled by at least a Master or Ph. Degree plant-sociologist. Revegetation study should be carried out with suitable natural vegetation species. The stored soil which is stripped in the construction process should be used after the process of building restoration. Germination success and achievements in the survival of seedlings of endemic, rare and endangered species which are ex situ transferred to other habitats should be monitored for at least 3 years in new habitats by at least a Master or Ph.Degree plant-sociologist.

- Some portion of aluvial/riperian vegetation existing with direct connection to stream systems might be damaged. This damage will be temporary and vegetation will regrow once the construction is complete.

- Increase in erosion level might be observed due to plant cover and top soil removed during the construction stage, and slopes. Furthermore, water structures with different sizes (weirs, forebay pool, plant etc.) might cause changes in the landscape. Following the completion of the construction works, works stated in the Ecological Landscape Assessment Report will be performed and this effect will be minimized by protective, functional and visual landscaping works.

IV.2.2. IMPACT ON AQUATIC FAUNA IN CONSTRUCTION AND OPERATION STAGES AND SUGGESTIONS FOR PRECAUTIONS

- First, the environmental/ecosystem water to be released to the stream bed determined by the letter of the Nature Preservation and Natural Parks General Directorate dated 28.08.2009 on the subject (See Appendix-1.10) as for March, April, May and June 0.5 m^3/s, and 0.27 m^3/s for other months shall be sufficient to enable reproduction and migration of animals present in the work area. 6 fish species have been determined in the area and Salmo trutta fario and Salmo trutta labrax are deemed important in a biological point of view. The amount of environmental flow to be released to the stream bed on which the project will be constructed fulfills the requirements for fish reproduction (See Annex-4: Ecosystem Assessment Report).

- The amount of environmental flow to be released in HEPP projects is especially important for aquatic life. Flow rate meters will be placed on stream beds for flow control in the project.

- Flow conditions should always be regular. As natural life is dependent on the oxygen present in the water, even short disruptions might cause irreversible damage. Therefore, especially during the reproduction and migration periods stated in the Ecosystem Assessment Report, flow levels shall be preserved in accordance with seasonal requirements and flow rate shall be kept under control with the use of flow meter. Results will be shared with State Hydraulic Works 22nd Region Directorate and Ministry of Forest and Water Works 12nd Region Directorate, Trabzon Branch Office.

- Disruption of fish migration routes is a significant problem in HEPP projects. In accordance with Law of Water Products no.1380, fish passes will be constructed for continuation of fish migration and these fish passes will be constructed taking weir location and characteristics to be constructed under consideration. One of the points to pay attention in this regard is that necessary precautions shall be taken to prevent use of water ponds formed due to low water flow between the weir and turbine as

fishing area (such as informing project employees and raising awareness on this subject, placing signs stating that fishing is forbidden etc.).

- One of the general problems in HEPP projects is the increase of muddiness of the water due to collecting sand and gravel from the stream bed and spilling of excavation material without any environmental precaution. In this case, the amount of dissolved oxygen in the water will decrease and activities of microorganisms which enable disintegration of organic wastes will slow down. This might have a temporary effect on aquatic life. In the construction process of the project, compliance with "Excavation Soil, Construction and Debris Waste Control Regulation" is ensured and temporary muddiness to occur in the water shall be kept at minimum. In this regard, attention is paid so that excavation wastes are not dumped in areas other than excavation material storage areas and this issue has been observed on site.

- Due to excavation works in weir area and adjacent areas, sedimentation might occur in downstream of the stream. Therefore, water quality of the stream is affected negatively due to effects such as muddiness. Increase in amount of sediments accumulated in the stream bed might prevent respiration of fish and invertebrates. This might cause suffocation of organisms in the water and reduction in number of species and thus, a secondary effect on the food chain. Although this effect is very significant, it is temporary. Furthermore, a diversion structure will be built to enable work on dry area, interference with the stream will be short-term due to weir construction and this will decrease the likeliness of any effect on the creatures. It will be possible to prevent sediment transportation and erosion with landscape works to be performed after the completion of construction activities.

- Benthic life forms which adapt to flowing waters might move away from weir location which is partially dead water. Furthermore, change in distribution of species which display a drifting behaviour might be observed. This will not cause total damage of life forms.

- Base structure of streams is very significant for aquatic organisms. Bottom of the stream provide ideal conditions for nutrition, hiding and egg lying. Stream bed being sandy, gravelly or stony affects both characteristics and intensity of species living in the area. Base structure and water depth is important especially for nutrition and reproduction of trouts. Changes in water speed, flow rate and depth of the stream migh impact the base structure. Quantity of environmental flow and its flow rate determined in accordance with the project requirements are in the range to fulfill living system requirements and will not cause any damage, as stated in the Ecosystem Assessment Report.

- As the water received will be given back to the stream bed, no significant change in water quantity and quality is expected in ecological perspective.

- To prevent any harm to fish and other aquatic creatures by being carried away by the water to be received by energy facilities conveyance system, precautions to prevent entrance of fish to the received water (sieve-filter structures etc.) shall be taken.

IV.2.3. IMPACT ON TERRESTRIAL FAUNA DURING CONSTRUCTION AND OPERATION STAGES AND SUGGESTIONS FOR PRECAUTIONS

- High level of noise, vibration and sound generated by construction machinery cause wild life to move to similar areas temporarily where such elements do not exist. During the project, compliance with "Environmental Noise Assessment and Management Regulation" present in Turkish legislation is ensured to minimize this effect. Similar and alternative habitats which may be preferred by the fauna elements

are close to activity areas. Following completion of the construction stage, wild life will be able to return to their original habitat. Additionally, noise can be lowered down to a harmless level by suspension of work between 22.00 and 06.00 during the summer months. Therefore, it is possible to lower the noise to a level not to unsettle nocturnal fauna species and move it out of the critical time period for the fauna living in the vicinity of the project site.

- Periodical maintenance of construction machinery and equipment is another precaution to prevent noise pollution. On the other hand, it is known that most of the species have the opportunity to stay far from the noise source and wild life get used to human activity in short term depending on the species.

- Another general problem observed in HEPP projects is the segmentation of the habitat by open channels which prevent animals from passing to other areas. Conveyance system in the project consists of a tunnel and it will not cause any segmentation of habitat as it will pass under the ground. Therefore, reproduction, nutrition and migration paths of wild life will not be damaged.

- Birds living in the project site and its vicinity are not dependent on streams. These birds have a wandering characteristic. They need the streams only for drinking water. They have the opportunity to fulfill this requirement from small and large streams located in many places across the basin. No problem shall be observed in fulfillment of water requirement of the birds in the case of realization of the project. This is because the mobility of these animals are very high. Furthermore, similar and alternative habitats preferable by bird species are present close to activity area. Following completion of the construction stage, birds will be able to return to their original habitat. Noise has a negative effect on species. Especially on their breeding behavior. Because of wide mobility, bird species will fly to alternative habitats and breed. The noise will be decreased to minimum level, especially in the period of reproduction and nesting times of animal species. Some local fauna components will be affected from the working devices during the construction and from different kinds of noise during operation. There can be species that already begin nesting or later on will begin nesting according to the start of the operation. If the produced level of noise is high, there is risk for those species to quit nesting and looking after the off springs. With suitable conservation measures it can be possible to keep that noise level low enough to prevent migration of the species inhabiting the region. Or else, since the breeding period of all, at least conserved species is known by the experts, a break can be given to the vehicles that cause that kind of noise for only in nesting period. Moreover, there are similar kinds of habitats in the vicinity of project area and those species can move there.

- Rodent (Rodentia) species and rabbits (Lepus sp.) can tampon small scale losses and negative effects with their high reproductivity potential.

- One of the problems faced during hydroelectric power plant construction is the fact that domestic wastes generated due to activities of personnel and dust emissions generated during excavation, loading, transport, unloading and construction being pollutive elements for the streams and hazards for all the wildlife in the region. To minimize these effects, compliance with “Industrial Air Pollution Control Regulation” present in Turkish Legislation is ensured during the construction stage. Furthermore, precautions such as loading and unloading activities without hurling any material at the source of emission, covering the dampers of the trucks with canvas during transport of materials and keeping the top layer of the material at 10% humidity level have been taken to minimize dust in the area.
- There are mammals species present in the project area which have been recorded during the works or existing in the literature. These specials are generally wild life

forms which come to the stream bank for fulling their water requirement. As mammal species, especially such as foxes, come to the project area and its surroundings to find food or fulfill their water requirement, they will be disturbed and they will avoid coming to the project area during the project activities.

- All personnel working in construction activities have been informed on the sensitivity of target species and primary species living in the project area and no illegal hunting activities have been performed by the personnel.

- During all kinds of activities to be performed in all areas of the project, it has been observed that all precautions regarding all wild animal species stated in appendices of Bern Agreement (Appendix-II and Appendix-III) stated above have been complied with precisely.

- In accordance with the decision of Directorate of Nature and National Parks Central Hunting Commission (CHC) on 2011-2012 period, protection measures shall be complied with for species present in protection lists updated by CHC.
- Among these species, wild animals listed in Appendix-I is protected by Ministry of Environment and Forestry in accordance with first paragraph of article 4 of Land Hunting Law no.4915.

- Hunting of the wild animals present in the list, keeping them dead or alive or their transportation is forbidden. The study to inform personnel unaware of those issues is being performed by the site manager to raise awareness.

IV.3. EFFECTS OF THE PROJECT ON SOCIO ECONOMIC ENVIRONMENT

Trabzon Province is surrounded by Eynesil (Giresun) in the west, Torul (Gümüşhane) and Bayburt Province with its central districts in the south and İkizdere and Kalkandere Districts (Rize) in the east. It is also neighbor on Black Sea in the north. Coastal length of Black Sea in provincial borders is approximately 135 km. Trabzon Province consists of 18 districts including central district. Mavi Weir and HEPP Project is planned to be constructed in Maçka District, on Hamsiköy Stream.

Trabzon climate is hot in summer and cold in normal levels in winter. Average temperature in summer months is approximately +32 degrees Celcius. In winter, temperature drops to -6 degrees Celcius in coldest days. Spring months are generally rainy and foggy. Months in fall are quite nice. Trabzon has a humid climate and humidity level reaches up to 99% from time to time. Annual average precipitation is 800-850 kg/m^2. Precipitation quantity increases in the inner regions. Months with the least precipitation are July and August whereas the highest quantity of snow is observed in February. **There are 440 region-specific and 2,500 rare (in Turkey in general) plant species in Trabzon.**

Population of Trabzon is 757,353 as per the latest population census in 2011. 421,504 of the total population live in province/district centers whereas 335,849 of the population live in towns/villages. In accordance with the General Census results, Trabzon is in the 2nd place in population after Samsun among 14 provinces in Black Sea Region. 10,000,000 people live in the region in total. This equals to 12.44% of the total population of Turkey. Trabzon, located in the Eastern Black Sea Region, is at the start point of Caucasus and Iran transit road. Trabzon has connection with ports of other countries having border to Black Sea. It is a touristic city with its historical and natural beauties which can be visited all four seasons.

Ensuring economic and social development by protecting the environment via use of efficient and reliable energy sources is one of the basic targets of the societies of our day. In this regard, to enable sustainable development as a process with increasing importance, it is observed that programs on sustainable energy have been prepared and strategies have been developed in this regard. This requires the application of energy policies which will minimize external dependence and ensure optimum use of national resources.

Mavi Weir and HEPP Project planned to be constructed in Trabzon Province, Maçka District, Hamsiköy Stream by CESE Elektrik Üretim A.Ş. aims to generate annually 28.58 GWh electric energy in total. This project with an installed capacity of 11.60 MWm can be observed as an important step to compensate a certain portion of increasing sufficient, reliable, quality, economical and environment-friendly electricity generation requirement of Turkey which aims to minimize energy import and maximize use of national and renewable energy sources to contribute to national development, provided that necessary precautions are taken against risks which may occur in social and economic basis.

Since the extent of the electromagnetic field to be generated by power transmission line installed during the operation phase of the project is low, it is not expected to cause negative impacts on human health and on other species. Impacts of the electromagnetic waves dispersed from power transmission lines can be seen as electrical and magnetic as two different types. There exist researches for electrical and magnetic field to be able to cause negative impacts on biological life and especially on human health. In this concern, required studies have been executed to ensure installation of the power transmission line as far as possible from the settlement areas in any condition.

In addition, to protect visual impacts which the project may cause, and to protect visual resources especially at scenic areas; potential visual impacts will be considered during route evaluation, as mitigation measures particularly the colour of pylons will be considered. Sensitive areas will be identified during the route evaluation. The power line will avoid crossing the main road. The route has been designed to approximately follow the existing power line corridor; crossings will be limited to existing crossing points.

“Mavi Weir and HEPP Project”, planned to be constructed and operated on Hamsiköy Stream in Maçka district in Black Sea Region, aims to generate electricity with a run of the river type power plant without forming a reservoir as it will be a water diversion structure. In this regard, it is stated that a total of 74 personnel will be employed during the land preparation crushing-sieving, concrete batching plant and construction stages, and approximately 14 people will be employed during the operation stage. It is appropriate to perceive the project as a contribution to the economy of the region considering that unskilled labor to be employed will be obtained from the local people and employment is planned to be continued during the operation stage, considering the operation period of 50 years.

It can be stated that Mavi Weir and HEPP Project is important as it has the potential to solve the unemployment problem, which is a social fact, to a certain extent. Such that, considering the information on Trabzon province 2,000 House Population Number Information as per House by Turkish Statistical Institute (TSI) is given as 5 persons, 370 people in land preparation and construction stage and 70 people in the operation stage will benefit from the project indirectly. On the other hand, with the start of energy generation by the project following commissioning, new investments in the district and around Trabzon province, which will present new employment oppurtunities and this may be considered as a long-term secondary contribution. All these positive changes can also be interpreted as small but significant steps to prevent migration observed in the region.

Facilities planned to be constructed within the scope of Mavi Weir and HEPP Project which is planned to be constructed and operated by CESE Elektrik Üretim A.Ş. are weir, conveyance tunnel, approach tunnel, forebay pool, pressure pipe, plant building, crushing-sieving plant, concrete batching plant, switching station and facilities for energy transmission. Works and activities during construction and operation stages of these facilities planned to be constructed primarily impact the dwelling areas close to the project area socio-economically in a significant manner. Following the realization of environmental precautions provided in Project Introduction File prepared in accordance with Environmental Impact Assessment Decision as per Turkish Legislation presently in force, it is observed that local people are not affected in an environmental sense due to the works and activities.

Land structure of Maçka district consists of valleys formed by Hamsiköy Stream and its branches, and hillsides and mountains rising from the valleys. Villages form the settlements in the mountain foothills. Forested lands, grasslands and plateaus are located at higher altitudes above the villages. As the land structure of the district is rough and susceptible to erosion, areas with high inclination have been used for planting hazelnnut, mixed orchard and meadowland. Region has a rich plant flora with the climate effect. Primary plant cover consists of agricultural lands, forest areas, moors and small trees in the form of moors and meadows. 80% of agricultural lands in the district consist of land with high inclination and total amount of agricultural land is 7,837 ha. Some flat agricultural lands are present in stream beds and village areas. Agricultural lands have been divided into small plots with inheritance. Crops except hazelnut do not possess commercial value. Crops which can be planted, grown and produced in agricultural lands in the province are; hazelnut, corn, fruits and vegetables. Stockbreeding is observed intensely in villages with high altitudes where hazelnut cannot be grown. Jersey crossbreed is the dominant breed in bovine breeding whereas holstein and local breeds are low in number. In ovine breeding, Karakaya crossbreed and local sheep breeds are present and there is a small number of hair goat present. There exist 12,030 cattles, 11,790 sheep and goat, and 7,932 bee hives (plated). Fishery industry has been developed in the province with private sector enterprises and migratory beekeeping is observed.

On the other hand, the project needs to be assessed from basic protection areas perspective present in Trabzon province; such assessment is very significant in the sense that it puts out the mostly overlooked potential of the region. Altındere Valley National Park is located in the region. Main values of the park consist of Sümela Monastry, plant cover of the valley and richness of wildlife and interesting geomorphological structure. This National Park also has an important source for eco-tourism with the surrounding plateaus. Furthermore, Uzungöl and Sera Gölü Natural Parks are located in the region. Lakes and surrounding plant and wildlife richness are integral with the scenery in both of these Natural Parks. Additionally, Kayabaşı, Ağaçbaşı, Çal-Camili, Çamburnu and Sazalan recreation spots are located in the region.

It can be stated that the project provides a significant contribution to the economic activities in the region as materials required for Mavi Weir and HEPP Project are obtained from the facilities in the region; fuel and mineral oil required for construction machinery and vehicles to be utilized in construction works and technical, social and daily requirements of the personnel to be employed are supplied from within the district/province.

As per regulation in force, no Public Participation Meetings are organized for projects provided in Appendix-II of Environmental Impact Assessment Regulation. For these projects, the decision that Environmental Impact Assessment is not required is announced to public by Governorship following the ruling of such decision. However, meetings have been held in Gürgenağaç and Bağışlı villages on 15.09.2010 by CESE Elektrik Üretim A.Ş. to share information regarding the project and receive ideas and opinions of the local people of the region on the project.

One of the concerns of Bagisli Village has been the quantity of the water to be released to the stream bed during the operation of the plant. The person, who brought up this concern, was a village person living in Bağışlı village and making his living on running a water mill. He wanted to be informed on the future of the water mill. Project specialist stated that sufficient amount of water determined by the state institutions shall be released to the bed between plant intake and outlet and the stream shall never be left to dry due to operation of the plant.

Project specialist informed the local people on working principles of run-of the river type power plants and stated that the project owner would do their best to have the facilities in peace with the local people. Selim Yılmaz, General Manager of Cese Energy stated that he would personally follow this subject and that the water mills would continue to work following the start of operation of the plant.

Another question from Bagisli Village was on job opportunities during construction and operation stages. This question has been asked by one of the young people of the village. Selim Yılmaz stated that they would prioritize employment of local people as much as possible. He further stated that they would contact with the local people for job opportunities in the process of start of construction activities. Project specialist stated that skilled and unskilled labor would be required and employment of local people would be connected with the presence of workers qualified for these positions in the region.

Consequently, Mavi Weir and HEPP Project planned to be constructed on Hamsiköy Stream in Maçka district of Trabzon Province by CESE Elektrik Üretim A.Ş.;

- Contribution to increasing electricity requirement of Turkey within the framework of the facilities,
- Generating employment in the region where construction will take place with the number of employees foreseen for unskilled and permanent personnel,
- Contribution to economy of the region by procuring supply of construction materials, fuel and mineral oil of construction machinery and equipment and repair and maintenance works in addition to technical-social-daily needs of the employed personnel from the district.

have positive socio-economic impacts and pragmatic functions due to its potentials. In this regard, Mavi Weir and HEPP Project aiming to improve and use water resources for generating energy can be regarded as a contribution while considering the requirement of on site, on time and uninterruptible electric energy for industrialists and other users for social and economical development of Turkey.

CHAPTER V

ASSESSMENT OF ALTERNATIVES

CHAPTER V. ASSESSMENT OF ALTERNATIVES

Mavi Weir and HEPP Project is an hyroelectric plant activity for which effort is spent to increase its ratio in total energy generation in Turkey. With the project, it is planned to utilize the altitude difference of 188 m between levels of 894.00 m and 706.00 m of Hamsiköy Stream, which is a branch of Değirmendere Creek in Eastern Black Sea basin. The plant will provide contribution to national electricity generation with its generation capacity of 28.58 GWh in average annually. Furthermore, economy in Eastern Black Sea basin will flourish and new employment and work opportunities will be provided with the realization of the project.

Site Alternative

Unlike fossil-fueled combustion turbines, construction of hydroelectric plants requires a long lead-time for site studies, hydrological studies, and environmental impact assessment. Hydrological data up to 50 years or more is usually required to determine the best site and operating regime for a hydroelectric plant.

The coal fired or gas fired thermal power plants are generally built as close as possible to their fuel source or transportation routes. Unlike plants operated by fuel, such as fossil or nuclear energy, the number of sites that can be economically developed for hydroelectric production is limited; new sites tend to be far from population centers and require extensive transmission lines for his reason.

Hydroelectric production depends on rainfall in the watershed, and may be significantly reduced depending on low rainfall or snowmelt. Long-term energy yield of hydroelectric plants also may be affected by climate changes. Utilities that primarily use hydroelectric power may spend additional capital to build extra capacity to ensure sufficient power in years of low rainfall.

Energy potential of our country in terms of topographical and hydrological features are not evenly distributed throughout the whole country.

Eastern Black Sea valleys with their geological and hydrological structure and water potential are rich sources for hydroelectric power generation. As a result of their geographical position and rainfall characteristics they are composed of streams parallel to each other and their sub-basins. This is an important investment field for power generation plants based on the hydrological source.

Taken into consideration the geographical feature of the region and these types of advantages, this territory is preferred for Mavi Weir and HEPP Project.

Technology Alternative

Power plants can produce electricity using a renewable resource, such as water, wind or solar, or a nonrenewable resource such as coal, oil/gas or nuclear energy. The coal fired or oil/gas fired thermal power plants have high air emission rates although their stack air emissions are significantly reduced by modern treatment technologies. In thermal power plants, various types of hazardous wastes are generated due to their processes. Thermal power plants generally require a considerable amount of water for their cooling systems, which creates another environmental concern to overcome. Hydroelectricity eliminates the flue gas emissions from fossil fuel combustion, including pollutants such as sulfur dioxide, nitric oxide, carbon monoxide, dust, and mercury in the coal. Hydroelectricity also avoids the hazards of coal mining and the indirect health effects of coal emissions.

Establishment costs of thermal power plants are two or three times lower than the hydroelectric power plants with the same capacity. On the other hand, operating costs of the hydroelectric power plants is very low, while operating costs of the thermal power plants are always very high since they use expensive fuel. Despite the high depreciation in hydroelectric power plants, kilowatt/hour production costs less than thermal kilowatt/hours production. A hydroelectric plant is considered to have feasible conditions if operating costs of it meets its establishment expenses. After the initial investment, since the main source of energy production is water, the production cost is very cheap. Start-up and deactivation of thermal power plants is not very easy and fast. They undergo a loss of efficiency during the start-up and deactivation. For superheated steam to be ready for power generation, boilers should be burned for a long time.

Compared to nuclear power plants, hydroelectricity power plants generate no nuclear waste, have none of the dangers associated with uranium mining, or nuclear leaks. Unlike uranium, hydroelectricity is also a renewable energy source. Cost of the first establishment of nuclear power plants, is approximately equal to the investment to be made for hydroelectric power plant. Although operating costs of a hydroelectric power plant can be neglected, maintenance and operating costs of a nuclear power plant are as high as a thermal power plant which has almost lower establishment cost. If there is a need to build a nuclear power plant today, it is not because the given cheap energy price or probability of price fall in the near future. This initiative is based on the idea that places to install hydroelectric power plants will run out of twenty years later and that the replication of the production of conventional fuels such as coal, oil and natural gas which is eventually running out of will not be feasible enough.

Compared to wind farms, hydroelectricity power plants have a more predictable load factor. If the project has a storage reservoir, it can be dispatched to generate power when needed. Hydroelectric plants can be easily regulated to follow variations in power demand.

Hydroelectric power plants are the most environmentally friendly plants between the alternative energy plants. Hydroelectric power plants have no greenhouse gas emission and solid waste problem. Since their energy source is the running water from stream bed, they don’t need any additional transportation and transmission facilities of ships or pipelines etc. like import sources. For this reason, there are no environmental problems and risks that may arise from these additional facilities and transportation in hydroelectric power plants.

Hydroelectric power plants use water coming from turbines only for energy production and leave it on the river bed again. Therefore, hydroelectric power plants are rare power facilities only using but not consuming the source of production while generating energy. This water can then be used also for other purposes. These plants do not consume any natural resource.

Some advantages of hydroelectric power plants in comparison with other power plants using nonrenewable energy resources are summarized below:

- Operation and maintenance costs of hydroelectric power facilities are low, their lifetime is long.
- Hydroelectric energy source is native and renewable, and much more environmentally friendly than its alternatives.
- Hydroelectric energy is compatible with variable energy demand.
- Hydroelectricity improves the quality of the air we breathe.
- Hydroelectricity offers a significant contribution to development.
- Hydroelectricity means clean and cheap energy for today and tomorrow.
- Hydroelectricity is a fundamental instrument for sustainable development.

In Mavi Weir and HEPP Project, tunnel structure is preferred to channel structure to minimize the possible harmful effects of the project to the environment. By selecting this technology instead of channel structure, less harm to the public and natural habitat was aimed.

Decision of tunnel structure prevented damages to agricultural lands in case of transition from the surface and agricultural activities in the region have been in a convenience. Significant amounts of the expropriation land were disposed of. Another important reason for choosing this system is that in the case of transition from the surface, the geology of the region is not sufficiently reliable.

As a result, formulation composing Mavi Weir and HEPP Project to capture the best environmental conditions and the annual net income, and significantly higher rantability reveals that the most advantageous formulation was chosen.

CHAPTER VI

CUMULATIVE IMPACT ASSESSMENT

CHAPTER VI. CUMULATIVE IMPACT ASSESSMENT

The project's separately environmental benefits, impacts on socio-economic development and other possible effects which can be called positive impacts are summarized below.

Unlike dams with water storage run of river type HEPPs do not accumulate water but divert water by a regulator to a forebay through a conveyance canal/tunnel and accumulated water reaches turbines by a penstock to generate electricity. Turbined water is then released to the river without any loss in quantity and quality.

Mavi HEPP Project will not produce any greenhouse gas emissions contributing to air, soil and water quality which is vital for the whole ecosystem and next generations. The estimated total emission reduction amount is approximately 16,000 tonnes CO. Moreover, due to the usage of national resources, the economic dependency on the foreign countries will be eased. The Project is within the Turkish Laws, Environmental Regulations and United Nations Clean Development Mechanism (CDM) Principles. All permits have been granted for relevant licenses.

Change in water levels in the river: Water level will only change between the water intake and water outlet points in the river as this is a run- of -river Project and no dams are involved. By law investors are required to maintain sufficient level of water between these two points to ensure that there is no impact on the riverine ecosystem. At no point will the river be allowed to run dry. In other words, riverine ecosystem will be preserved.

Change in the topographical structure of the land by reason of excavations, fillings, leveling, material removal and reclamation during the construction: During Project implementation, the materials removed from the diggings will be carefully stored and then reused to avoid local waterways being polluted by runoff.

• The most considerable negative impact of the HEPP projects is the need to cut down trees. Nevertheless, construction of conveyance tunnel, instead of a canal, will minimise the loss of trees.

• Any materials from the excavation area will be used either for landscaping or for the development of the roads in the area. Also, the local road network will be tried to be improved.

Socio-economic Development

• New employment opportunities will be provided during the construction and operation phases.
• Demand for other services such as provision of equipment, food and accommodation will be created.
• We are seeking to make an investment in the community in order to improve the standards of living of the local people through donations to improve local facilities such as a contribution to school or medical facilities or improvement in roads or stockbreeding programs. During the meeting we would welcome your suggestions as to the ways in which we can best assist the community.
• A reduction in the importation of fossil fuels will improve the balance of payments for Turkey and improve the energy security of the country.
• The access to electricity for local communities will be improved.
• No resettlements are required as the project is run-of-river type.

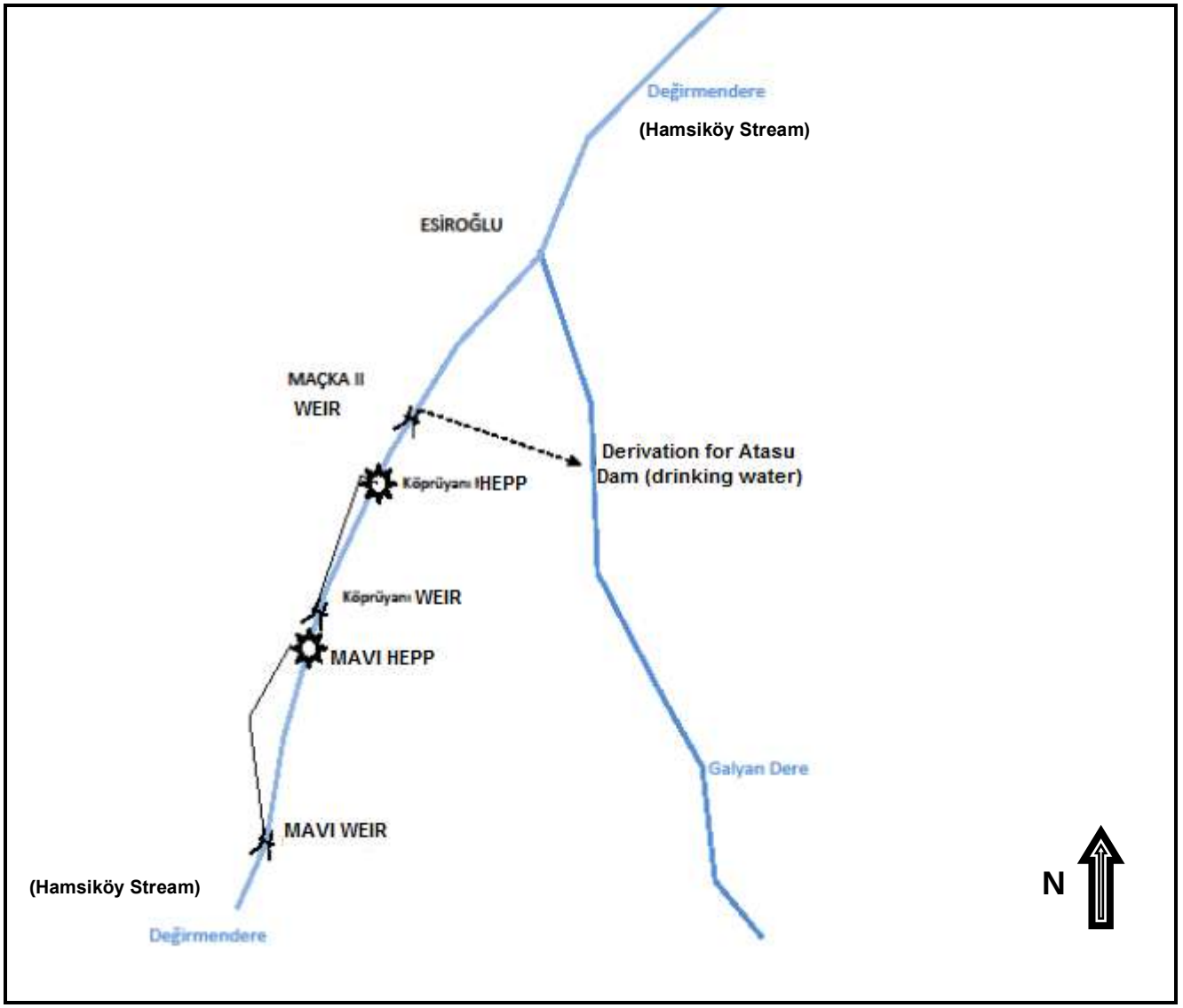
Cumulative impact assessment was made taking into account characteristics of the other projects in the upstream and downstream of water intake structures, water usages of those projects, valuable ecosystem elements and impacts of environmental flow on those elements and flora-fauna in the effective area under the following subtitles.

- **Other Projects At Upstream and Downstream of Water Intake Structures**

There is no similar project present at the upstream of the project. At downstream of Mavi HEPP Project, Köprüyanı HEPP Project is planned and **Maçka HEPP Project** is planned at downstream of **Köprüyanı HEPP Project**. The plan showing the locations of the the projects at downstream of the Mavi HEPP Project is given below.

In Mavi Weir and HEPP Project, it has been suggested in Ecosystem Assessment Report (see Appendix-4) that environmental/ecosystem water of 0.258 m^3/s shall be released at all months except other usages. In the letter of Nature Preservation and Natural Parks General Directorate dated 28.08.2009 on the subject (See Appendix-1.10.), investor has been obliged to release 0.5 m^3/s for March, April, May and June and 0.27 m^3/s for other months of environmental flow to the downstream. Accordingly, the quantities obliged by Nature Preservation and Natural Parks General Directorate shall be released to stream bed as environmental/ecosystem water. (No irrigation, or drinking water sources?)

Regarding **Köprüyanı HEPP Projec**t located in the downstream of Mavi Weir and HEPP Project, the quantity of environmental flow to be released to the stream bed at all months has been determined as 200 lt/s as per the information received from the investor. Regarding **Maçka HEPP Project** located in the downstream of Köprüyanı HEPP Project, no information can be received as several completed designs for which EIA works have been performed can be kept confidential by investor. In EIA process; EIA reports are open to the public only for a certain period, to confirm if there is any objection before finalization of the project. Initiation of examination and assessment process of planned project and submission of the EIA Report to public opinion is announced by the Ministry and Governorate by appropriate means of communication such as billboards, announcement, internet, etc. Those who wish to examine Environmental Impact Assessment may examine the report in the Ministry center or Provincial Directorate of Environment and Urbanization within the specified time period beginning from the announcement date and communicate their opinions to the Ministry or Governorate. The opinions notified to the Governorate are communicated to the Ministry. These opinions are taken into account by the Commission and reflected in the Environmental Impact Assessment Report. Provisions of Nature Preservation and Natural Parks General Directorate and State Hydraulic Works are obliged for flow rates and environmental flow quantities regarding these projects. As approvals have been given for these quantities by relevant authorities, sustainability of natural life has been secured by these authorities.


Değirmendere
(Hamsiköy Stream)
ESİROĞLU
MAÇKA II
WEIR
Derivation for Atasu
Dam (drinking water)
Köprüyanı HEPP
Köprüyanı WEIR
MAVI HEPP
Galyan Dere
MAVI WEIR
(Hamsiköy Stream)
Değirmendere
N

In addition to all this information about Maçka and Köprüyanı HEPP Projects, the characteristics of both projects are given below:

Maçka HEPP Project

Maçka Weir

Type	: Solid webbed, covered
Crest Length	: 9.00 m
Thalweg Elevation	: 512.00 m
Base Elevation	: 510.25 m
Height from Thalweg	: 5.00 m
Height from Base	: 7.00 m

Scouring Sluice

Number and of Cover and their Dimensions	: 1 Unit 1.75 m x 1.00 m
Scouring Sluice Base Elevation	: 512.00 m

Water Intake Structure, Sedimentation Basin

Type	: Cross Intake
Slope of the Basin Base	: 0.0100
Number of Covers and their Dimensions	: 2 x 4.00 m (b) x 1.50 m (h)
Length of the Sedimentation Basin	: 2 Units 4.00 m x 1.20 m
Width of the Sedimentation Basin	: 27.00 m
Diameter of Grain to be Settled in the Basin	: 0.30 mm
Base Elevation of the Sedimentation Basin	: 510.55 m
Transmission Line Inlet Base Elevation	: 512.24 m

Transmission Conduit 1

Conduit Type	: Rectangular / box
Channel Dimensions	: B = 3.60 m, h = 2.20 m
Conduit Length	: 14.00 m
Conduit Base Slope	: 0.00035
Water Length in the Conduit	: 1.80
Conduit Inlet Base Elevation	: 512.240 m
Conduit Outlet Base Elevation	: 512.235 m
Conduit Inlet Water Elevation	: 514.040 m
Conduit Outlet Water Elevation	: 514.035 m
Conduit Beginning KM	: 0+000.00
Conduit Ending KM	: 0+014.00

Energy Tunnel 1

Tunnel Type	: Reformed Horseshoe
Diameter	: 3.60 m
Tunnel Length	: 638.957 m
Tunnel Base Slope	: 0.00035
Water Length in the Tunnel	: 1.80 m
Tunnel Beginning Base Elevation	: 512.235 m
Tunnel Ending Base Elevation	: 512.011 m
Tunnel Inlet Water Elevation	: 514.035 m
Tunnel Outlet Water Elevation	: 513.811 m
Tunnel Beginning KM	: 0+014.000
Tunnel Ending KM	: 0+652.957

Transmission Channel 1

Channel Dimensions	: 3.60 x 2.00 m
Channel Length	: 89.218 m
Channel Base Slope	: 0.00035
Water Length in the Channel	: 1.80 m
Channel Inlet Base Elevation	: 512.011 m
Channel Outlet Base Elevation	: 511.98 m
Channel Inlet Water Elevation	: 513.811 m
Channel Outlet Water Elevation	: 513.78 m
Channel Beginning KM	: 0+652.957
Channel Ending KM	: 0+742.175

Energy Tunnel 2

Tunnel Type	: Reformed Horseshoe
Diameter	: 3.60 m
Tunnel Length	: 2328.571 m
Tunnel Base Slope	: 0.00035
Water Length in the Tunnel	: 1.80 m
Tunnel Beginning Base Elevation	: 511.98 m
Tunnel Ending Base Elevation	: 511.165 m
Tunnel Inlet Water Elevation	: 513.78 m
Tunnel Outlet Water Elevation	: 512.965 m
Tunnel Beginning KM	: 0+742.175
Tunnel Ending KM	: 3+070.745

Transmission Channel 2

Channel Dimensions	: 3.60 x 2.00 m
Channel Length	: 767.554 m
Channel Base Slope	: 0.00035
Water Length in the Channel	: 1.80 m
Channel Inlet Base Elevation	: 511.165 m
Channel Outlet Base Elevation	: 510.897 m
Channel Inlet Water Elevation	: 512.965 m
Channel Outlet Water Elevation	: 512.697 m
Channel Beginning KM	: 3+070.745
Channel Ending KM	: 3+838.300

Energy Tunnel 3

Tunnel Type	: Reformed Horseshoe
Diameter	: 3.60 m
Tunnel Length	: 731.958 m
Tunnel Base Slope	: 0.00035
Water Length in the Tunnel	: 1.80 m
Tunnel Beginning Base Elevation	: 510.897 m
Tunnel Ending Base Elevation	: 510.64 m
Tunnel Inlet Water Elevation	: 512.697 m
Tunnel Outlet Water Elevation	: 512.44 m
Tunnel Beginning KM	: 3+838.30
Tunnel Ending KM	: 4+570.257

Transmission Channel 3

Channel Dimensions	: 3.60 x 2.00 m
Channel Length	: 179.205 m
Channel Base Slope	: 0.00035
Water Length in the Channel	: 1.80 m
Channel Inlet Base Elevation	: 510.64 m
Channel Outlet Base Elevation	: 510.578 m
Channel Inlet Water Elevation	: 512.44 m
Channel Outlet Water Elevation	: 512.372 m
Channel Beginning KM	: 3+570.257
Channel Ending KM	: 4+749.462

Forebay Pool

Width	: 12.00 m
Length	: 30.00 m
Pool Base Elevation	: 506.10 m
Minimum Water Level	: 510.731 m
Normal Water Level	: 512.378 m
Maximum Water Level	: 512.788 m
Active Volume	: 5912.698 m3

Penstock

Diameter	: 1.40 m (St 52)
Number	: 1
Length (Inclined)	: 248.70 m

Maçka HEPP

Water Intake Elevation	: 512.378 m
Tail Water Elevation	: 386.00 m
Gross Head	: 126.37 m
Net Head	: 122.01 m
Project Flow Rate	: 8.00 m 3 / sec.
Power Plant Type	: Surface

Köprüyanı HEPP Project

Hydrology

Köprüyanı Weir Drainage Area	: 175 km^2
Köprüyanı Weir Annual Flow	: 91.51 hm^3

Köprüyanı Weir

Type	: Tyrol
Thalweg level	: 691.5
Minimum level of construction	: 687.4
Height from Thalweg	: 8.5
Maximum Water Level	: 702.04
Normal Water Level	: 700.00
Minimum Water Level	: 696.00
Crest Level of the Weir	: 700

Crest Length of the Weir	: 13.30
Bottom Level of the Gravel Pass	: 692.00
Dimensions of the Gravel Pass	: 2x2
Length of the Stilling Basin	: 5.70
Type of the Stilling Basin	: Type 3 (USBR Type 2)

Water Intake Structure

Bottom Level	: 696.00
Number of the Racks	: 1
Dimensions of the Racks	: 6x2
Number of Water Intake Gates	: 2
Dimensions of the Water Intake Gates	: 3.0 x 2

Forebay Pool

Length	: 19
Bottom Level	: 691.50
Number of Water Intake Gates	: 1
Dimensions of the Water Outlet Gates	: 4x3.75
Number of the Racks	: 1
Dimensions of the Racks	: 3.8 x 3.3
Normal Water Level	: 696
Minimum Water Level	: 692.00
Maximum Water Level	: 697.04
Top Level of the Barrier	: 698.43
Crest Level of the Flood Weir	: 697.10
Crest Length of the Flood Weir	: 5.75

Penstock Pipe

Type	: Steel
Diameter	: 1.40
Length	: 216.00
Manifold Diameter	: 0.80
Manifold Length	: 14.7

Valves

Number of Valves	: 2
Type	: Butterfly
Diameter	: 0.80

Power House

Width	: 28.5
Length	: 9.00
Height (From Construction Level)	: 24.00
Base Elevation	: 513.45
Type of Substructure	: Embedded
Type of Superstructure	: Open
Capacity of Power House Mobil Crane	: 35 tones

Turbines

Turbine 1

Type	: Horizontal Pelton
Number	: 2
Unit Flow Rate	: 3.195
Net Head	: 178.58 m
Gross Head	: 181 m
Unit Power	: 10 MW
Turbine Rater Speed	: 750 rpm

Internal Needs Power Distribution Unit

Number	: 2
Power of the Unit	: 2x100 kVA
Frequency	: 50 Hz
Nominal Voltage	: 6.3/0.4-0.231 Kv

Generators

Generator 1

Type	: Three-phase, synchro generator
Number	: 2
Power	: 5,600 kVA
Power Factor	: 0.90
Rated Speed	: 750 rpm
Yield	: 0.975
Frequency	: 50 Hz

Transformers

Transformer 1

Type	: external, three-phase, grease-insulated
Number	: 2
Unit Capacity	: 6,500 kVA
Yield	: 0.985
Frequency	: 50 Hz
Rated Voltage	: 6.3/34.5 Kv
Cooling Type	: ONAN-ONAF

Energy Production

Total Annual Energy Generation	: 28.30 GWh
Annual Reliable Energy Generation	: 0.96 GWh
Annual Secondary Energy Generation	: 27.34 GWh

- **Water usage of the projects**

For HEPPs to be constructed in Turkey, it is compulsory to release at least 10% of the annual average flow values (environmental flow) to downstream for sustainability of natural life in accordance with Water Usage Rights (WUR) agreements by State Hydraulic Works. This quantity can be determined in the ecosystem assessment reports submitted for the approval of Ministry of Forest and Water Works Nature Preservation and National Parks General Directorate (NPNP) and increased while keeping over the ratio of 10%. Other projects in upstream and downstream of the project undertake to release this minimum quntity to downstream of water intake point of the stream for sustainability of natural life and compliance to water usage rights in the area. In Turkey, this is the practice and thus, sustainability of natural life is guaranteed.

However, “Valuable Ecosystem Elements” specific to each project may vary from project to project. Determination of this variance with ecosystem assessment reports is at issue and NPNP has also the right to comment in this regard. Reports for determination of Valuable Ecosystem Elements are subject to approval by NPNP. Therefore, NPNP determines a value over the minimum of 10% at the point of sustainability of natural life considering the local conditions of existing creatures in the region. As the quantity of environmental flow (environmental flow) required for natural life for each project is determined by NPNP, a database is formed by NPNP. These quantities are determined by NPNP, taking also the effects of other projects in the upstream and downstream of the project. Therefore, environmental impacts shall be kept at a minimum by assessing upstream-downstream relationship in the basin by NPNP and complying with the environmental flow quantity while considering the cumulative effects specific to this project. Same assessment has also been made for other projects in operation in the basin. Interaction of this project with other upstream-downstream projects under Environmental Impact Assessment process or under construction is also assessed in this regard.

In accordance with Water Usage Rights agreement made with State Hydraulic Works to protect the water rights in the area impacted by the project; Water Usage Rights reports are prepared in the format requested by State Hydraulic Works and submitted for the approval of the same. Prior to preparation of the report, written opinion is requested from relevant authorities on whether there exist any water usage quantities allocated for existing, under construction or planned facilities, drinking-utility water, tourism and industrial water usage, flood protection and energy generation. Water Usage Rights reports prepared in the light of these opinions and researches on the project area for agricultural requirements are examined and approved by State Hydraulic Works by questioning authorities’ opinions and examining on site. Quantity of water to be released between the weir and plant is under guarantee with Water Usage Rights agreements made with State Hydraulic Works. Investor company accepts to release the required quantity of water by complying to this undertaking. The quantity of water to be released to the stream bed is controlled by measurements taken by State Hydraulic Works at the electronic flow monitoring/lake level measurement stations built by the company in locations deemed appropriate by State of Hydraulic Works and investor company following the start of operations at the facilities. Furthermore, setting flow monitoring stations, maintenance and repair of these stations, release of water to its natural course without any loss in water quality and any chemical pollution which can affect normal human, animal and plant development are audited by authorized State Hydraulic Works personnel.

In the light of the changing and developing conditions in the upstream and downstream and considering the upstream-downstream relationship, planning on update the requirements in accordance with the hydrological data and the changes in actual and planned projects following the completion of 20-year periods upon signature of related Water Usage Rights agreement regarding the project is the performed by State Hydraulic Works and investor company shall be obliged to comply with such plans in the case of any changes.

During the preparation of Mavi Weir and HEPP Project's Water Rights Planning Report, 3 water mills have been confirmed in the project area. The location of them is indicated on the map given below. There are no trout farms under operation in the project area.

As known, water mills may operate during specific months or the whole of the year depending on region characteristics and demand. Therefore, working period of the water mills in the project area could not be exactly determined. Thus, water quantity calculation has been made assuming that the water mills would be operational for 12 months per year. However, it would be sufficient to release water from Mavi HEPP during the operation period of the water mills. Monthly Actual and Natural Life Requirement Water Rights Values (l/s) are provided in Table VI.1.

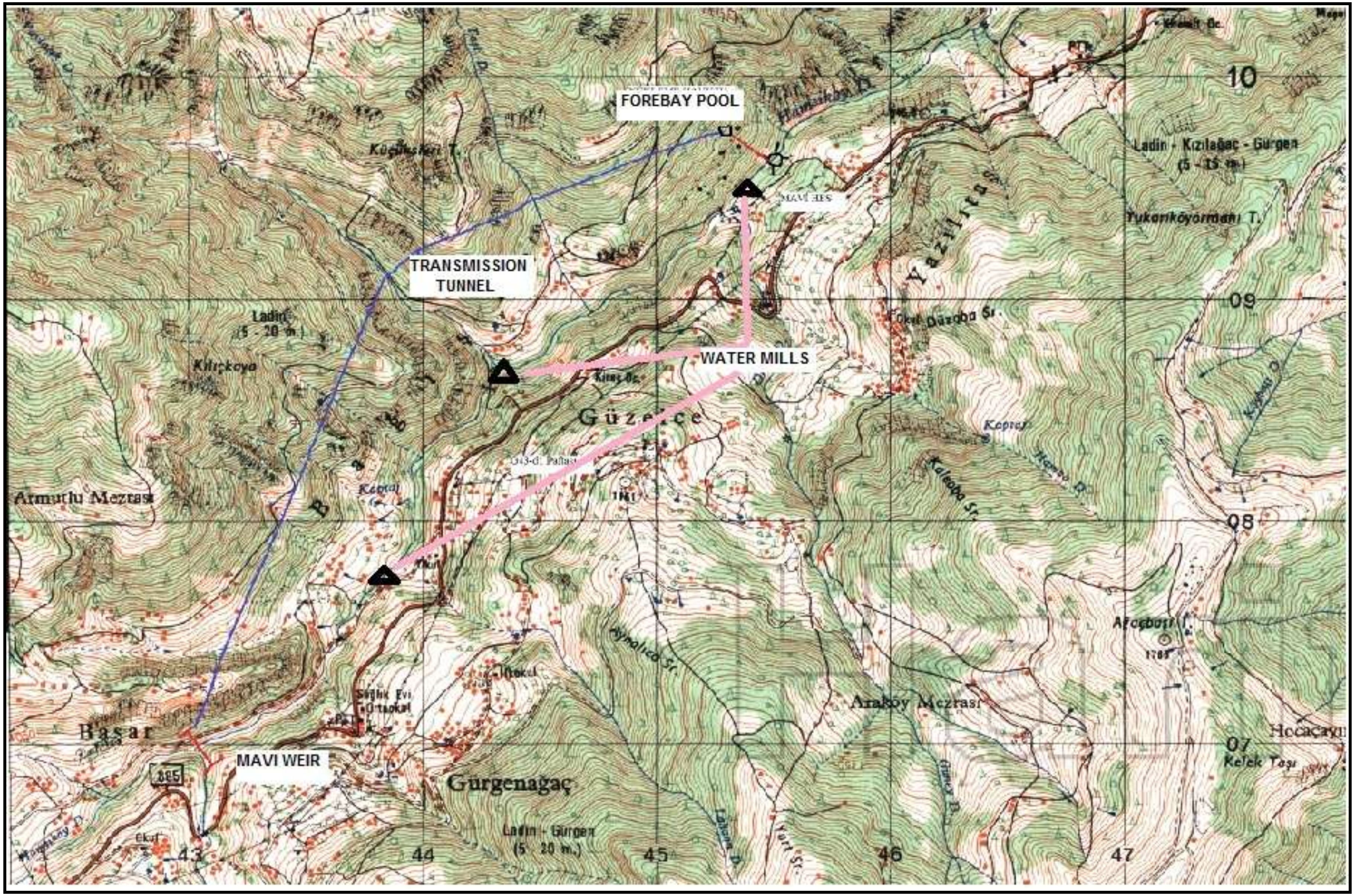

FOREBAY POOL
TRANSMISSION TUNNEL
WATER MILLS
MAVI WEIR
Güzelce
Gürgenağaç
Armutlu Mezrası
Araköy Mezrası
Başar
Ladin - Kızılağaç - Gürgen (5 - 15 m.)
Ladin (5 - 20 m.)
Ladin - Gürgen (5 - 20 m.)
Yukarıköyormanı T.
Yazılıtaş
10
09
08
07
43
44
45
46
47

Table VI.1. Monthly Actual and Natural Life Requirement Water Rights Values (l/s)

Months	Actual Water Rights
January	40 lt/s
February	40 lt/s
March	40 lt/s
April	40 lt/s
May	40 lt/s
June	40 lt/s
July	41.44 lt/s
August	42.80 lt/s
September	40.64 lt/s
October	40 lt/s
November	40 lt/s
December	40 lt/s

Embankments for irrigation have not been observed. Upon examination, it is found that there is no underground water reserve in the project area. No aquifer area fed by Hamsiköy Stream has been spotted in the project site. Aforementioned stream is not related to Mavi Weir and HEPP Project. No water is received from these streams for Mavi HEPP Project. Furthermore, all facilities within the scope of Mavi Weir and HEPP Project (tunnel, pressure pipe and plant building) have been designed to be located on the left bank of Hamsiköy Stream and they have no negative effect on aforementioned drinking water resources (See Annex-5: Water Rights Planning Report).

The total irrigated area in the project has been calculated as approximately 40 da (4 ha). Vegetable, beans – legumes, potato and sweetcorn are produced in these agricultural fields. Planted areas and their rational distribution is provided in Table VI.2. below. As can be seen from the table, ratio of agricultural products is; 15% potatoes, 20% vegetables, 30% beans-legumes and 25% sweet corn (See Annex-5: Water Rights Planning Report).

Table VI.2. Irrigated Lands and Their Distribution in Existing Irrigation Area

	Cropped Area (Ha)	Distribution (%)	Planting Period
Vegetable	0,80	20	10/05-15/09
Beans-Legumes	1,20	30	10/05-15/09
Potato	0,60	15	15/04-15/09
Sweetcorn	1,00	25	01/05-10/10
Fruits	0,40	10	15/04-15/10
Total	4,0	100	

Consequently, construction of Mavi Weir and HEPP Project results in water usage rights. Plant pattern, irrigated land area and plant water requirement for this pattern have been calculated for the project area. Irrigation water requirement calculated for the project area is 13,230.09 m^3/year.

In the letter of Nature Preservation and Natural Parks General Directorate dated 28.08.2009 on the subject (See Appendix-1.10.), it has been obliged that 0.5 m^3/s for March, April, May and June, and 0.27 m^3/s of environmental flow for other months shall be released to downstream by investor. The quantities foreseen by Nature Preservation and Natural Parks General Directorate shall be released as environmental/ecosystem water. Environmental flow has not been included in the calculations during the preparation of Water Usage Rights Report. Consequently, the quantity suggested by NPNP shall be released as environmental flow and irrigation water requirement stated in Water Usage Rights Report shall be added to the environmental flow quantity. Total quantity of water to be released is provided in Table VI.3.

Table VI.3. Total quantity of water to be released

	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
NCNP	0.27 m^3/s	0.27 m^3/s	0.5 m^3/s	0.5 m^3/s	0.5 m^3/s	0.5 m^3/s	0.27 m^3/s	0.27 m^3/s	0.27 m^3/s	0.27 m^3/s	0.27 m^3/s	0.27 m^3/s
Monthly Actual and Natural Life Requirement Water Rights Values (l/s))	0.040 m^3/s	0.040 m^3/s	0.040 m^3/s	0.040 m^3/s	0.040 m^3/s	0.040 m^3/s	0.04144 m^3/s	0.04280 m^3/s	0.04064 m^3/s	0.040 m^3/s	0.040 m^3/s	0.040 m^3/s
Irrigation water requirement	-	-	-	-	-	-	0,0017	0,0017	0,0017	-	-	-
TOTAL	0.31	0.31	0.54	0.54	0.54	0.54	0.31272	0.31408	0.31192	0.31	0.31	0.31

- **Valuable Ecosystem Elements**

In the research performed with the consideration of Republic of Turkey Ministry of Forest and Water Works Protection areas, it has been observed that there are no national parks, natural parks, special protection areas, in addition no densely populated areas and, erosion and landslide areas.

In the project area, the following have been selected as target species while taking economic value, protection status and water intake locations in the stream: Salmo trutta fario (stream trout), Salmo trutta labrax (sea trout), Pelophylax ridibundus, Vipera barani (Baran's adder) (See. Annex-4: Ecosystem Assessment Report). The reasons of choosing these species as target species and why they are valuable ecosystem elements in terms of certain biological characteristics have been provided below.

Family: SALMONIDAE

Salmo trutta labrax Pallas, 1814 (Sea trout)

This species from Salmonidea family exists only in Eastern Black Sea Region of Turkey.

Sea trouts live in the fast flowing, clear, cold and with rich oxygen content areas. This species specially prefer areas with stony and gravelly bottom and sensitive to changes in the habitat. They are also very sensitive to daily and seasonal water temperature changes. They move to lower basins of streams in spring and summer months. This species lay their eggs in holes they dig with their body and fin movements in stony and gravelly spots at the source of clear and rich-in-oxygen areas of upper basins of streams. One of the most important factors in seasonal migration of sea trout is the water level of the stream. Stream flow rate is an important factor affecting the migration from stream to sea and sea to stream. They feed on invertebrates when young and on small fish, worms and bugs in and out of water when full-grown. They have "LC" status according to IUCN list.

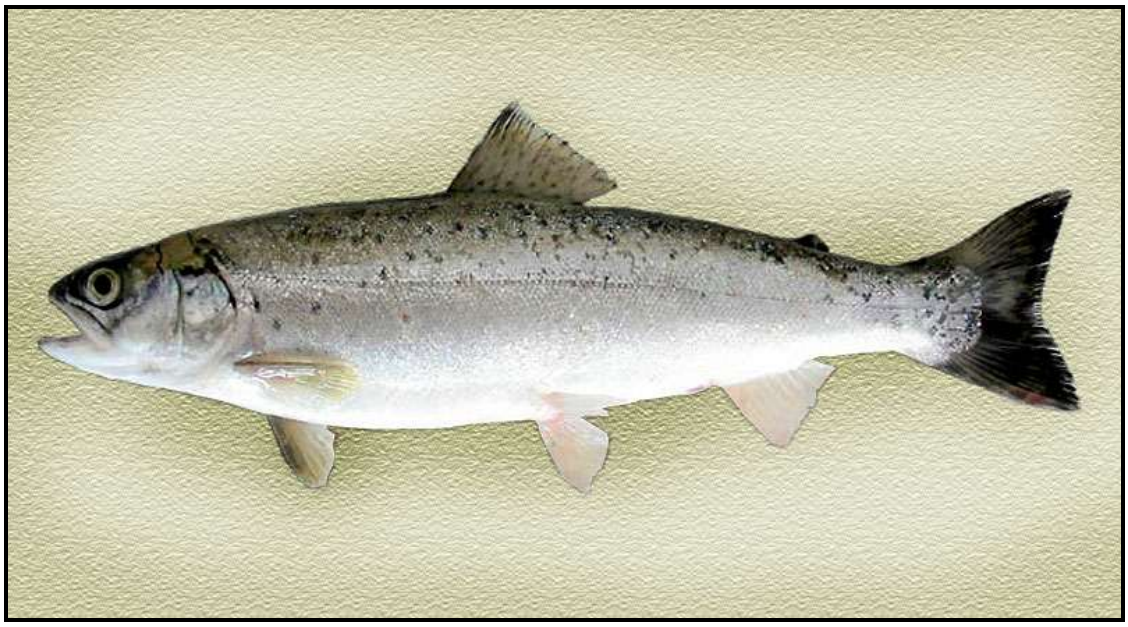


Figure VI.1. Salmo trutta labrax Pallas, 1814 (Sea Trout) (www.ittiofauna.org)

They spend most of their lives nd especially feeding period in the sea. In their reproduction period, they migrate to streams flowing to the Black Sea and lay their eggs to stony and gravelly areas. They migrate in two different periods (fall and winter).

Salmo trutta fario Linnaeus, 1758 (Stream trout)

Stream trout, Salmo trutta forma fario (Linnaeus, 1758), being one of the subspecies of Salmo trutta, is the stream ecotype in the systematics. Being considered as “real trout” as they live in fresh water all their lives, they migrate in short distances in the stream although they do not migrate between sea and streams (Çelikkale, 1992; Geldiay and Balık, 1996).

Stream trout, being a typical cold water fish, live in streams and rivers mostly in mountainous areas with clear and gravelly-bottomed, not very hot and rich-in-oxygen. However, they can be found in lakes, ponds and reservoirs whereas also in stream mouths. Stream trout exists in many water resources, primarily in Eastern Anatolia, Black Sea and Central Anatolia Regions. (Çelikkale, 1992).

Figure VI.2. Salmo trutta fario (www.gradinapovestilor.ro)

Body of stream trout is stocky, torpedo-shaped and flattened from the sides. Their color is very variable depending on the environment in which they live in. They are generally brown, green or blue tones in color but many pink, purple and black ones are also observed. Their sides are mostly covered in red or black dots circled by light blue, orange or yellowish lines. Red dots, which are very characteristic especially in the young also remain when they are fully grown and do not disappear for the whole of their lives. There exist 6-9 dark and transverse stripes on the young of this species. Fins are generally dark and occasionally matt in color. Caudal fins are slightly bifurcated in the young, sharp or round in older ones. Males are distinctive from females with their longer mouth opening and hook structure reaching from jawbone.

They reach sexual maturity at the age of 3-4. They mostly reproduce during the fall and start of winter. They lay their eggs in clear, motile, gravelly areas with no sand near mountain streams between October-January. A female lays 1000-1500 egs per 1 kg weight. Larvas hatch in 2.5-4 months or in a shorter period depending on water temperature. Eggs are big and orange in color. Larvas hatching from the eggs are 2-2.5 cm in length. Their meat is delicious and it is a species with a high economic value.

Pelophylax ridibundus (Pallas, 1771) (Marsh Frog)

This is a species with a wide range of habitat including mixed and deciduous forests, rain moors, meadow areas, semi-desert and desert areas. Marsh frog prefers open areas with high temperatures and dense vegetation. Marsh frog is a half-aquatic species. They have a wide habitat and reproduction zone in flowing and dead waters, shallow ponds and lakes which are larger than ponds, reservoirs, streams and rivers. They can even be seen in mildy salty waters.

There exists no great threat for this species with its ability of adaptation. Although loss of reproduction habitat of localized groups results in a decrease in the population, this species is resistant to environmental pollution and can even survive in waters exposed to chemical pollution in which other amphibious species can not survive.

Droughts in wastelands may cause decrease in the number of the population. A threat risk for this species in our country is that marsh frogs are consumed as food due to its delicious legs. Furthermore, extreme pollution caused in some industrial areas cause a great reduction in its population.

This species is listed under Appendix V category of EU Natural Habitats Directive and Appendix III of Bern Agreement, thus it is protected by several countries' regulations. When moved out of their habitat, they have to be protected to prevent threat of other natural species. Yellow areas shown in the map below are the natural habitat range of Pelophylax ridibundus and purple areas are where they are moved afterwards.

Figure VI.3. Pervasion Areas of Pelophylax ridibundus

Vipera barani Böhme & Joger, 1984 (Baran's Adder)

They are collected excessively from their natural habitat as they have a significant position among domestic animals. Therefore, they are almost classified as extincted species.

Development in their habitat and oppression on the snakes are the most significant reasons threatening this species. Monitoring and protection is required for prevention of extinction of this species.

Baran's adder is also collected for international domestic animal trade by hunters and the level of collection of these animals are not exactly known. They are also killed by local people as they are seen as a potential peril. Increase in the tourism opportunities in their habitats is also a threat for this species.

Baran's adder is listed in Bern Appendix II list. They exist in few protected areas in Eastern Black Sea Region in Turkey. Dark yellow areas shown in the map below show the natural pervasion area of Vipera barani and light yellow areas show the areas where they can possibly be found.

Figure VI.4. Preservation Areas of Vipera Barani

- **Impact of Environmental flow on Flora**

Acer cappadocicum (VU), Frangula alnus, Lonicera caucacasia, Trifolium pannonicum, Geranium cinereum, Pilosella hoppeana (Endemic) ve Geranium lazicum exist in the project site and its surroundings. None of the plant species other than the above are subject to any national and international protection criteria (ENDEMİC, RARE, IUCN, BERN and CITES).

Acer cappadocicum ***Distribution in Turkey***

Frangula alnus ***Distribution in Turkey***

Lonicera caucacasia

Distribution in Turkey

Trifolium pannonicum

Distribution in Turkey

Geranium cinereum

Distribution in Turkey

Pilosella hoppeana

Distribution in Turkey

Geranium lazicum

Distribution in Turkey

Considering national and international protection criteria, aforementioned plants are characteristically endemic for this region. In consideration of this situation, for those plants existing in the area during the HEPP project works in the region, a biologist will collect the seeds of those plants; send those seeds to the seed depository. Planting young trees obtained from those seeds, in similar habitats shall increase the biological diversity.

Plant species in the project site being widely spreaded in the area in general, environmental distribution being present for determined species meaning the floristic and species composition being similar to the structure in the surrounding area, land structure of the site where the facilities shall be constructed and limited and tolerable change in the ecosystem to occur in the plant species existence show that no serious ecological damage will be observed due to planned facilities.

In this regard, no irreversible loss shall occur in the floristic structure after the construction of the facilities. Biomass loss to occur due to removal of plant species in the areas where the facilities shall be built shall be compensated by replanting after completion of construction.

Planned HEPP construction project is composed of several stages. These are the head regulator, conveyance tunnel, forebay pool, pressure pipe and plant building. Some changes shall occur in the geomorphological structure during these works. The first one is the tunnel. As the tunnel will be under the ground, there shall be no changes in the geomorphological structure. However measures for noise and vibration were taken for blasting activities performed during the construction of the tunnel structures to control the noise and vibration levels caused by explosions, operations creating noise and vibration and, the heavy construction vehicles in order not to have negative effects on the closest area and limit values were provided. Blasting operations were stopped in construction stage of the project in the reproduction period of the species (March-April). There shall be changes also in the area between the head regulator and HEP plant. Excavation activities shall be performed in the area during the construction of the head regulator. Some of the plants existing in the area of excavation might be devastated during the excavation activities. Furthermore, it has been determined that these plants exist abundantly in the natural habitat out of the project area. In this regard, no negative impact shall occur in biological diversity perspective.

Consequently, it is foreseent that the project will not cause any dramatic change on the assessed characteristics of the ecosystem in the present and future time periods. Environmental/ecosystem water to be released will be sufficient for the continuity of aquatic ecosystem and creatures living in the area. Thus, energy generation withoug damaging the ecosystem will be possible.

As stated in the Ecosystem Assessment Report; the biggest change in the natural and physical area shall occur in the areas of head regulator, conveyance structure, and plant building and excavation material storage area. Geomorpological changes will occur in these areas. Plant cover on these areas will be partially damaged and the balance of the ecosystem will be temporarily interrupted due to interferences. When the works are completed and the facilities are in operation, it is possible to rehabilitate the area with erosion control projects to be prepared by subject matter experts (soil science, ecology and reforestation) taking topographic (general and specific location), edaphic (main rock, soil), climatic (precipitation, temperature) and biotic (plant cover, biological restraints) into consideration and landscaping works. Ecological Landscaping Report prepared in this regard is provided in Appendix-6 and compliance with the provisions of this report will be ensured.

It has been suggested to release 258 liters of environmental/ecosystem water during all months in Mavi Weir and HEPP Project. Average depth and average speed for the environmental/ecosystem water to be released at this rate have been determined as 0,30 m (30 cm) and 0,36 m/s respectively. With the aforementioned quantities (See Annex-4: Ecosystem Assessment Report), it is stated that water to be received from the basin where the project is located would contribute to the availability of sufficient amount of water in the stream. In the letter of Nature Preservation and Natural Parks General Directorate dated 28.08.2009 on the subject (See Appendix-1.10) it has been obliged that for March, April, May and June 0.5 m^3/s and for other months 0.27 m^3/s of environmental flow shall be released to downstream. Release of environmental/ecosystem water more than the quantity stated in the Ecosystem Assessment Report will provide a better habitat for the creatures in the area. When these data are considered, it can be concluded that the project shall not have any significant effect on hydrological, hydrobiological and living ecosystem parameters in the sense of sustainable ecosystem diversity.

- **Impact of Quantity of Environmental Flow to Fauna**

The subject of amount of environmental/ecosystem water to be released to the stream bed within the scope of HEPP projects is one of the most important parameters of sustainable ecosystem approach. Amount of environmental/ecosystem water calculated in accordance with scientific methods ensures the prevention of possible damage of the ecosystem and better protection of the same.

First, the environmental/ecosystem water to be released to the stream bed shall be sufficient to enable reproduction and migration of animals present in the work area.

6 fish species have been determined in the area. Most of the species in the area prefer clean waters with abundant oxygen levels. These species mostly lives in waters with 5 to 35 cm depths. Among these species Salmo trutta fario and Salmo trutta labrax require more water (30-35 cm). The fish species having economic value among these is salmon. Almost all of these fish can live at waters of 20 to 25 cm depth. Waters with 30 to 35 depth is required for salmon. Although stream trouts are present under normal conditions of the stream; sea trouts enter the stream to lay their eggs in April and May when snow is melting and sea water mixes with stream water (Kutrup, 1995 and 2000). There exist no stream trout in the stream basin where the activities will be performed and Salmo trutta labrax do not enter the stream from the sea (Kutrup, 1994, 2000). They spawn their eggs to stream waters between April and June. Sufficient water level at the stream during this periods allows fish to breed properly. In the Ecosystem Assessment Report (See Appendix-4), it has been suggested that 0.258 m^3/s environmental/ecosystem water shall be released at all months. Average depth and average speed for the environmental/ecosystem water to be released at this rate have been determined as 0.30 m (30 cm) and 0.36 m/s respectively. Water height required for the aquatic ecosystems existing in this area shall not be less than 0,30 m during April-June (egg laying and development period) (Geldiay, 1999) (Kutrup, 2000).

In the letter of Nature Preservation and Natural Parks General Directorate dated 28.08.2009 on the subject (See Appendix-1.10) it has been obliged that for March, April, May and June 0.5 m^3/s, and 0.27 m^3/s of environmental flow for other months shall be released to downstream. Release of environmental/ecosystem water more than the amount calculated in the Ecosystem Assessment Report shall provide a better habitat for the fauna in the area.

Total amount of environmental water flow and irrigation water stated in Water Usage Rights Report is indicated in Table VI.3 on page 99.

None of the 6 amphibians existing and possible to be found due to habitat characteristics in the activity area and its surroundings are listed under NT (Might be threatened) category in IUCN list. 5 species are listed under LC (Least Concerning) and 1 species is listed under VU (Species under threat of extinction if no protection precaution is taken) category. Along with this, no endemic species is also present. In accordance with the studies performed by Demirsoy (1996), these species are abundant and common in Turkey and they are not under any threat. Of these species, Pelophylax ridibundus is one of the significant frog species which is recently exported from Turkey. Frog species within the study area requires stream water only during spring (May-July) months for laying eggs. Of these species, only *Pelophylax ridibundus* (*Rana ridibunda*) continues to live in the water during other than spawning periods. 5-15 cm water is sufficient for these species to lay their eggs. The determined amount of environmental flow will also be sufficient for the amphibians.

14 reptilian species existing or possible to exist in the working area have been determined and 3 species are in LC, 2 species are in NT and 1 species is in EN category in accordance with IUCN list. 7 of these species are listed in Bern Appendix-2 and 7 of these species are listed in Bern Appendix-3. Four of these species are considerably abundant and common in Turkey according to studies executed by Demirsoy (1996), and they are under no threat as well. Vipera barani existing in the working area is an endemic species specific to the region and Turkey (Kutrup 2002, 2003). Among these reptile species, only water snakes (Natrix natrix and Natrix taselleta) enter the stream in order to drink water and hunt. They mostly prefer water ponds of 1 to 30 cm at the edges of stream. None of the other reptile species enter stream waters for breeding, hunting or food. They supply their water need from small ponds at land areas. In this regard, determined amount of environmental flow does not constitute any threat to these reptilian species.

52 bird species were identified in the project area according to observations, information from society and literature survey. All of the bird species are listed in LC category of IUCN Red List Categories. Species given in LC category are common and are under no threat. The stream on which works will be performed is not a significant wetland area for bird species migrating through Turkey. As there are similar habitats close to project area and birds fulfill their water requirement from any water puddle, no damage will occur on those bird species from the water perspective. The noise will be decreased to minimum level, especially in the period of reproduction and nesting times of those species. If the produced level of noise is high, there is risk for those species to quit nesting and looking after the off springs. Since the breeding period of all, at least conserved species is known by the experts, a break can be given to the vehicles that cause that kind of noise for only in nesting period. Moreover, there are similar kinds of habitats in the vicinity of project area and those species can move there.

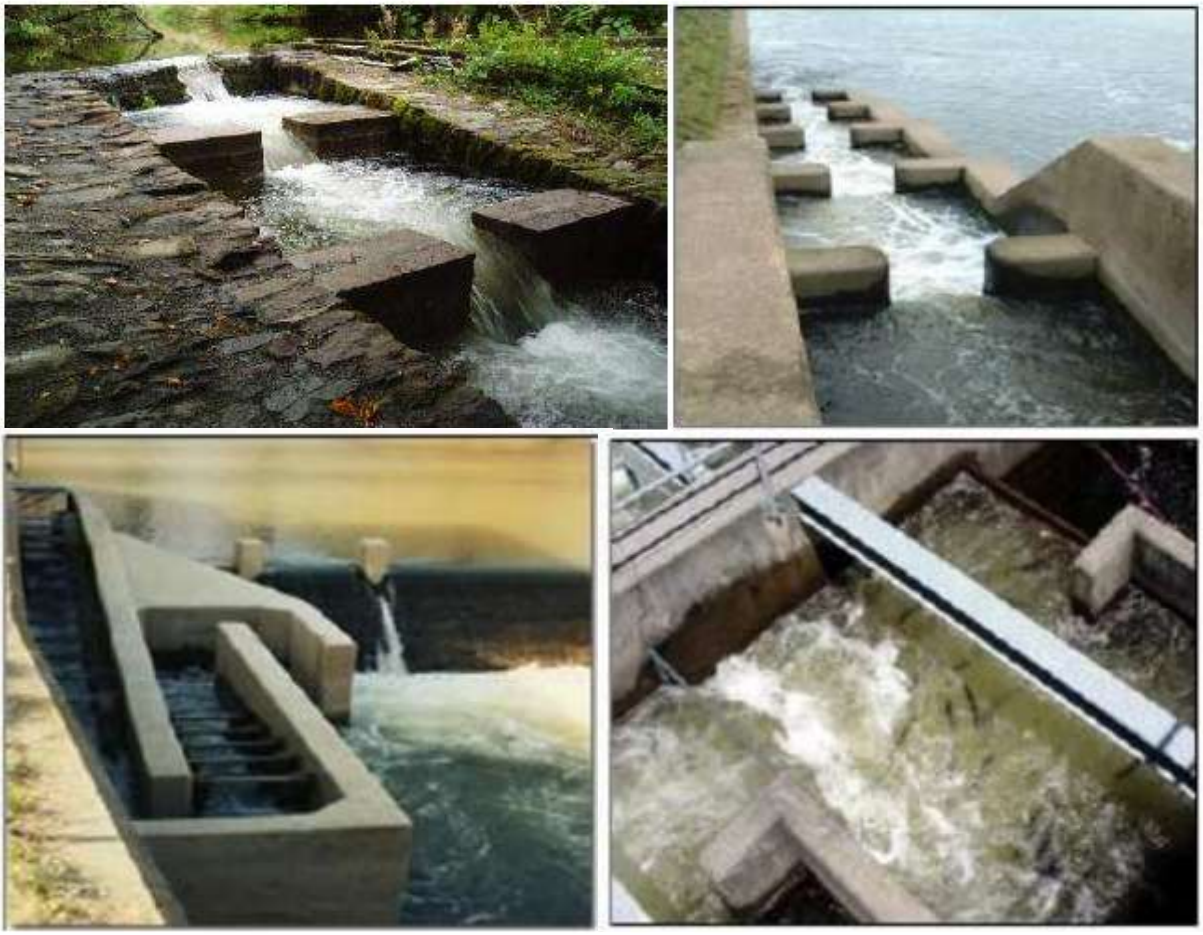
As the result of monitoring, information gathered from local people and literature studies, 18 mammal species have been determined to exist or possibly exist in the project area and 4 of these species are listed in Bern Appendix-2 and 6 of these species are listed in Bern Appendix-3. Fifteen of the mammal species are listed in LC category of IUCN Red List Categories and are under no threat. 1 species is listed in DD, one is VU and one is NT category. Rodent species and rabbits have the capacity to tampon small scale habitat losses and negative effects due to project activities with their high reproductivity potential. Wild animals living in the project area and its vicinity do not require the stream for reproduction and development. These species require the stream only to fulfill their drinking water requirement. They can fulfill this requirement from branches of the main stream and also from other water flows outside of the project area (upstream and downstream of the project) and the environmental/ecosystem water to be released to downstream. Foxes, wolves, jackals and other carnovores are species having a wide area. They will move to less disturbed areas without any harm from project activities. As parts which will continue with their natural flow will exist in exchange of parts with reduced water flow due to project activities, mammal fauna species will not lose their opportunity to reach water. Therefore, mammals will not have any obstruction for fulfilling their water requirement other than the areas where water is taken to canal. No problem shall be observed in wild life due to realization of the project. Furthermore, similar habitats exist in the vicinity of the project area.

Consequently, it is foreseen in accordance with the investigations and observations performed in project area that infrastructure and facilities of the project shall not have an impact of destroying habitats of target species and other species in full.

Fish Passes

In accordance with Article 22 of Water Products Law numbered 1380 in force upon issue in Official Gazette no.13799 dated 4 April 1971 for the purpose of creating proper environment for passage of fish species found within operating area, it is obligatory to construct fish passes or conveyors that will provide opportunity for fishes living in aquatic ecosystem to pass upper zones of river in period needed in weir facility within the scope of project and it is also obligatory to keep them continuously operational.

Fishes living in aquatic ecosystems immigrate towards upper zones of river in reproduction periods. Necessary conditions for reproduction (lack of water temperature, lack of organisms that will harm for eggs, etc.) are more appropriate in upstream parts of rivers. For this reason, fish passes should be constructed for structures such as barrage, weir, dam that will be constructed and will cut or weaken the connection of water. Fish passes are water and aquatic organisms' transmission route providing continuity of habitats in rivers and established in weir, barrage and dam.



As seen in the above figure, main structure units of fish passes are consistent of fish entrance and water exit structures, passage curtains and concrete divisions with fish passage pools.

These structures should be planned specially for each structure. This is because sizes of weirs, annual natural flows, water requirements of organisms in river mouth, factors resulted from land structure and economic issues in construction. In addition to continuity of natural life, it is directly associated with profitability of facilities put into practice by making great investments. When excessive amount of water is delivered, firm (reliable) energy of the facility is lost, if underrated water is delivered, both natural life is damaged and adverse conditions may be experienced before the law. This planning is more important for particularly storage facilities.

Fish passes are ways that enable fishes to pass connection in river mouth or upstream direction according to species of fishes living in rivers and passages creating transmission way for water and aquatic organisms by establishing in facilities like weir, barrage and dam for the purpose of providing organism life in rivers (http://www.2aproje.com/balik.asp (in Turkish)).

Fish passes should be constructed by planning in such a way that water velocity is low and turbulence is small for enabling fish to enter into passage easily. Call water should be delivered with pipe for creating water plashing as seen in the figure given above for allowing entrance of fishes into passage. Fish passage pools should be separated from each other with concrete divisions.

Designs of fish passes have been prepared by third parties upon direction of the company and will be submitted to Food, Agriculture and Stockbreeding Provincial Directorate for project approval.

CHAPTER VII

ENVIRONMENTAL MANAGEMENT AND EMERGENCY MANAGEMENT PLAN

CHAPTER VII. ENVIRONMENT MANAGEMENT PLAN AND EMERGENCY RESPONSE PLAN

VII.1. ENVIRONMENT MANAGEMENT PLAN

Positive and negative, bio-physical and socio-economic effects of Mavi HEPP project in land preparation, construction and operation stages have been reviewed in EIA (environmental impact assessment) studies. Additionally; “Environment Management Plan” is significant as facilitator for ensuring compliance to laws and regulations in force in Turkey and minimizing impacts of the project on the environment and human health. Thus, full compliance with issues and undertakings stated in the EIA Report prepared considering precautions reducing impacts, approved plans, permissions, conditions and requirements is ensured.

In this regard, an Environmental Management Plant has been prepared in the light of Turkish Environmental Legislation and IFC relevant policies depending on EIA Report. It is also put into practice.

Environment Management Plan has been prepared under two sections consisting of construction stage and operation stage.

The purpose of the Environment Management Plan is the assessment of data on environmental conditions to determine environmental impacts during above-stated periods and for compliance to relevalt regulations regarding works during these periods and minimizing impact on the environment, air emissions, wastewaters, noise, wastes, excavation, permissions etc. operation applications will be monitored. Furthermore, organizational structure will be formed for following environmental issues in construction and operation stages. During all phases of the project, it shall be determined in Environmental Management Plan; how, when and by whom the precautions to be taken in accordance with national regulations and guidance of financial institutions and local people, official bodies and non-governmental agencies shall be informed on the project.

First, environmental impacts due to activities to be performed in the construction and operation stages of the project and measures to be taken to prevent or minimize in the manner not to damage the environment and relevant responsible bodies are defined in detail in Table VII.1. Furthermore, “Monitoring Plan” (parameters to be monitored, where, how and when the parameter is monitored and responsible body) is provided in Table VII.2.

Table VII.1. Mitigation Plan

PHASE	ISSUE		MITIGATION MEASURE	RESPONSIBILITY
Construction	Ground Safety		During the project design, the requirements from "Regulations on Buildings to be Constructed at Earthquake Regions" were considered and were included in the main design.	- CESE Elektrik Üretim A.Ş. - Contractor
	Wastewater		Domestic wastewater generated on the construction site was disposed of by transmitting directly to the Maçka Municipality sewage system from treatment plant.	- CESE Elektrik Üretim A.Ş. - Contractor
	Air Management	Dust Generation	To minimize dust emissions during excavation and filling works, loading and transportation of construction materials; watering has been performed by using sprinkler trucks on roads, loading and unloading has been done without emitting dust, top of truck dampers have been covered with canvas and top layer of material has been kept at 10% humidity.	- CESE Elektrik Üretim A.Ş. - Contractor
		Vehicle Emissions	To minimize emissions due to vehicles, routine checks and maintenance of all vehicles and equipment are performed; spare vehicles are replaced until maintenance activities are completed. Furthermore, operators and drivers are warned to work in accordance with Traffic Law and care is and will be taken to perform loading in accordance with loading standards.	
	Noise and Vibration		Noise generation during the construction works is limited by working in daytime.Vehicles with completed traffic inspections, exhaust measurements and maintenance are utilized during the construction period. For protection of employees from noise to be generated by construction machinery and equipment and protection from health and safety risks (especially risks on hearing) due to the exposure to noise during the construction stage and when required, necessary measures have been taken. During the construction stage, appropriate protective gear such as safety helmet, ear buds or ear plugs are provided to workers working with machinery and equipment. Thus, noise and vibration levels due to construction machinery and equipment utilized during construction works have been reduced to a convenient level. Local residents will be informed of use of explosives at least “5” days before intended use. Explosives are not stored in the project site.	- CESE Elektrik Üretim A.Ş. - Contractor
	Landscaping		Vegetable top soil to be required to create landscaping elements has been stored on site and works stated in Ecological Landscaping Assessment Report were performed after completion of construction works as protective, functional and visual landscaping works.	- CESE Elektrik Üretim A.Ş. - Contractor
	Waste Management	Domestic Solid Wastes	Domestic solid wastes to be generated by the personnel to be employed in the project are collected in closed waste bins placed in several locations of the areas used as construction site. These solid wastes collected in containers are daily disposed of by delivery to Maçka Municipality solid waste storage area by means of the municipality’s solid waste collection trucks.	- CESE Elektrik Üretim A.Ş. - Contractor
		Waste Oil	Maintenance, repair and cleaning activities of vehicles to be utilized in the construction stage shall not be performed on site and have been performed in the closest authorized service and/or gas stations. However, if the maintenance activities should be performed on site, waste oils shall be delivered to companies licensed to transport hazardous wastes to deliver the waste oil to licensed disposal or recycling facilities upon preparation of National Waste Transport Forms, collected in oil collection barrels and “storage in impermeable ground” shall be ensured until delivery. In case of oil spill, leakage etc. in the project site, sawdust will be laid on the soil or ground and leakage will be soked before spreading. Sawdust mixed with dangerous waste, will be temporarly stored in closed and impermeable containers in accordance with the “Hazardous Waste Control Regulation” until submitting to the licensed company. For temporary storage of the dangerous wastes in project site, project owner will take necessary permissions from Governership (Provincial Directorate of Environment and Urbanization) in accordance with the 9th Article of the relevant regulation. (Please see Section VII.2.4. Emergency Response Plan for details).Furthermore, vegetable waste oils to be generated in the cafeteria to be utilized in the project are collected in barrels and transmitted to a licensed recycling company.	

PHASE	ISSUE		MITIGATION MEASURE	RESPONSIBILITY
Construction		Waste Batteries and Accumulators and Other Wastes	As maintenance of vehicles utilized in the project is performed in the closest authorized services, no wastes as per "Waste Battery and Accumulator Control Regulation" are generated. In case of occurrence of such wastes, they will be disposed of by delivery to the licensed recycling companies.	- CESE Elektrik Üretim A.Ş. - Contractor
		Medical Wastes	Medical wastes stored temporarily in the facilities are disposed of by the workplace doctor working in the infirmary unit by delivery to hospitals in city/district center. During temporary storage, medical wastes possible to be generated within the facilities will be put in sealed and labeled bags and in a certain frequency the waste will be submitted to a licensed company. There will be a track record of waste disposal.	
		Excavation Wastes	A certain portion of the excavation surplus material generated during the construction works of main and ancillary units of MAVİ HEPP Project was used in filling works and the remaining quantity was used in leveling and landscaping works.	
	Historical and Cultural and Archaeological Assets		In case of encountering with any cultural and natural asset during the application stage of the project, works will be stopped immediately and closest Museum Directorate or Local Authority shall be notified.	- CESE Elektrik Üretim A.Ş. - Contractor
	Flora		Seeds of the plants existing in and around the project area and its surroundings will be collected by a biologist and sent to the seed depository. Those seeds will be used for planting of the young trees in similar habitat to increase the biological diversity.	- CESE Elektrik Üretim A.Ş. - Contractor
	Fauna		To avoid segmentation of habitats, water conveyance system was preferred to be constructed in form of tunnel, instead of open channel. All personnel working in construction activities have been informed on the sensitivity of target species and primary species living in the project area by site manager and no illegal hunting activities have been allowed performed by the personnel.	- CESE Elektrik Üretim A.Ş. - Contractor
	Aquatic Life		During the construction works, no dumping of excavation material in areas other than excavation material storage areas was ensured. Also a diversion structure was built to enable work on dry area.	- CESE Elektrik Üretim A.Ş. - Contractor
	Soil Erosion and Silt Runoff		As HEPP projects are planned in areas with high altitude differences and construction areas have a high water flow potential, it is inevitable to take temporary and permanent precautions against erosion. In areas where facilities will be constructed for Mavi Weir and Hyroelectric Plant; Material heaps will be left except in rocky areas in order to interrupt the surface flow and to prevent base scouring. Drainage channels will be utilized in slopes in vertical and horizontal direction to ensure soil stabilization where required. Small sluiceways will be formed where slopes need to be cut and discharge of flow along the slope will be ensured. Constant monitoring will be performed to prevent occurrences such as soil settlement and soil losses. When required, surface will be covered with soil and geotextile. Hydro-seeding will be applied in areas where plant development is difficult. During Project implementation, the materials removed from the diggings will be carefully stored and then reused to avoid local waterways being polluted by runoff.	- CESE Elektrik Üretim A.Ş. - Contractor
	Access Roads		On the existing roads to be used for accession, additional traffic movements will be minimized. Damages on the roads rising from the construction of the project will be repaired as soon as damage becomes evident. Roads will be kept free from mud, debris and other obstacles.	- CESE Elektrik Üretim A.Ş.
	Raw Material Supply		All materials supplied to the subproject such as; stone, concrete, sand, etc. will be ensured to be provided by Contractors with valid operating permits in the region.	- CESE Elektrik Üretim A.Ş. - Contractor
	Power Transmission Line		Routing and construction of power transmission lines in forested areas, on the migratory or local bird routes, and in the protected areas were avoided.	- CESE Elektrik Üretim A.Ş.
	Expropriation		For forest areas in the project scope, permits have been received for the areas of 699 m^2 and 38,362 m^2 for project units from Trabzon Regional Directorate of Forestry, Hamsiköy Forest Sub-District Directorate. The cutting will be done according to the permit of Forest Directorate. Fallen	- CESE Elektrik Üretim A.Ş. - Contractor

PHASE	ISSUE		MITIGATION MEASURE	RESPONSIBILITY
Construction			trees will be given to the residents living in the villages around the project area and will be handled under the control of Forrest Directorate. Furthermore, expropriation of land owned by real persons in the project area has been completed.	
	Housing and Other Technical/Social Infrastructure Requirements of Personnel		Social requirements (housing, rest etc.) of the personnel to be employed in the project are fulfilled in social facilities built on construction site. If required, social requirements are supplied from dwelling units close to project area and if such requirements cannot be supplied from close dwelling units, they are supplied from Maçka District.	- CESE Elektrik Üretim A.Ş. - Contractor
	Occupational Health and Safety		Contractor will develop a health and safety plan before starting construction work. Workers will be subjected to health screening and, health and safety training sessions will be provided. Necessary personal protective equipment such as helmets, working shoes, ear protection, dust filter and others will be provided and be required to be used by workers. New workers will be trained before start and other workers will be trained regularly regarding their health and safety issues.	- CESE Elektrik Üretim A.Ş. - Contractor
Operation	Wastewater		Domestic wastewater to be generated by the personnel during operation stage will be disposed of by direct delivery to Maçka Municipality sewage system. In the project, compliance with "Water Pollution Control Regulation" in force upon issue in Official Gazette no.25687 dated 31.12.2004 and provisions of the relevant regulation shall be ensured.	- CESE Elektrik Üretim A.Ş.
	Waste Management	Domestic Solid Wastes	Domestic solid wastes shall be separately collected in order to enable disposal and recycling of solid wastes without damaging the environment, to prevent environmental pollution and contribute to economy. There will be containers and bins on site for collection of domestic solid wastes and recyclable wastes. Attention shall be paid not to spill the domestic wastes on site and solid wastes shall be collected in closed standard waste bins. Solid wastes shall be disposed by Maçka Municipality in trucks suitable for preventing polluting factors such as appearance, smell, dust and leakage, to the solid waste storage area of the municipality. Frequency of collection will be determined according to the protocol which will be made by the Municipality.	- CESE Elektrik Üretim A.Ş.
		Waste Oils	In case of oil spill, leakage etc. in the project site, sawdust will be laid on the soil or ground and leakage will be soked before spreading. Sawdust mixed with dangerous waste, will be temporarly stored in closed and impermeable containers in accordance with the "Hazardous Waste Control Regulation" until submitting to the licensed company. For temporary storage of the dangerous wastes in project site, project owner will take necessary permissions from Governership (Provincial Directorate of Environment and Urbanization) in accordance with the 9th Article of the relevant regulation. (Please see Section VII.2.4. Emergency Response Plan for details). Delivery of waste oils to disposal facility shall be made by licensed vehicles. Furthermore, vegetable waste oils to be generated in the cafeteria to be utilized in the project are collected in barrels and transmitted to a licensed recycling company.	
	Fauna		Especially during the reproduction and migration periods flow levels shall be preserved in accordance with seasonal requirements and flow rate shall be kept under control with the use of flow meter. Results will be shared with State Hydraulic Works 22nd Region Directorate and Ministry of Forest and Water Works 12nd Region Directorate, Trabzon Branch Office. During the project activities working staff will be awared by regular trainings organized by site manager to avoid hunting and damaging wild animals.	- CESE Elektrik Üretim A.Ş.

PHASE	ISSUE		MITIGATION MEASURE	RESPONSIBILITY
Operation	Aquatic Life	Minimum Flow Rate to be Released for Continuity of Natural Life (Environmental flow)	The environmental/ecosystem water to be released to the stream bed from Mavi Weir for reproduction and migration of animals present in the work area determined as 0,5 m^3/s for March, April, May and June, and 0,27 m^3/s for other months will be ensured by flowmeters. Flowmeters will be placed on stream beds in the locations in cooperation with the 22nd Regional Directorate of State Hydraulic Works and results will be controlled by that governmental institution regularly. Results will also be shared with the 12nd Regional Directorate, Trabzon Branch Office of the Ministry of Forest and Water Works on the official monitoring control forms periodically.	- CESE Elektrik Üretim A.Ş.
		Functionality of Fish Passes	Fish passes will be constructed in compliance with their projects for continuation of fish migration. They will be kept operational continuously. Necessary precautions to prevent use of the water ponds formed due to low water flow between the weir and turbine as fishing area shall be taken (such as informing employees, raising awareness on this subject and, placing signs stating that fishing is forbidden etc.)	
	Ecological Landscaping		Landscape restoration works planned to be performed around plant site, weir area, tunnel entrances and pressure pipes shall be simple, natural and integral to prevent damage on existing characteristics of the region. Serial and ordered planting shall be made not to perturb natural appearance. Screening with trees and bushes having column and pyramide forms shall be performed to minimize negative visual effects of new patches and corridors after construction. Planting shall be performed from tall to short in screening works. Monotonousness shall be avoided by using plants in different forms.	- CESE Elektrik Üretim A.Ş.
	Complaint Mechanism		In Mavi HEPP a system in which local people can relay their problems, complaints, opinions and requests regarding project activities via village headmen will be formed and village headmen will also be informed of this system. In the complaint mechanism; telephone numbers, addresses and electronic mail addresses will be recorded to contact to the relevant local people regarding their problems, complaints, opinions and requests in village headmen's office. An official will be appointed on this subject by the company and these records will be transmitted to company representative (project manager). Thus, complaints of local people on works performed regarding the project will be assessed and solutions will be found, and source of complaint of the local people will be remedied by the investor company as soon as possible.	- CESE Elektrik Üretim A.Ş.

Table VII.2. Monitoring Plan

PHASE	PARAMETER TO BE MONITORED		LOCATION OF PARAMETER	MONITORING METHOD	MONITORING FREQUENCY	REASON FOR MONITORING	RESPONSIBILITY	Estimated Cost
Construction	Water Management	Oxygenation parameters, metals, nutrients, pH, temp., conductivity, color in river water	At upstream an downstream between Weir and Plant on Hamsiköy River	In situ Measurement and Analysis in laboratories certificated by Ministry of Environment and Urbanization	Before construction	To inspect change in water quality due to the project activity	- CESE Elektrik Üretim A.Ş.	- Included in the Project Budget
		Wastewater parameters stated in the Regulation to give wastewaters to the sewage system	Project site	In situ Measurement and Analysis by laboratories authorized by Ministry of Environment and Urbanization	In periods required by the Municipality	To assure the limits to give waste water to the sewage system	- CESE Elektrik Üretim A.Ş.	- Included in the Project Budget
		Surface Waters	Project area and surrounding surface water sources	Visual	Continuous	To prevent dumping of excavation materials and wastes in surface waters and to enable supervision	- CESE Elektrik Üretim A.Ş.	- Included in the Project Budget
	Air Management	Dust Emission	Construction sites, access roads, excavation material storage areas, closest and most sensitive receiving environment	Measurements to be performed by enterprises certificated by Ministry of Environment and Urbanization	When complaints received or during works in sensitive areas	Monitoring of whether precautions for prevention of dust emission have been taken, protection of environment and workers	- CESE Elektrik Üretim A.Ş.	- Included in the Project Budget
		Vehicle Emissions	Exhausts of construction machinery	Exhaust measuring device	In regular maintenance periods	Compliance with Exhaust Gas Emissions Control Regulation	- CESE Elektrik Üretim A.Ş.	- Included in the Project Budget
	Noise		Construction areas, access road routes, in case of complaints in sensitive areas close to blasting areas	Measurements to be performed by enterprises certificated by Ministry of Environment and Urbanization t	When complaints received or during works in sensitive areas	Compliance with Environmental Noise Assessment and Management Regulation	- CESE Elektrik Üretim A.Ş.	- Included in the Project Budget
	Vibration		Sensitive areas where blasting activities are performed	Measurements to be performed by enterprises certificated by Ministry of Environment and Urbanization	When blasting in different locations or when complaints received	To minimize any explosion risks, to ensure safety of environment and personnel, for compliance with Environmental Noise Assessment and Management Regulation	- CESE Elektrik Üretim A.Ş.	- Included in the Project Budget

PHASE	PARAMETER TO BE MONITORED		LOCATION OF PARAMETER	MONITORING METHOD	MONITORING FREQUENCY	REASON FOR MONITORING	RESPONSIBILITY	Estimated Cost
Construction	Landscaping		Construction sites	Recording by photographs and video camera	Continous	For landscaping works to be performed after construction	- CESE Elektrik Üretim A.Ş.	- Included in the Project Budget
	Waste Management	Domestic Solid Wastes	Construction sites or areas which will be used as construction site	Observation, Supervision and Recording	Daily	Compliance with Solid Waste Control Regulation, Soil Pollution Control and Sites Polluted with Point Source Regulation, and Packaging Wastes Control Regulation	- CESE Elektrik Üretim A.Ş.	- Included in the Project Budget
		Waste Oils	Area to be used as construction site	Observation and recordings	Daily	Ensuring compliance with Waste Oil Control Regulation	- CESE Elektrik Üretim A.Ş.	- Included in the Project Budget
		Other Wastes (Tires, Accumulators, etc.)	Construction sites	Observation and recording	Daily	As per relevant regulations	- CESE Elektrik Üretim A.Ş.	- Included in the Project Budget
		Excavation Wastes	Construction area (excavation and storage areas)	Observation	Continous	Compliance with Excavation Soil, Construction and Debris Waste Control Regulation	- CESE Elektrik Üretim A.Ş	- Included in the Project Budget
	Proper storage and use of excavation material		Construction areas, equipment areas and storage areas	Visual inspection	Daily	Monitoring of measures taken to reduce possible negative effects on natural habitat, to protect vegetable soil and natural structure, and placing stored vegetable soil in its place when construction is completed	- CESE Elektrik Üretim A.Ş.	- Included in the Project Budget
	Occupational Health and Safety		All of project area	Observation and Supervision	Daily	Compliance with Labor Law and Legislation	- CESE Elektrik Üretim A.Ş.	- Included in the Project Budget
Operation	Wastewater		Project site	Analysis by laboratories authorized by Ministry of Environment and Urbanization	In periods required by the Municipality	To assure the limits to give waste water to the sewage system	- CESE Elektrik Üretim A.Ş.	- Included in the Project Budget
	Domestic Solid Wastes and Packaging Wastes		Project Units	Observational and Recording	Daily	Compliance to Control of Solid Wastes Regulation, Control of Soil Pollution Regulation, Control of Packing Wastes Regulation	- CESE Elektrik Üretim A.Ş.	- Included in the Project Budget

PHASE	PARAMETER TO BE MONITORED	LOCATION OF PARAMETER	MONITORING METHOD	MONITORING FREQUENCY	REASON FOR MONITORING	RESPONSIBILITY	Estimated Cost
Operation	Species at streams	In Hamsiköy Stream	Observation and Survey	Once during species activity periods during operation and when requested by Provincial Directorate of Environment and Urban Planning	For control of sustainability of natural life in stream	- CESE Elektrik Üretim A.Ş. Contractor	- Included in the Project Budget
	Determination of Remotely sensed FMS	Weir location	Location to be determined along with SHW Regional Directorate. Records of flow meter with GPRS model	Continuous	In order to allow continuity of natural life and recording	- CESE Elektrik Üretim A.Ş. Contractor	
	Environmental flow (Maximum Flow Rate)	Weir location	Measurement and recording with RS FMS	Continous	In order to allow continuity of natural life	- CESE Elektrik Üretim A.Ş. Contractor	
	Fish Passages	At Weir	Observation	During migration periods of fish	Check for whether fish pass works	- CESE Elektrik Üretim A.Ş. Contractor	
	Landscaping	Project Area	Observation	When necessary	For control of restoration of natural appearance with rehabilitation works in demolished areas after construction	- CESE Elektrik Üretim A.Ş. Contractor	
	Occupational Health and Safety	Project Area	Observation and Supervision	Continous	Compliance with Labor Law and Legislation	- CESE Elektrik Üretim A.Ş. Contractor	

VII.2. EMERGENCY RESPONSE PLAN

VII.2.1. Purpose of Emergency Response Plan

The purpose of Emergency Response Plan is to protect people from emergency situations, natural disasters, accidents in facility and communication losses which may occur during land preparation, construction and operation stages of Mavi HEPP Project and to minimize negative effects on dwelling units or project units.

For successful implementation of the plan to be prepared during land preparation and construction stages of the project, Emergency Response Plan Coordinator and team will be nominated by CESE Elektrik Üretim A.Ş. and their duties will be determined by providing trainings to such personnel on this subject.

Measures to be taken in case of accidents, natural disasters etc. which may occur during land preparation and construction stages of the project and duties and responsibilities of Emergency Response team are given below.

VII.2.2. Duties and Responsibilities

VII.2.2.1. Facility Owner (CESE Elektrik Üretim A.Ş.)

All actions and activities to be performed during land preparation, construction and operation stages of the project are in control of project contractor. Duties and responsibilities of facility owner within the framework of Emergency Response Plan are given in Figure VII.2.2.1.

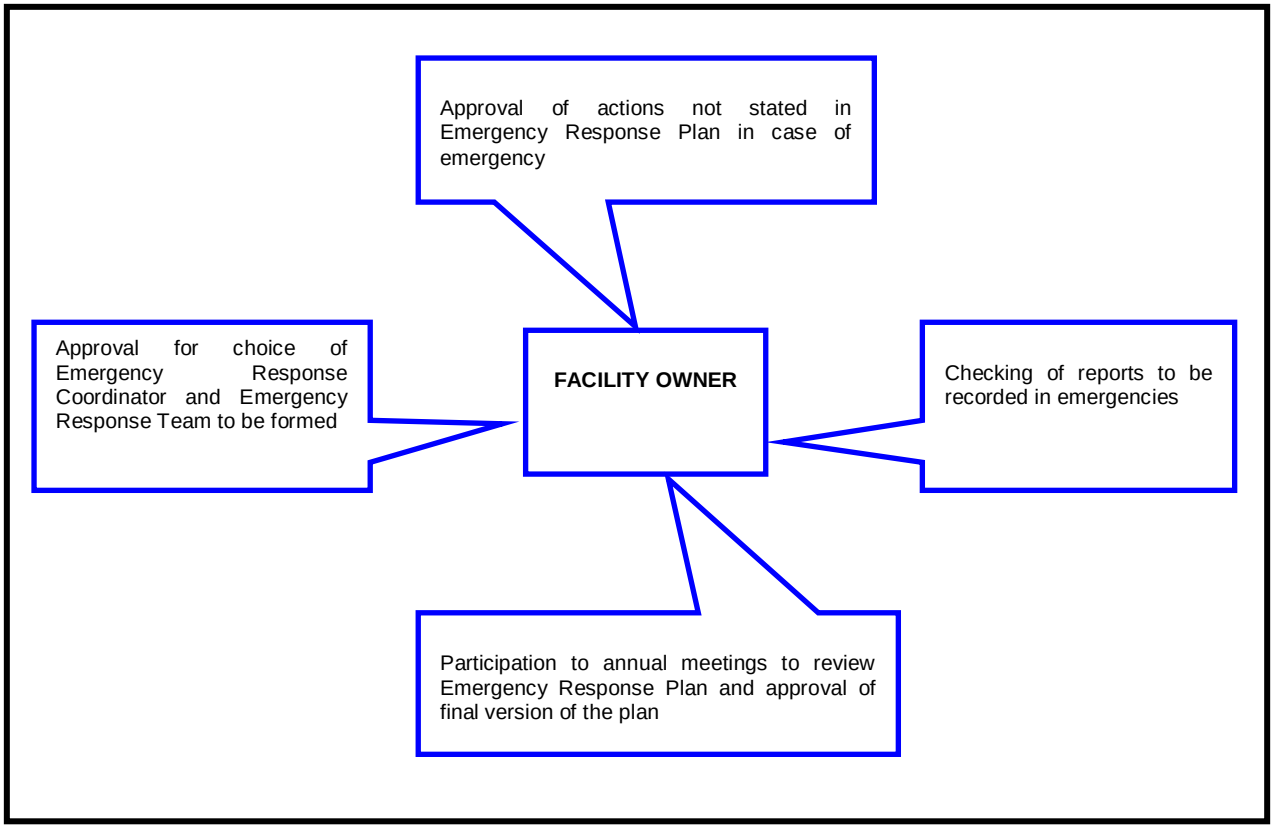


Figure VII.2.2.1 Duties and Responsibilities of Facility Owner

VII.2.2.2. Emergency Response Plan Coordinator

Other duties and responsibilties of Emergency Response Plan Coordinator, who will ensure formation of Emergency Response Team and performance of activities as per Emergency Response Plan in case of emergencies by the Facility Owner are given in Figure VII.2.2.1 below.

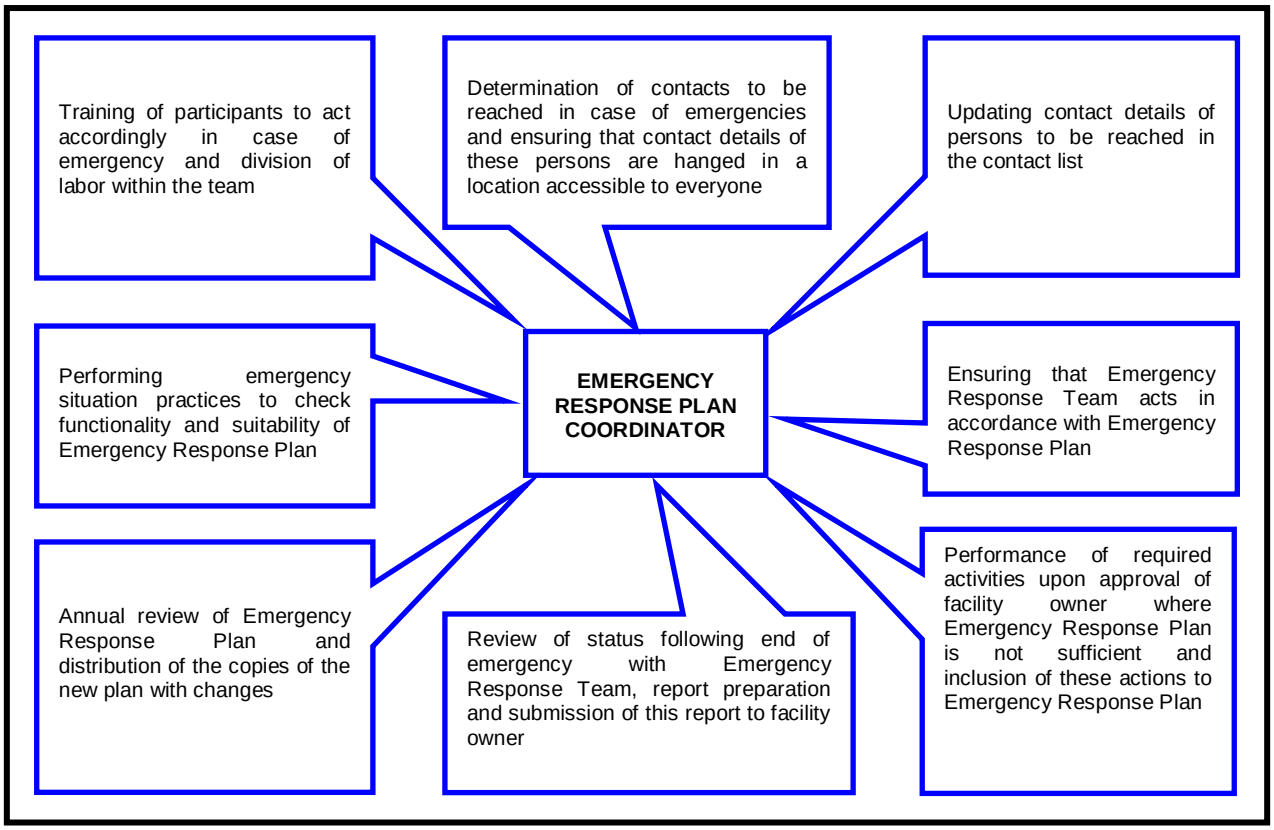


Figure VII.2.2.1. Duties of Emergency Response Plan Coordinator

VII.2.2.3. Emergency Response Team

Duties and responsibilities of Emergency Response Team formed by Emergency Response Team Coordinator are given in Figure VII.2.2.3.

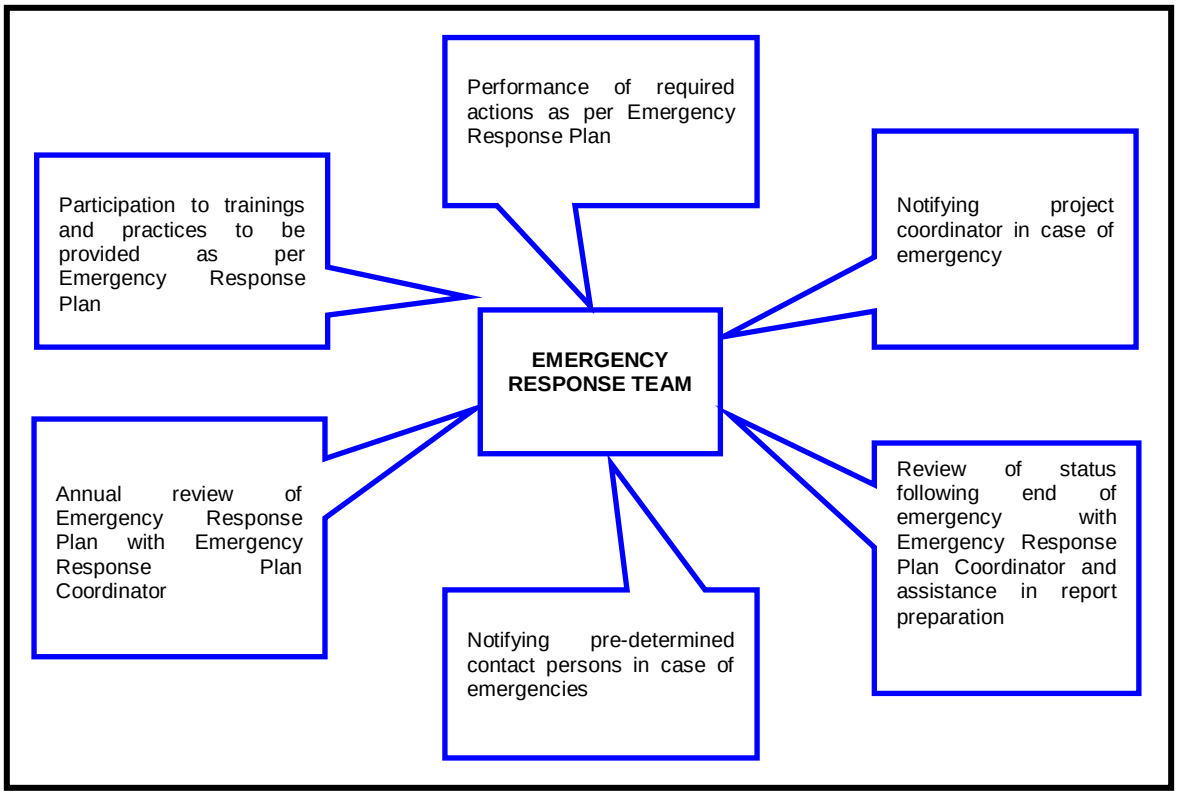


Figure VII.2.2.3. Duties and responsibilities of Emergency Response Team

VII.2.3. Emergency Situations

VII.2.3.1. Accidents

To prevent possible injuries or deaths due to accidents which may occur in land preparation and operation stages of the project, it is considered to acquire help from Emergency Response Team to be present on project site, health clinics located in dwellings closeby or the closest hospital when required. In case of an injury, first aid will be conducted by Emergency Response Team. Meanwhile, to prevent spreading of damage or occurrence of more damage, remaining members of the Emergency Response Team will take various safety measures.

Against possible fire hazards in consequence of various accidents, inspection shall be performed by Emergency Response Team and hazardous liquids such as oil, gas etc. to be spilled on water surface shall be cleaned by the Emergency Response Team, if any. In cases where such responses are not sufficient, fire department shall be contacted and these materials shall be removed from the surface of the water and disposed of in accordance with “Waste Oil Control Regulation” following collection in impermeable containers.

Duties and responsibilities of first aid and rescue teams to be ready on project site against accidents are given in Figure VII.2.3.1 below.

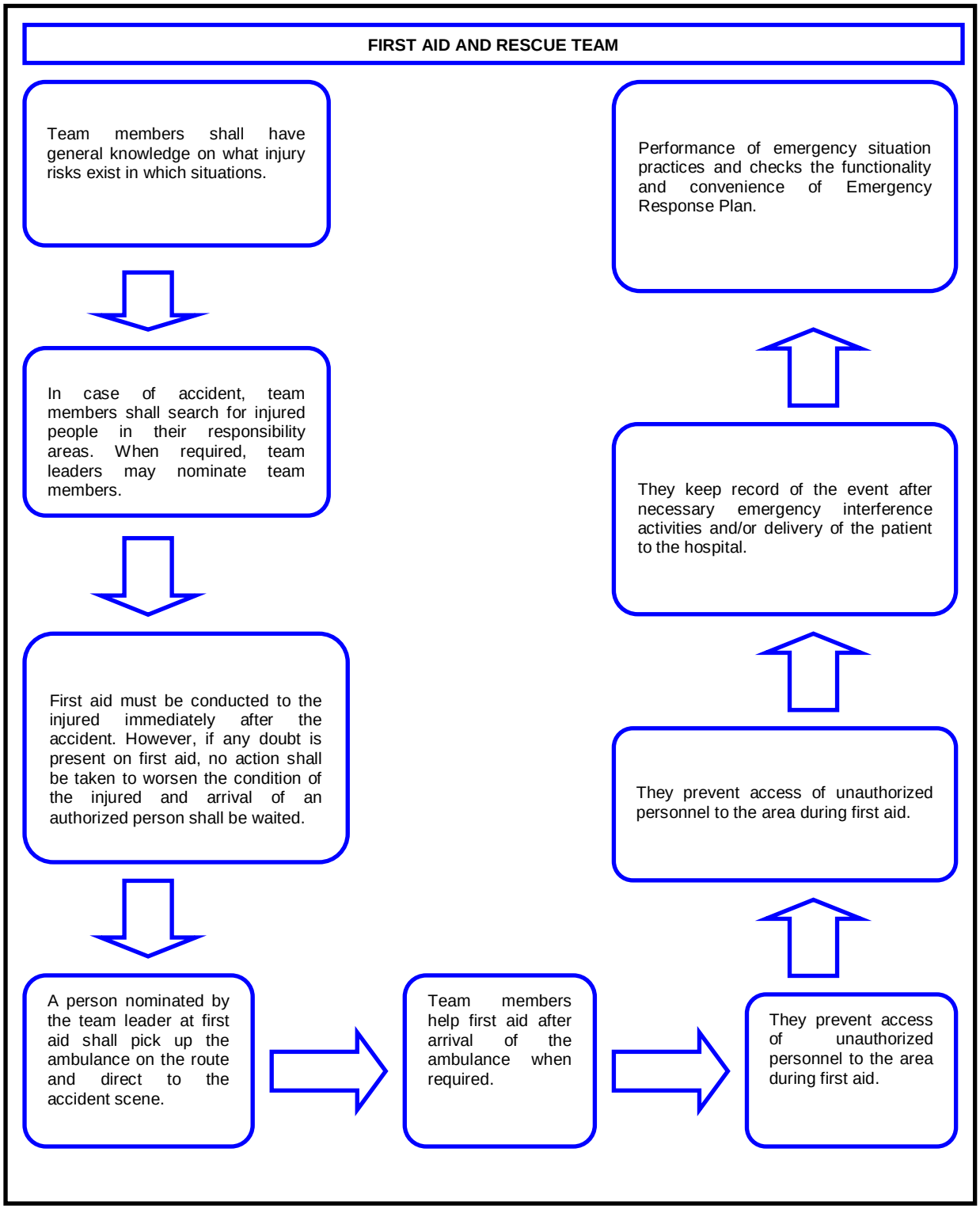


Figure VII.2.3.1. Flow Chart to be used in Case of Accident

VII.2.3.2. Earthquake

First, trainings on what the personel working in the facilities should do in case of a possible earthquake shall be conducted. In case of an earthquake indication, steps provided in the flowchart in Figure VII.2.3.2 shall be followed.

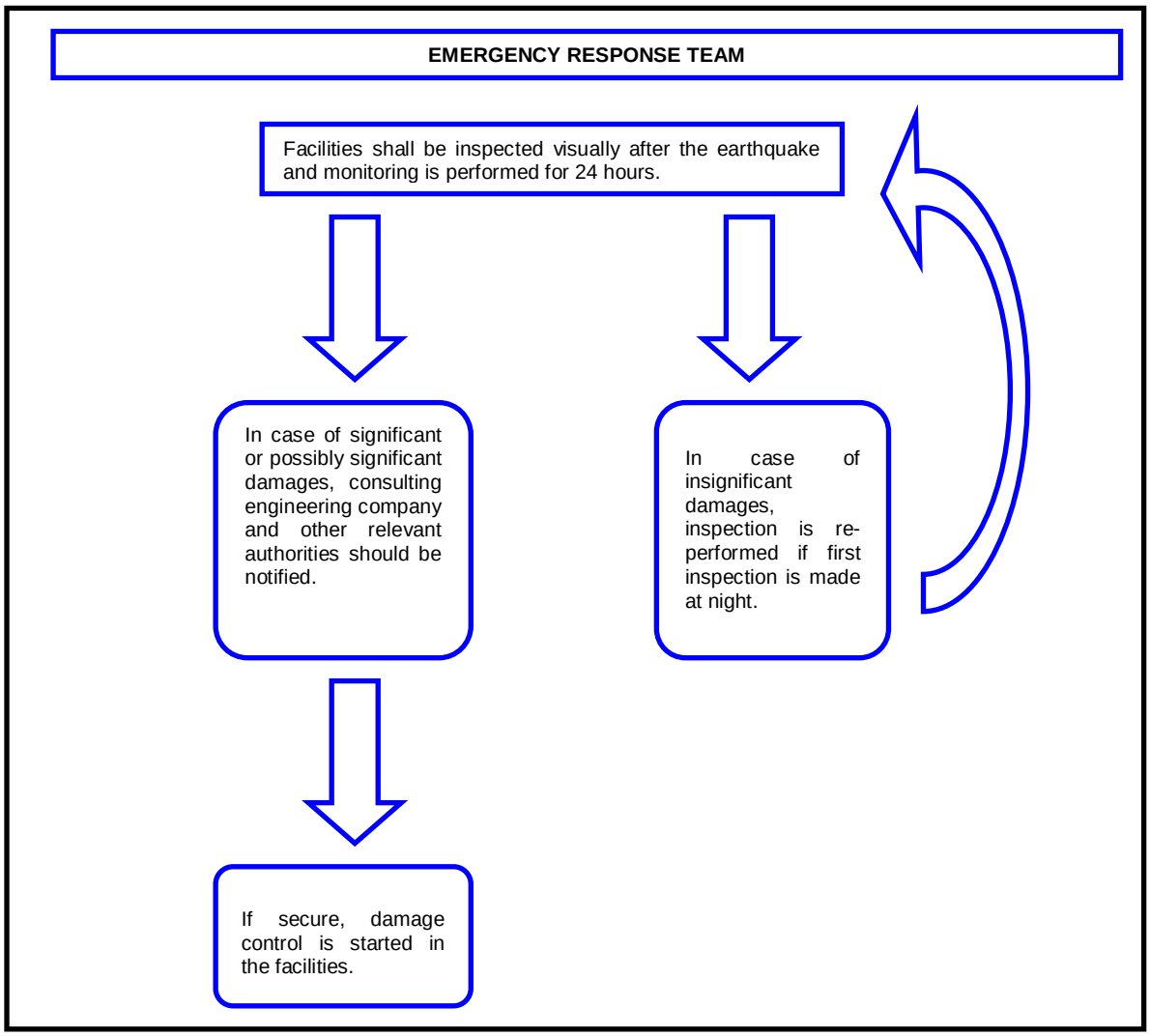


Figure VII.2.3.2. Flow Chart to be Followed in case of an Earthquake

VII.2.3.3. Fire

For fires which may occur in the project area, necessary precautions shall be taken and fire shall be tried to be prevented. In arid seasons, no fire shall be started outside the facility area, especially in forest areas, and all measures shall be taken to prevent fire. In case of a possible fire, fire extinguishing tools and equipment shall be kept ready in the project area.

Duties and responsibilities of Emergency Response Team on fire are given in Figure VII.2.3.3 below.

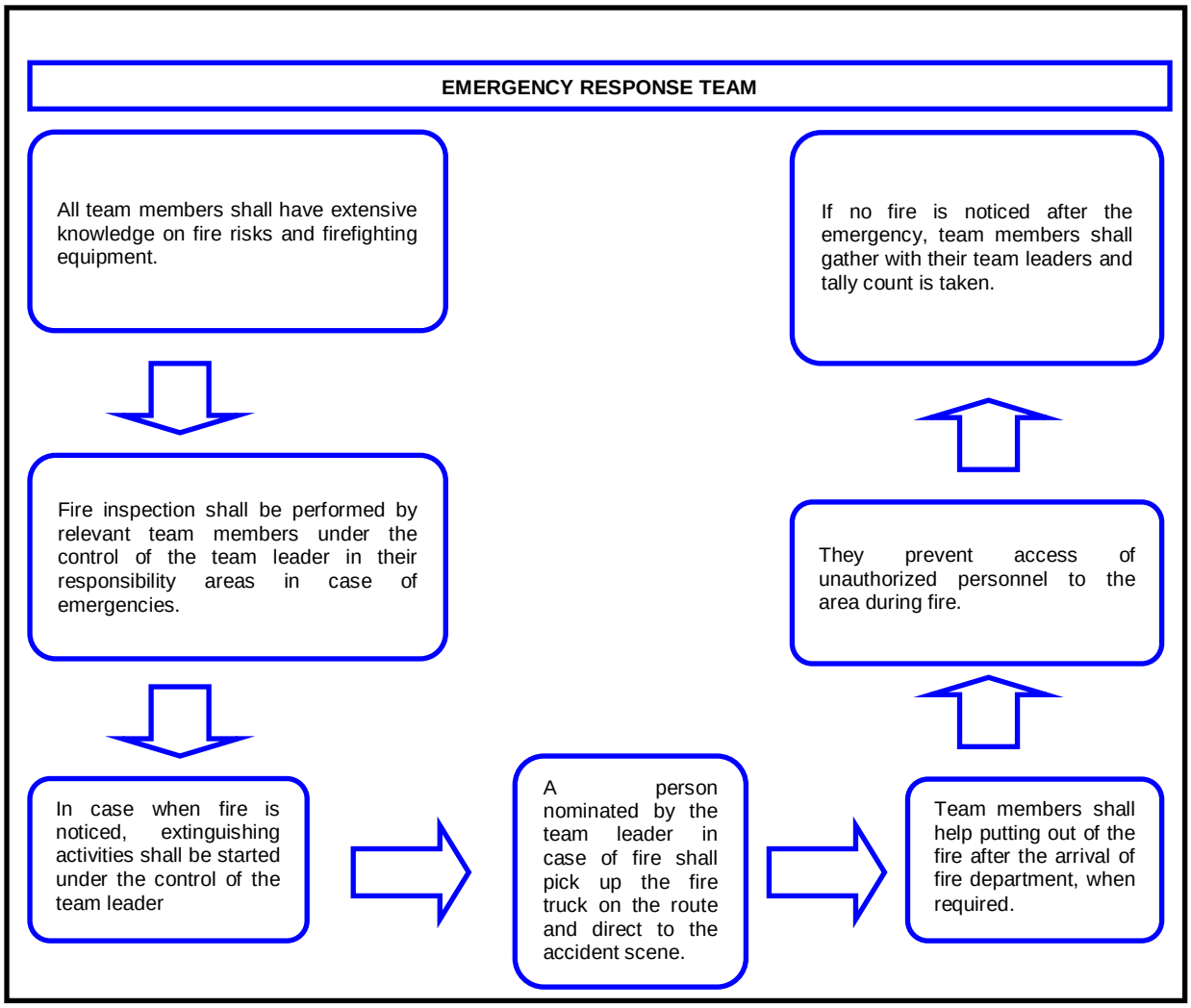


Figure VII.2.3.3. Flow Chart to be followed in case of Fire

VII.2.3.4. Excessive Precipitation

Duties and responsibilities of Emergency Response Team in case of excessive precipitation in the project area are given in Figure VII.2.3.4 below.

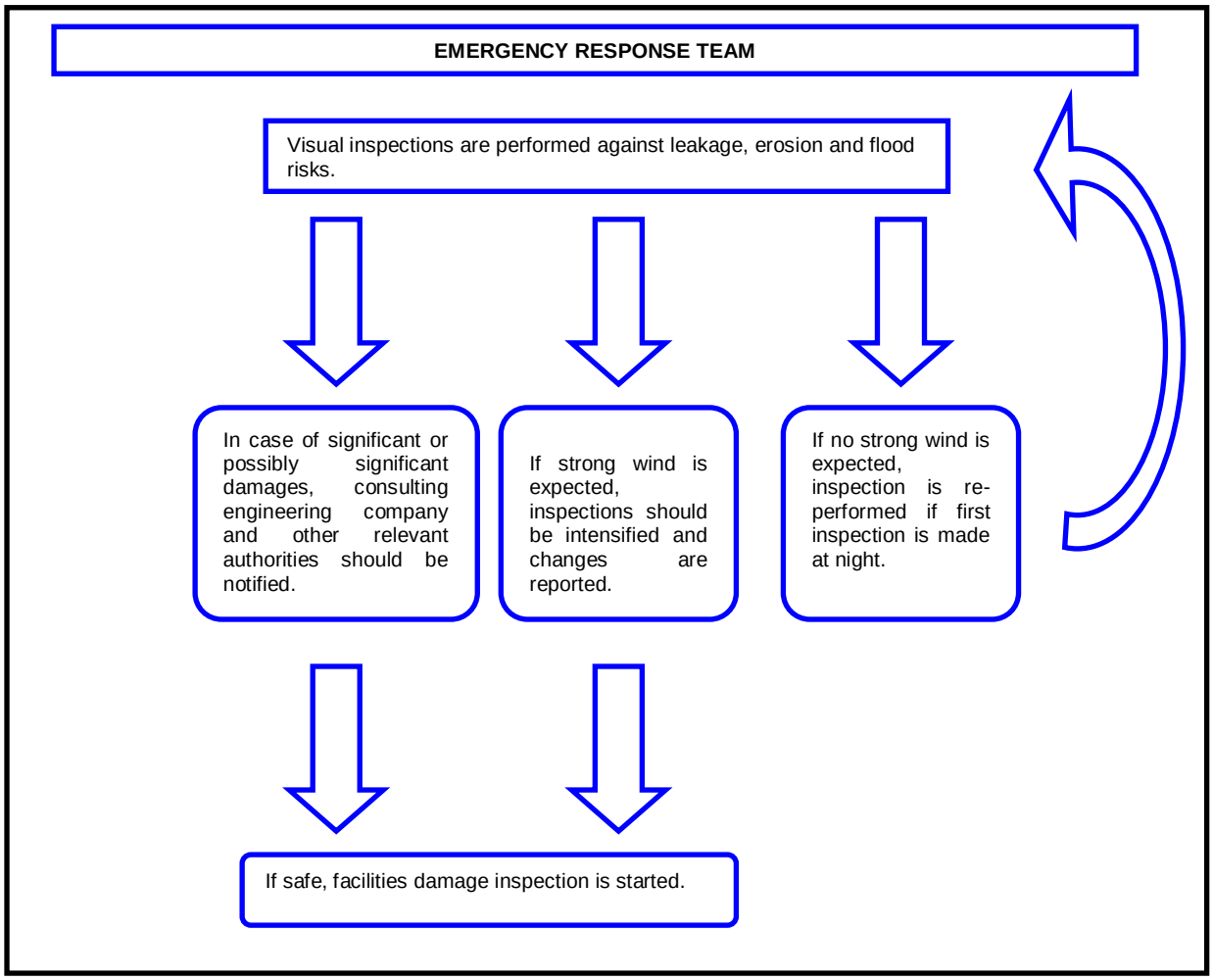


Figure VII.2.3.4 Flow Chart to be Followed in case of Excessive Precipitation

VII.2.3.5. Soil Movements

Actions to be taken in case of soil movements (landslide, erosion etc.) in the facilities are given in Figure VII.2.3.5 below.

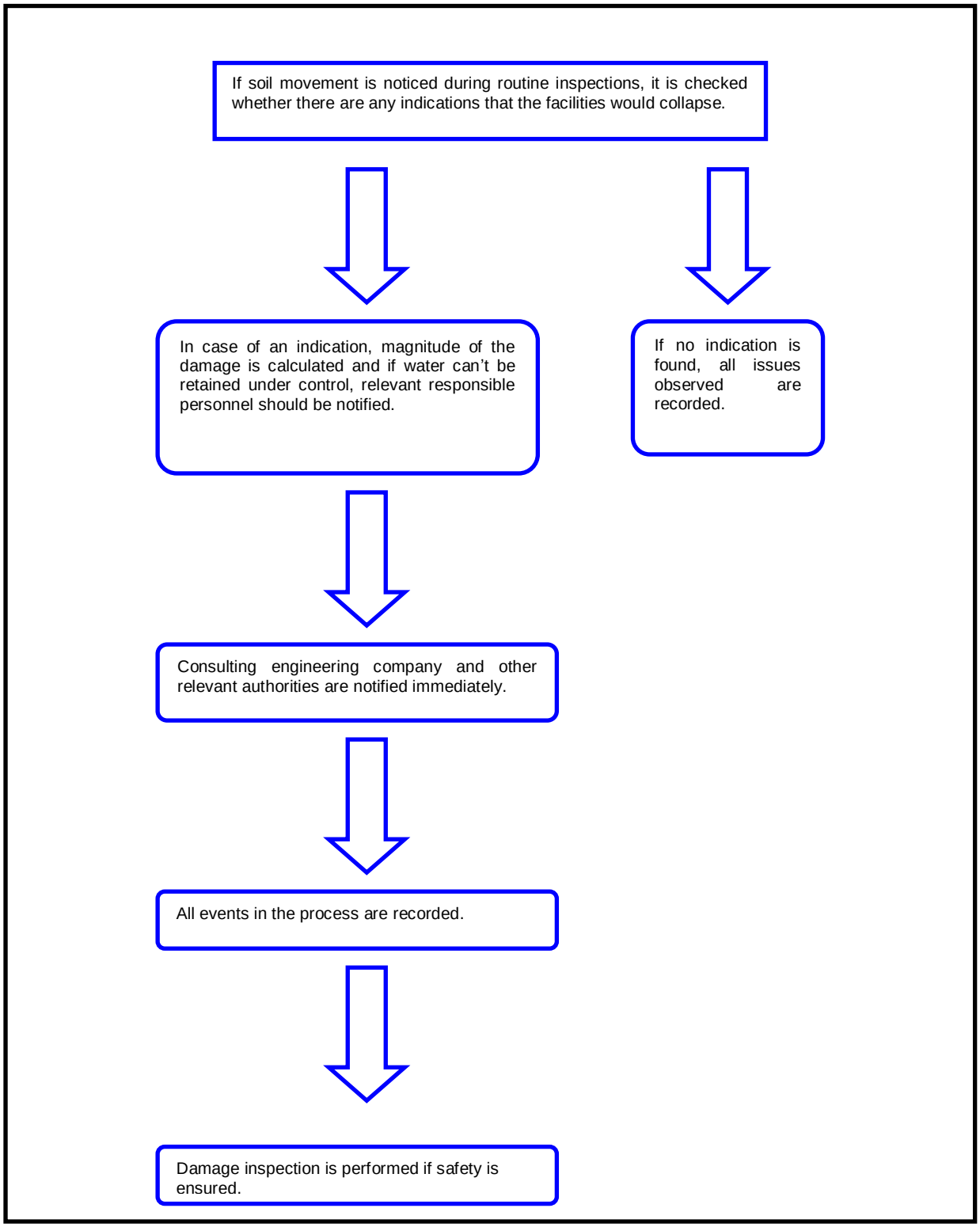


Figure VII.2.3.5. Flow Chart to be followed in case of Soil Movements

VII.2.4. Leakage and Spillage

VII.2.4.1. Road or Soil Pollution

Actions to be taken in the first half hour after spillage of fuel, oil or paint in project area or roads used are very important for prevention of pollution. Actions to be taken in case of any leakage or spillage in consequence of an accident are given in Figure VII.2.4.1 below.

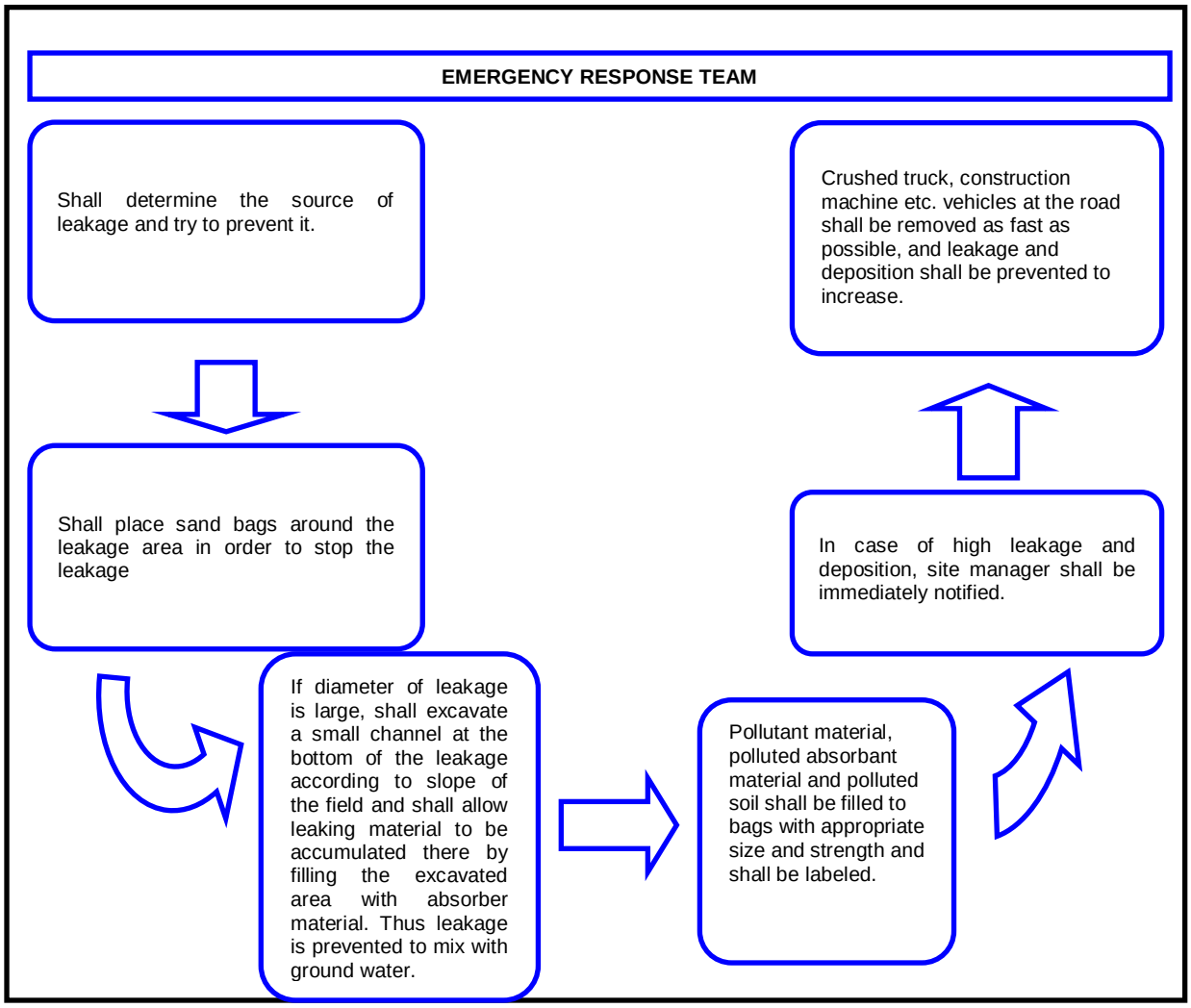


Figure VII.2.4.1. Flow Chart to be followed in Case of Road or Soil Pollution

VII.2.4.2. Leakages to Water Resources

In case of an accident, absorbing buoys filled with absorbing materials shall be used to prevent spillage of oil-fuel and chemicals and collection of these materials. When required, several lines of buoys shall be used until collection of all the material considering the size of leakage and flow rate of the water source.

Equipment and Material for Prevention of Pollution

- Sand (dry)
- Sawdust
- Can, barrel etc.
- Absorbing buoys
- Absorbing cushions

- Rubber gloves, special clothing and personal protective equipment
- Vacuum pump
- Chemical-resistant barrel
- Durable plastic bag

VII.2.5. End of Emergency and Following Actions

If conditions showing that the emergency condition has expired and Emergency Response Plan Coordinator has approved the safety of project area; relevant units will be informed on the issue. Emergency Response Team will meet with the leadership of Emergency Response Plan Coordinator to make a general assessment and prepare a report on the emergency. Compliance of actions performed during the emergency by Emergency Response Plan will be discussed and required adjustments or additions will be integrated to the plan. In the case of an unforeseeable emergency, this situation shall be included in the Emergency Response Plan and relevant preventive measures and response plans shall be developed.

CHAPTER VIII

PUBLIC PARTICIPATION

CHAPTER VIII. PUBLIC PARTICIPATION MEETING AND WORKS ON INFORMING PEOPLE

As per Turkish Environmental Regulation, no Public Participation Meetings are organized for projects provided in Appendix-II of Environmental Impact Assessment Regulation. For those projects, the decision of “Environmental Impact Assessment is not required” is announced to public by Governorship following the ruling of such decision.

However, the first public participation meeting (PPM) was held Gürgenağaç Village of Maçka District in Trabzon Province on 15.09.2010 at 14.30 to share information regarding the project and receive recommendations and opinions of the local people of the region on Mavi Weir and HEPP Project. The second PPM was organized in Bağışlı Village on the same day as per the request of the Village residents after the meeting in Gürgenağaç Village. Advertisements have been issued to announce the meeting to the public in Günebakış newspaper between 23 August-1 September 2010.

In the session, local people have been informed on the project to be constructed in their region and their opinions and suggestions were collected. Main agenda of the meeting has been employment and social contributions to the region. It has been observed in the bilateral discussions during survey works/investigations that requests of local people are being answered at the point of employment and socio-economically within the process.

During the PPM, questions of the participants were answered and concerns have been corrected. For this reason, there was no need to make any change in the project design. All participants were provided with the documents including contact information of the consulting company. In case of any worrying situation arising, they were asked to call the consulting firm and it was planned to leave a notebook and evaluation forms for ones not attended the meeting at the project site to share their ideas. This notebook and forms will be checked by the consulting company on a regular basis and when a remarkable observation or evaluation is faced with, the project owner will be contacted and the necessary measures will be taken.

Furthermore, the project owner intends to contribute socially the area to meet the needs of local people. Since the scope of those contributions is unclear during the meetings, it will be determined according to the needs of the region and will be announced later on to the public. Furthermore, the project owner will take great care of the water mill in Bagisli Village throughout all stages of the project.

The general view acquired after each meeting, the construction of such a project would provide a positive contribution to the national economy. However, participants had concerns on issues such as the level and quality of the water, tunnel construction and soil condition. Some of the concerns rose due to the lack of the technical knowledge of the participants on the principles of the run-of-the river type power plants. Graphical studies were distributed for participants to understand better the operation principle of those type power plants. The participants having questions or concerns reported them verbally or by filling out the evaluation form. Many of the participants chose not to fill in the matrix. A total of 14 Matrices was filled in by the stakeholders.

One of the issues on the agenda of the meeting was, how to follow-up the environmental and socio-economic impacts of the project. The project team suggested leaving a notebook on the construction site and proposed citizens to write their opinions and suggestions regarding the project on that notebook. In this way, Mr. Selim Yilmaz who is the general manager of CESE Energy and is also from the Gurgenagac Village will be in contact with the local people and will take the necessary measures for any opinion or recommendation of them written on the notebook related with environment or local people.

One of the most important issues discussed during and after the meetings had been the employment. Participants wanted job and assurance continuously. General Manager of Cese Energy, Selim Yilmaz, stated that priority would be given to the local people in terms of employment, however for some jobs requiring technical knowledge and skills, competent staff would be employed.

The other issues talked about had been related to cutting trees and the amount of water between the water intake and drop structures. The representative of the Project' consulting company had requested the participants to show sensitivity on the environmental issues, and in case they observed any violation on those issues, to contact with the consulting company, or to write their opinions on the notebook kept in the construction site. In case of arise of any important issue concerning the local people or the environment; the necessary measures would be taken immediately.

The participants reported positive opinions on the project's contribution to the country's economy and on the impacts to the global warming. However, questions were asked about the potential environmental issues that may arise during the construction and operation stages of the project. It was observed in both meetings that many of the participants had no idea about the operation of the run of-the river type hydroelectric power plants. For this reason, answering participants' any questions regarding environmental and social issues at both of the two meetings brought light to those issues. A participant operating a water mill in the village asked a question about the future of his water mill, and wanted to know the effects of the project to the water mill. Cese Energy General Manager Selim Yilmaz promised to handle this issue and stated that he would continue to operate the water mill after the operation of the power plant. In addition the project team carried out a visit to the project site to confirm the expressions of the water mill operator.

A total of 16 evaluation forms were filled at both Village, 14 of which from Gurgenagac Village and 2 of which from Bagisli Village. Although there was so much participation, the actual number of completed evaluation forms was less than the participation rate. Some of the participants behaved abstentions in filling the documents such as participant list, evaluation forms etc. distributed by the consulting company during the meeting. Although it was expressed that the purpose of those documents was to form the list of the participants attending the meeting, participation list was not signed by some of the citizens for personal reasons.

The participants were stated that it was important to hear and register any opinion expressed positively or negatively for the development of the project. Some of the young participants, who had the questions about employment, didn't fill in the evaluation forms saying that "there's no need".

Some of the participants asked questions about the explosions to be held during the tunnel excavation, they have expressed their concerns due to the bad experiences faced with as a result of uncontrolled explosions neighboring quarries. They also asked how the tunnel explosions involved in the project to be executed and if there was any inconvenience. They were told all of the blasting works to be carried out accompanied by gendarmes in accordance with Law, under the control of an experienced and expert team.

Some participants had asked the possible risk of erosion and landslides near Mavi Weir. It was said in response that geological studies had been continued in the area and as a result of those studies; all necessary measures would be taken.

Another issue that the participants were interested in was the employment. It was expressed that the project owner would give priority to the local people on this subject. It was estimated that during construction 74 people and during operation 14 people would be employed. At both meetings, the participants were requested to contact with the consulting company whose contact information is provided in the files distributed in case of having further questions about the project, and observing any violation in relation to the construction of the project. The consulting company also left evaluation forms to Gurgenagac Village Headman for the citizens to post their comments on the project.

Newspaper advertisements, invitations to meeting, meeting participation list, Public Availability Session documents and evidence report that Environment Management Plan has been announced are provided in the appendices whereas photos from Public Availability Session are provided in Figure VIII.1. Figure VIII.2. and Figure VIII.3. Appendix-1.9).

Figure VIII.1. Scene from Public Availability Session (1)

Figure VIII.2. Scene from Public Availability Session (2)

Figure VIII.3. Scene from Public Availability Session (3)

BÖLÜM IX

LAND USAGE AND EXPROPRIATION

CHAPTER IX. LAND USAGE AND EXPROPRIATION

Mavi Weir and HEPP Project is located in Trabzon Province, Maçka District. Closest dwelling units to the project area are Bağışlı and Gürgenağaç villages.

As provided in Chapter II.4.and Figure II.4.3 (1/25,000 Land Availability Map), some of the project units are located on forest areas.

For forest areas in the project scope, permits have been received for two plots with areas of 699 m^2 and 38,362 m^2 for project units from Trabzon Regional Directorate of Forestry, Hamsiköy Forest Sub-District Directorate as per article 17 of Forest Law no.6831. Along with this, expropriation of personal lands within the scope of the project has been completed and list of the expropriated lands are given in appendix (App.-1.5).

CHAPTER X

RESULTS

CHAPTER X. RESULTS

Electric energy consumption is one of the most important indicators of economic development and social welfare. Per capita electric energy production and/or consumption in a country presents great importance in terms of living standards in that country. Today, Turkey, as a fast developing and industrializing country, requires uninterrupted, high quality, reliable and economic energy.

This report including required precautions to be taken to assess the environmental impacts on environment and local people and to minimize negative effects during on-going construction and operation stages of Mavi Weir and HEPP project has been prepared in line with Turkish Regulation and International Finance Corporation (IFC) and World Bank (WB) Guidelines.

Control precautions stated below as a result of Environmental Impact Assessment studies shall be taken for assessment of positive and negative impacts on environment or minimizing to prevent damage to environment for Mavi Weir and HEPP Project

Air Management: Excavation works of all project units planned under Mavi Weir and HEPP Project have been completed and reinforced concrete works are being performed at the moment. No emission shall occur except the dust due to vehicles to be utilized during landscaping works at the end of the construction stage of the project. In this regard, predominant wind direction is determined by reviewing long term data of Trabzon Weather Station and settlements surrounding the project area shall not be affected by the distribution of dust emission

Noise: Noise due to vehicle and equipment to be utilized during construction stage and turbines and generators in the plant building during operation stage will be generated. SoundPLAN 6.5 software has been used for modelling to determine the noise level to be generated due to all activities of the planned project. As the result of the modelling works, people living in dwelling units in the vicinity of the project site will not be adversely afffected by noise.

Waste Management: Wastewater, solid wastes, waste oils and excavation wastes possibly to be generated during all stages of the project are and will be disposed of in accordance with the provisions of the relevant regulations.

Flora and Fauna: Flora and fauna characteristics of the project area and its vicinity have been given in Chapter III.2.1. Characteristics of flora and fauna elements in the project area and its vicinity and international protection statuses such as IUCN, BERN and CITES have been provided. Impacts on flora and fauna elements and precautions to be taken related to the project have been provided in detail in Chapter IV.2.

Aquatic Life Environmental/ecosystem water to be released in the project shall be sufficient for reproduction and migration of the animals in the project area. 6 fish species have been determined in the area and Salmo trutta fario and Salmo trutta labrax are deemed important in a biological point of view. Environmental flow quantity to be released to the stream bed during the project provides the required conditions for fish reproduction. It has been suggested to release 258 liters of environmental/ecosystem water during all months in Mavi Weir and HEPP Project. Average depth and average speed for the environmental/ecosystem water to be released at this rate have been determined as 0.30 m (30 cm) and 0.36 m/s respectively. With the aforementioned quantities (See Ecosystem Assessment Report), it is stated that water to be received from the basin where the project is located would contribute to the availability of sufficient amount of water in the stream. In the letter of Nature Preservation and Natural Parks General Directorate dated 28.08.2009 on the

subject (See Appendix-1.10) it has been foreseen that 0.5 m^3/s for March, April, May and June, and 0.27 m^3/s of environmental flow shall be released to downstream. Release of environmental/ecosystem water more than the quantity stated in the Ecosystem Assessment Report will provide a better habitat for the creatures in the area. When these data are considered, it can be concluded that the project shall not have any significant effect on hydrological, hydrobiological and living ecosystem parameters in the sense of sustainable ecosystem diversity.

Socio-Economic Status: Mavi Weir and HEPP Project; has positive socio-economic impacts and pragmatic functions within the framework of its potential in perspective of contribution to increasing electricity requirement of Turkey, creating employment in the region where facilities will be constructed with the projected number of unskilled and permanent personnel and contribution to local economy by supplying construction material and fuel and mineral oil for construction machinery, maintenance and repair activities and technical-social daily needs of the personnel to be employed. In this regard, Mavi Weir and HEPP Project aiming to improve and use water resources for generating energy can be regarded as a contribution while considering the requirement of on site, on time and uninterruptible electric energy for industrialists and other users for social and economical development of Turkey.

Archeological and Historical Assets: There is no natural or archaeological site present within the boundaries and in the vicinity of the activity area. There is no high value landscape or recreation area, and unique geological or geomorphological area present within and in the vicinity of the activity area. Uzungöl Special Environment Protection Area, Uzungöl Natural Park, Seragölü Natural Park and Altındere Valley National Park is present within the boundaries of Trabzon province. Among these areas, Uzungöl Special Environment Protection Area and Uzungöl Natural Park is 65 km away from the project site, and Seragölu Natural Park is 27 km, Altındere Valley National Park is 12 km away from the project site. Therefore, the project planned to be realized does not have any effect on these areas.