AECOM Environment

Prepared for:
Borares Enerji Elk. Ürt. A.Ş.
İstanbul, Turkey

Prepared by:
AECOM
Turkey
Report No: TR-R740-01-01
November 2014

Non-Technical Summary (NTS) for Environmental and Social Impact Assessment Report of Karova Wind Farm, Muğla, Turkey



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Gizem Güngör, Environmental Engineer, BS
Hüseyin Akyol, Environmental Engineer, BS
İrem Kayıran Bozoğlu, Chemical Engineer, BS
Başak Şentürk, Biologist, BS,
Lütfiye Özdirek, Biologist, BS, MS
Okan Can, Biologist, BS, MS
Mert Onursal Çatak, Geological Engineer, BS
Merve Dilber, Sociologist, BS

_____
Prepared By

Arzu Ertuğrul, Chemist, MS

_____
Reviewed By

AECOM
Mustafa Kemal Mah., Dumlupınar Bulvarı No: 266,
Tepe Prime İş Merkezi, B Blok, Suite: 51, Çankaya 06800
Ankara, Türkiye
T: +90-312-442-9863
F: +90-312-442-9864
www.aecom.com

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List of Abbreviations

Borares	Borares Enerji Elektrik Üretim A.Ş.
EIA	Environmental Impact Assessment
EMRA	Energy Market Regulatory Authority
ESAP	Environmental and Social Action Plan
ESIA	Environmental and Social Impact Assessment
ETL	Energy Transmission Line
IBA	Important Bird Area
IUCN	International Union for Conservation of Nature
KBA	Key Biodiversity Area
MWe	Megawatt electricity
NTS	Non Technical Summary
PDoEU	Provincial Directorate of Environment and Urbanization
PDR	Project Description Report
TEIAS	Turkish Electricity Transmission Company
WFP	Wind Farm Project

1.0 Project Description

1.1 Proposed Project

Borares Enerji Elektrik Üretim A.Ş. (Borares) plans to develop and operate a wind farm in Bodrum District of Muğla Province in Turkey. The closest settlements to the Project site are Çocuk Mezarlığı (Çamlıca) Neighborhood in the south and Yeniköy Village in the north. The wind farm will have a total installed capacity of 30 MWe with 13 turbines. The Project will have 7 GE2.85-103 (hub height of 85m) and 6 GE1.7-103 (hub height of 80m) model wind turbines. The Project is planned to generate about 122.5 million kWh of electrical energy annually. The generated energy will be connected to the existing 154kV Bodrum-Yeniköy Energy Transmission Line (ETL) via an overhead ETL (approximately 4 km in length) that will be constructed in the scope of the Project.

1.2 Environmental Impact Review Status

The Project Description Report (PDR) was prepared and submitted to the Muğla Provincial Directorate of Environment and Urbanization (PDoEU). The PDR was reviewed by the PDoEU and the Project had secured an “EIA is not required” decision on May 15, 2009. Since the Project has been revised afterwards, the PDoEU will be notified about the revision.

Since the length of ETL (4 km) that will be constructed to transmit the generated energy will be shorter than 5 km, thus no EIA or PDR is required according to Turkish EIA Regulation.

2.0 Legal Framework

2.1 Generation License

All energy producers need to secure a Generation License from Energy Market Regulatory Authority (EMRA) prior to developing new power projects. Hence, Borares, the project company, has applied to the EMRA for generation license. This application was approved and a “49-year electric power generation license” for the proposed project (License No. EÜ/3382-9/2049, dated August 18, 2011) has been secured from the EMRA by Borares. Since the project has been revised afterwards, license amendment application was done to EMRA and the approval is expected.

2.2 Local Environmental Regulatory Framework

The Turkish Environmental Law provides the legislative framework for the regulation of industries and their potential impact on the environment. Industrial projects are subject to varying levels of review that begin while projects are in the development and pre-operation phases. Additional regulations apply to facilities once they are in operation.

The Environmental Law authorized the promulgation of a number of regulations. Those that pertain to development and operation of the proposed power project are the following:

- Industrial Air Pollution Control Regulation
- Packaging Waste Control Regulation
- Environmental Permit and Licenses Regulation
- Regulation Related to Workplace Opening and Operation Permits
- Environmental Impact Assessment Regulation
- Regulation on Assessment and Management of Environmental Noise
- Water Pollution Control Regulation
- Regulation on General Principles of Waste Management
- Waste Oil Control Regulation
- Regulation on Protection of Wetlands
- Regulation on Soil Pollution Control and Contaminated Sites by Point Source
- Hazardous Wastes Control Regulation
- Vegetable Waste Oil Control Regulation
- Medical Waste Control Regulation
- Waste Batteries and Accumulators Control Regulation
- Excavation, Construction and Demolition Waste Control Regulation
- Solid Waste Control Regulation

- Air Pollution Control Regulation For Heating Sources
- Air Quality Assessment and Management Regulation,
- Exhaust Gases Emission Control and Gasoline and Diesel Oil Quality Regulation
- Regulation on the Septic Tanks to be installed where a Sewer System is not Available
- Regulation on Inventory and Control of Chemicals
- Communiqué on Recovery of Some Non-Hazardous Wastes
- Waste Tires Control Regulation;

In addition to the Environmental Law and its associated regulations, there are several other laws that directly or indirectly include environmental review, and thus, are applicable to the Project. The Project will comply with the 6331 numbered Law on Occupational Health and Safety, Official Gazette No.28339, dated June 30, 2012 and its regulations stated below:

- Health and Safety Regulation for Construction Works, Official Gazette No. 28786 dated October 05, 2013; and

Other regulations that the Project will comply with can be listed as follows:

- 5346 numbered Law on Utilization of Renewable Energy Resources for the Purpose of Generating Electrical Energy;
- 2863 numbered Law on Protection of Cultural and Natural Heritage
- 6831 numbered Forestry Law;
- Regulation on Buildings located on the Disaster Areas, Official Gazette No. 26582 dated July 14, 2007;
- Regulation on the Buildings to be Constructed in Earthquake Zones, Official Gazette No. 26454 and dated March 6, 2007; and
- 167 numbered Groundwater Law.

2.3 Environmental Impact Assessment Process

The scope of the Turkish EIA regulation includes the following:

- Determination of the type of projects required to prepare an environmental impact assessment report or a project description report and the issues to be covered in these applications or reports;
- The technical, administrative and legal aspects related to the environmental impact assessment process;
- The work related to the establishment of the Scope Definition, Review and Evaluation Committee; and

- Monitoring and auditing of the projects subject to this regulation, prior to the commissioning phase, during the operational phase and the decommissioning phase.

According to Article 6 of the EIA regulation, projects should either submit an Environmental Impact Assessment (EIA) Report or Project Description Report (PDR) based on the classification of the projects listed in Annex I and Annex II of the EIA regulation. Annex I and Annex II define the type and projects that are subject to preparing and submitting an EIA Report and PDR, respectively.

2.4 International Conventions Adopted by Turkey

Turkey signed many international conventions and agreements to protect its environment and biodiversity. Potential related international conventions with the Project are the following:

- Convention on Biological Diversity, approved by 4177 numbered Law dated August 29, 1996 and published in the Official gazette No. 22860 and dated December 27, 1996, Ratified 1997;
- Convention on the International Trade in Endangered Species of Wild Flora and Fauna (CITES), published in the Official Gazette No.22672 and dated June 20, 1996, Ratified 1996;
- Convention on The Conservation Of European Wildlife And Natural Habitats (Bern), published in the Official Gazette No. 18318 and dated February 20, 1984, Ratified 1984;
- Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar), published in the Official Gazette No. 21937 and dated May 17, 1994, Ratified 1994;
- International Convention For the Protection of Birds, published in the Official Gazette No. 12480 and dated December 17, 1966, Ratified 1967; and
- Convention Concerning the Protection of the World Cultural and Natural Heritage published in the Official Gazette No. 17959 and dated February 14, 1983.

The Project should comply with the relevant provisions of conventions mentioned above.

2.5 Equator Principles

The Project is assessed in accordance with the Equator Principles. The “Equator Principles” is a financial industry benchmark for determining, assessing and managing social and environmental risk in project financing. The Principles apply to all new project financings globally with total project capital costs of US$10 million or more, and across all industry sectors.

The Equator Principles (2013) that are adopted by the Equator Principles Financial Institutions (EPFIs) are listed below:

- Principle 1: Review and Categorization
- Principle 2: Environmental and Social Assessment
- Principle 3: Applicable Environmental and Social Standards
- Principle 4: Environmental and Social Management System and Equator Principles Action Plan
- Principle 5: Stakeholder Engagement
- Principle 6: Grievance Mechanism

- Principle 7: Independent Review
- Principle 8: Covenants
- Principle 9: Independent Monitoring and Reporting
- Principle 10: Reporting and Transparency

The Equator Principles are based on the IFCs Environmental and Social Safeguard Policies. Thus, the IFC/World Bank environmental, health and safety guidelines are described in the following section.

2.6 IFC/World Bank Group Environmental, Health, and Safety Guidelines

The Project is assessed in accordance with the IFC guidelines, performance standards and their related guidance notes, and manuals related to environmental, social, health and safety issues. The documents that guided the ESIA study are listed in the following sections.

Guidelines:

- IFC/WB Environmental, Health, and Safety General Guidelines (2007),
- IFC/WB Environmental, Health, and Safety Guidelines for Wind Energy (2007); and
- IFC/WB Environmental, Health, and Safety Guidelines for Electric Power Transmission and Distribution (2007).

Performance Standards:

- IFC Performance Standards on Environmental and Social Sustainability (2012),
  - Performance Standard 1 – Assessment and Management of Environmental and Social Risks and Impacts
  - Performance Standard 2 - Labor and Working Conditions
  - Performance Standard 3 – Resource Efficiency and Pollution Prevention
  - Performance Standard 4 - Community Health, Safety and Security
  - Performance Standard 5 - Land Acquisition and Involuntary Resettlement
  - Performance Standard 6 - Biodiversity Conservation and Sustainable Management of Living Natural Resources
  - Performance Standard 7 - Indigenous Peoples
  - Performance Standard 8 - Cultural Heritage
- IFC Guidance Notes: Performance Standards on Environmental and Social Sustainability (2012).

IFC's Performance Standards and related guidance notes were followed in the ESIA. The overall content of the ESIA is formulated in accordance with the Guidance Note on Performance Standard 1. Guidance notes for Performance Standard 2 to 8 were addressed when applicable. Performance Standard 7 is not applicable to the Project.

2.7 EBRD Performance Requirements

The PRs that are applicable to the proposed Project are listed below:

PR 1: Environmental and Social Appraisal and Management,
PR 2: Labour and Working Conditions,
PR 3: Pollution Prevention and Abatement,
PR 4: Community Health, Safety and Security,
PR 5: Land Acquisition, Involuntary Resettlement and Economic Displacement,
PR 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources,
PR 8: Cultural Heritage,
PR 10: Information Disclosure and Stakeholder Engagement.

The remaining Performance Requirements which are “PR 7: Indigenous People” and “PR 9: Financial Intermediaries” are not relevant to the proposed Project.

3.0 Proposed Project

3.1 Project Objective

Turkey has an increasing energy demand. This rate of demand growth has been higher than the growth rates seen in other major Turkish industries and outstrips growth in the Turkish economy overall. The purpose of this Project is to utilize wind energy potential and to compensate energy requirement through a sustainable, environmentally and cost effective way by using wind energy.

3.2 Project Location

Karova WF is located to the eastern part of Bodrum District of Muğla Province in the Aegean Region of Turkey. The Project site is located on a series of hills located approximately 18.5 km east of Bodrum District Center. The Project site is approximately 65 km to the Muğla City Center (Figure 3-1).

The closest settlements to the Project site are Çocuk Mezarlığı (Çamlıca) Neighborhood in south and Yeniköy Village in north. Other surrounding settlements are Pınarlıbelen Village, Kurudere Village and Çamarası Village in northwest (Figure 3-2).

3.3 Shipment and Transportation

It is planned to transport wind turbine components and equipments from İzmir Port to Karova WF Project site. İzmir port is located in the western Turkey, in the center of İzmir Province. The operator of this port is General Directorate of Turkish State Railways (TCDD). The port is the agriculture and industry port of Aegean Region of Turkey and has a vital importance for the exportation of Turkey. Also, the port has connections to both rail and highway networks.

3.4 Project Work Force

For the construction phase of the Project, approximately 45 personnel are expected to work. However, not all workers will be on-site at any one time. Local contractors will be encouraged to tender for the civil and electrical works. Electricians, riggers, crane operators and heavy equipment operators will also be required.

After construction phase, about 12 personnel will work during the operation phase of the wind farm.

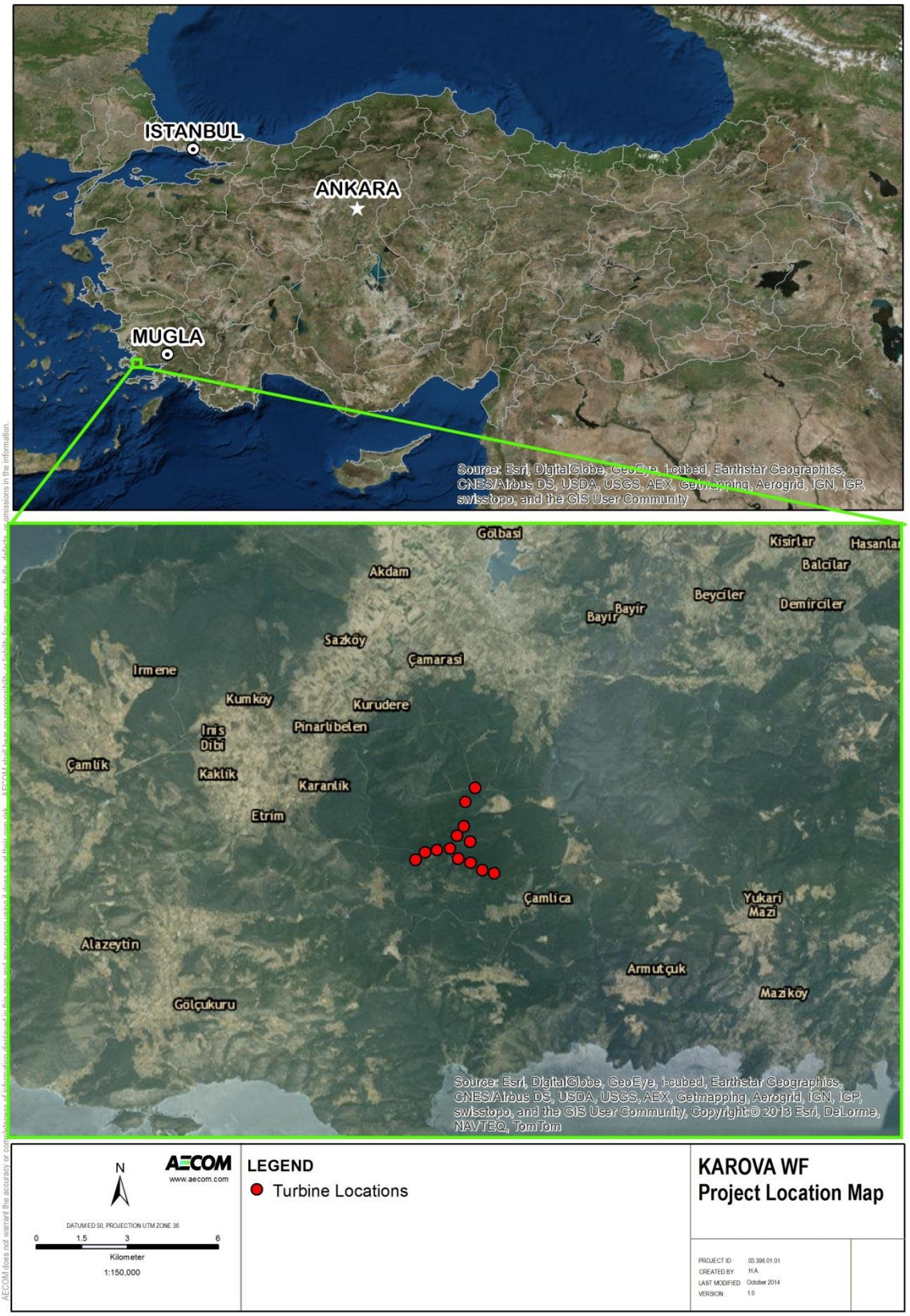


Figure 3-1 Project Location Map

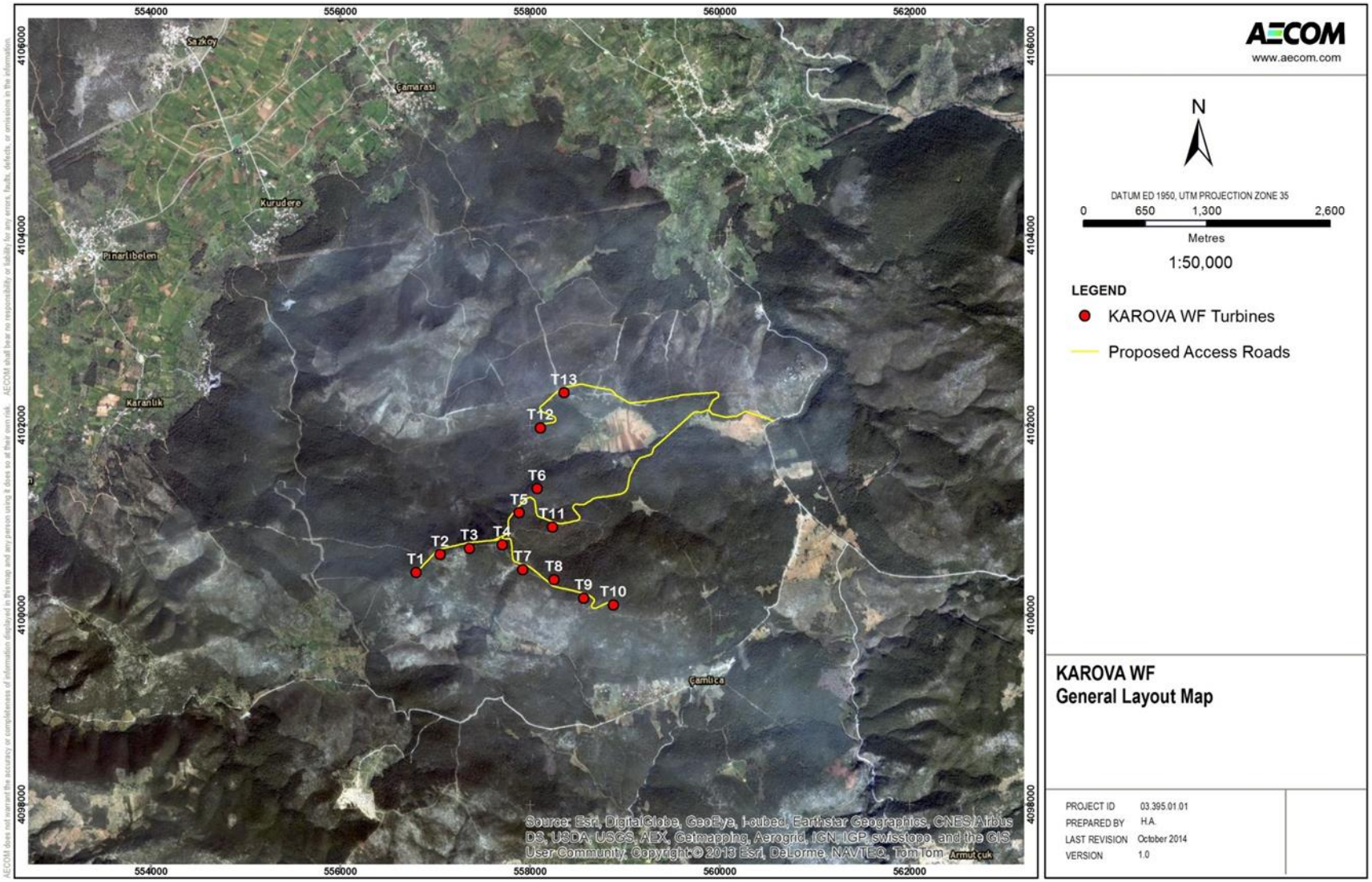


Figure 3-2 General Layout Map

4.0 Existing Environment

4.1 Climate

The Project site is located within Bodrum District of Muğla Province and under the Mediterranean climate. It is hot and dry in summer while it is cool and wet in winter. According to long-term meteorological data recorded by the Muğla Meteorological Station, the annual average temperature is 15.05 ºC. The maximum precipitation occurs during December.

According to the wind mast data that is supplied by Project owner, the prevailing wind directions are north, north-northwest and north-northeast.

4.2 Air Quality

Although air quality is not expected to be an important issue in wind farm projects, brief background information about air quality of Muğla Province is provided in this section.

AirBase is the European air quality database maintained by the European Environment Agency through its European topic centre on Air pollution and Climate Change mitigation. Airbase is used to provide information about air quality of Muğla Province. Average SO_2 and PM_{10} concentrations are 52.9 µg/m³ and 74.3 µg/m³, respectively in 2011 for Muğla Province according to the data taken from AirBase.

4.3 Land Use

The Project area is located on forest land. Permits will be taken before the construction phase for the forest areas to be used within the Project in accordance with the Article No. 17/3 (amended by Law No. 5192) of Turkish Forestry Law No. 6831.

The Project area is in a rural land and is not used currently for any purpose of settlement or economic income. Therefore, there will be no physical displacement within the Project.

4.4 Geology and Seismicity

The Bodrum area is a peninsula located in SW Turkey and NE of the Hellenic arc. The Aegean region exhibits strong seismic activity and complex, rapidly changing tectonics (Dewey and Sengör, 1979). Robert et al. (1992) defined the mafics of Bodrum as two groups: ultrapotassic and shoshonitic rocks.

Although western Turkey has experienced crustal extension since the lower Miocene, in the Bodrum area, the extension-related E–W-trending structure (Gokova graben) originated in the late Miocene–Pliocene period (Kurt et al., 1999).

Muğla Province and the Project site are located in the 1st Degree Seismic Zone according to the earthquake zones determined by the General Directorate of Disaster Affairs (GDDA). Since the project area is located at the 1st degree earthquake zone, the buildings and other structures will be designed to be built in accordance with the earthquake regulation.

4.5 Flora and Fauna

Flora

In order to determine the flora species within the Project site and its vicinity, the ecological evaluation on the wind farm (Bilgin et al., 2013) and the literature surveys were used. As a result of the field work in and around the Project area, belonging to 41 families and 154 species were identified. The phytogeographical regions are composed of 40 Mediterranean, 27 Eastern Mediterranean, 6 Euro-Siberian, 2 Iranian-Turanian element and. 79 of the species have multi-zone category or their phytogeographical region is unknown.

Since the Project area is in Mediterranean phytogeographical region, most of the species are Mediterranean elements. The richest families according to species number of the study are: Asteraceae with 18 species, Fabaceae with 15 species, Poaceae with 13 species, Brassicaceae, Lamiaceae and Liliaceae each with 9 species, Boraginaceae, Ranunculaceae and Rosaceae each with 7 species. There are three endemic species observed in the field survey period. 'Centaurea solstitialis subsp. pyracantha ' and 'Cytisopsis dorycniifolia subsp. reeseana.' are the first two endemic species that are common around the Mediterranean Basin and they are endemic to this basin. They are also widespread around the Project site and according to IUCN Red List, their conservation statues are LC which means least concern for that species. *Alyssum hirsutum* var. *caespitosum* is the third endemic species in the Project Site mentioned in Landscape Renovation Plan and Ecosystem Assessment Report (2014). Since the species is an element of Iranian-Turanian phytogeographical region, many of the records of the species is from that region instead of Aegean Region and the species prefers the habitats occurring between 500 m and 1700 m of elevation.

Fauna

In order to evaluate the possible or existing effects of the Project, the following species groups were taken into consideration: herbivorous and carnivorous species that have a high biomass and have effect on the ecosystem due to their hierarchical level; groups that are essential in terms of key functions such as pollination; critically endangered groups of species that are directly and rapidly affected by environmental inconveniencies such as pollution; species groups that are important due to the potential socio-economic damages they cause or regarding cultural (symbolic) values they represent; species groups that are practically and reliably detected and identified in a reasonable time period. As a result of this method; mammals (Mammalia), especially large mammal species, birds (Aves), reptiles (Reptilia), amphibious (Amphibia), and butterflies (Lepidoptera) were included in the contents of the report. These groups are globally regarded as main indicator groups.

In order to determine the terrestrial fauna species within the Project site and its vicinity, the fauna field surveys were conducted by a team from Nature Research Society, coordinated by Associated Prof. Can Bilgin. Moreover, the results are supported by detailed literature survey.

As a result of the further studies conducted by AECOM, no endemic or endangered amphibian and reptile species were found in the Project area in accordance with the IUCN Red List of Threatened Species and Bern Convention.

According to several resources, 119 butterfly (lepiodepteran) species were detected in Muğla. Some of these references date back to before 1990. Since the season was not suitable during the field surveys on 1st, 2nd and 6th February 2014 conducted by Associated Professor Can Bilgin, only three of the potential species from the Red List (Karaçetin & Welch 2011) were evaluated. Among the threatened species, Grecian Copper (*Lycaena ottomana*) is included in VU (vulnerable) threat category. There are records of this species from at least 19 locations (6 provinces) in Thracia and west Anatolia since 1980. Due to the records from five new regions mostly in Antalya between 2008 and 2010 shows that the habitat of the butterflies is larger than known. The species prefers lower regions in coastal areas, rich vegetation wetlands, deciduous forests and Mediterranean scrub vegetations. Also, it is observed openings and various forest bases in the inner places other than coastal areas (Hesselbarth *et al*., 1995). It is generally observed on the Cistur spp. where they search for nectar. The primary food of caterpillars is *Rumex acetosella.* When all these properties of the species are considered, it is probable, even small, for this species to be present in the Karova Wind Farm area. The second butterfly species which is under threat is Levantine Silver-Line (*Apharitis cilissa).* It is observed in the south east of Turkey in the past 30 years. This species is dependent on an ant in its lifecycle. It prefers dryer habitats than the Project Site. The third species is Halicarnas Brown (*Maniola halicarnassus).* This species is found in wet and shady meadows between 0-100 m altitudes.

Two detailed ornithological (bird monitoring) surveys were conducted by Nature Research Society. The first one was for 15 days within the scope of the Project in September-November 2013 covering the autumn 2013 migration period and the second one was for 17 days between 21st March and 7th April 2014 within the scope of the Project in March-April 2014 covering spring 2014 migration period. From the species that were observed during autumn 2013 survey, Common Kestrel, Peregrine Falcon, Common Buzzard and Northern Goshawk which were displaying hunting behaviour were thought to be local species. In addition, a number of Sparrowhawks and Short-toed Snake Eagles have the possibility of breeding in the Area.

The birds that flew directly through the Project area and flew lower than 200 m were considered to pass at the risk height. According to survey results of autumn 2013, 79 Eurasian Sparrowhawk (77.4 %), 6 Western Marsh Harrier (7%), 9 Northern Goshawk (100%), 3 Peregrine Falcon (33.3%), 10 Common Kestrel (55.5%), 6 Common Buzzard (14.2%) flew below 200m. These numbers constitute half of the total bird flights. Since there is no structure in the Project area yet that birds need to avoid, lower flight is understandable. The majority of the birds that use lower altitudes while migrating are observed to use the hills for rising. Especially the northern hills were used for gaining altitute.

16 individuals including 2 Short-toed Eagle, 5 Common Kestrel, 8 Common Buzzard and 1 unidentified eagle species were observed flying at low altitude (below 200 m.) during the spring 2014 survey. This number is half of the total records. However, it is not creating a big since the total number is already low and there are no dangerous structures in the area yet,

The Project area is not an important breeding point and on the main migration route.

The mammalian species consists of common and broadly distributed species. Carnivorous and large herbivorous species are weak in the region. According to camera trap, only wild boar, jackal and red fox species are recorded. The majority of the species are composed of bat species. However, all of

the species are determined considering geographical region and habitat information. Therefore, the lists are not prepared according to direct observations or catch. There is no cave system known to be suitable for reproduction, roosting or wintering habitat. The nearest bat cave is known to be 80 km away from Project area in Havran. Therefore, many of the species determined are rarely seen in the area. Three of the bat species, *Rhinolophus mehelyi* (VU), *Myotis capaccinii* (VU) and *Rhinolophus euryale* (NT) have high threat category. Although it seems that the species are likely to occur in the Project Site, there are no suitable caves for each of these species in the area. Moreover, the genuses that the species belong to are assessed in “low risk category” of collision with wind turbines by Catherine & Spray (2009).

4.6 Naturally Protected Areas

In accordance with the national environmental legislation, there are no national parks, nature reserves, natural monuments, wildlife protection areas and wildlife improvement areas within the project site.

Study area is under the control of Muğla Regional Directory Forestry and Nature conservation and National parks in terms of nature and species protection. There is no legally protected area in the study site.

The map showing naturally protected sites around the Project area is given in Figure 4-1. These areas are Güllük Bay Important Bird Area, Güllük Bay Key Biodiversity Habitat, Gökova Northern Coasts Key Biodiversity Area, Güllük Delta Wetland, Metruk Tuzlası Wetland, Sırtlandağı Halepçamı NPA.

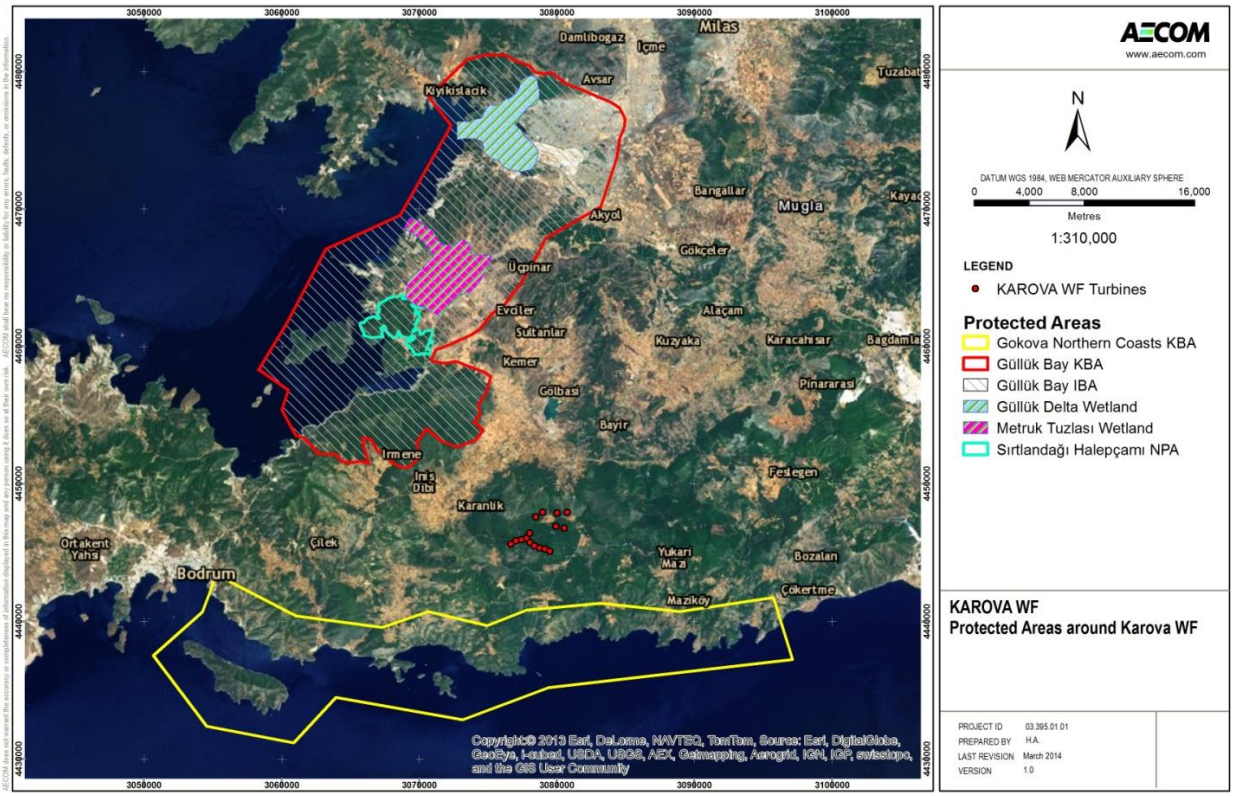


Figure 4-1 Naturally Protected Sites around the Project Area

4.7 Archeologically Protected Areas

Although there are no archeological and historical resources within the proposed project site, there is always a chance of discovering archeological artifacts or remains during construction related excavations in Turkey. During construction, if any archeological remains are discovered, as the national law requires, the Project will cease excavation at this location and inform the local Department of Culture and Tourism immediately. After inspection by the experts from the local Department of Culture and Tourism, a decision will be given to continue or reposition the excavation. With these precautions, the local cultural and historical resources will not be adversely impacted due to the construction activities.

5.0 Impacts and Mitigation

5.1 Noise

Four noise sensitive receptors (NSRs) are identified during the noise impact assessment study and the noise impact assessment studies are carried out in these NSRs (Figure 5-1). NSR-1 is situated on the east of T13 in the east of the Project site. It is a permanently used farm house. There is a dirt access road passing from the north of the house. The closest turbine is Turbine 13 (T13) in west with a distance of 2,087 m. In addition to NSR-1; NSR-2, NSR-3 and NSR-4 are the other sensitive receptors which are temporarily used dwellings situated in the east of T12. The location of the receptors is given below.

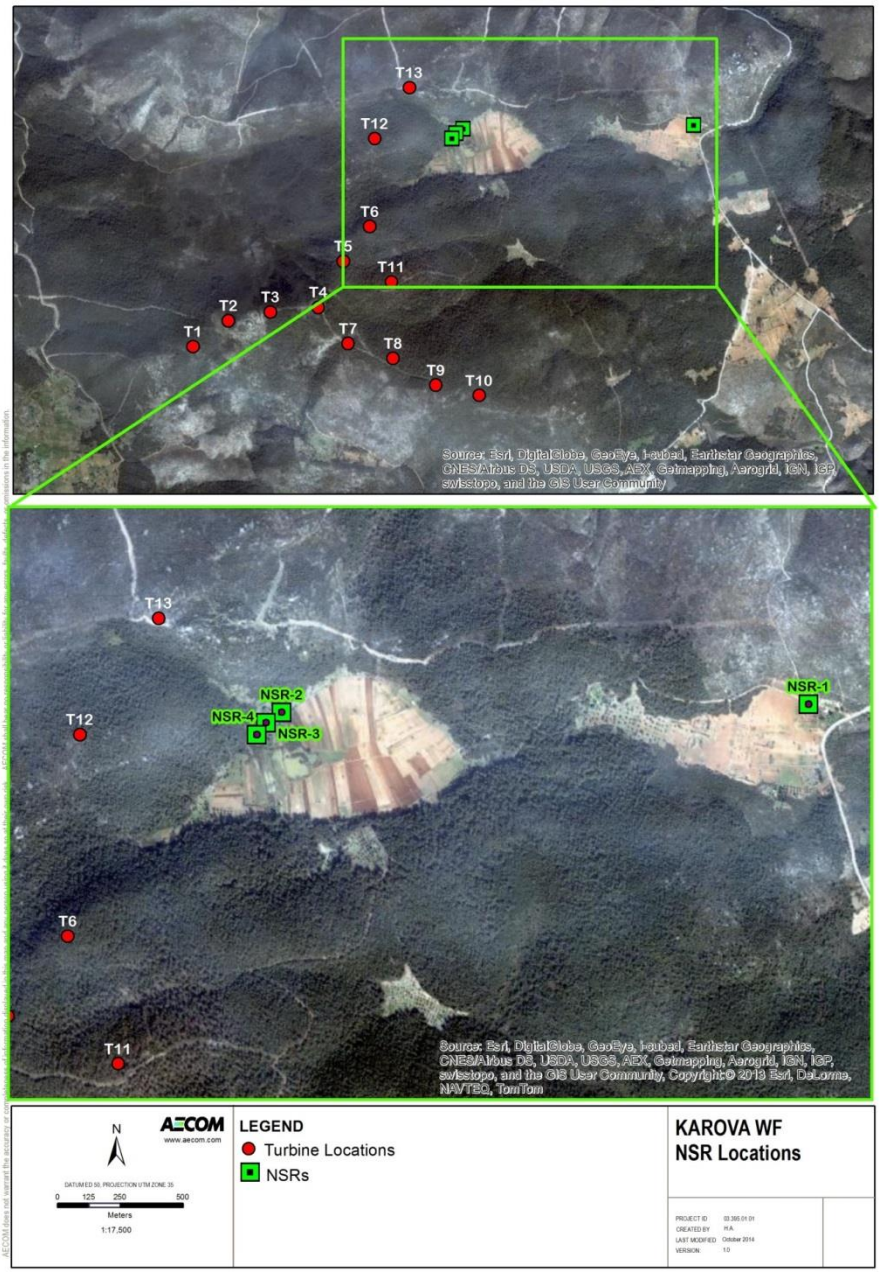


Figure 5-1 NSR Locations

Background noise level monitoring studies were undertaken for two days between February 25, 2014 and February 27, 2014 at NSR-1. The results of the background noise level measurements are compared with respect to both IFC/World Bank Group Environmental, Health and Safety Guidelines – Wind Energy (April 30, 2007) and Turkish Regulation on Assessment and Management of Environmental Noise (RAMEN). The measured background noise levels are below the IFC/WB noise guideline and Turkish RAMEN noise limits.

In order to assess noise impacts of construction activities at the noise sensitive receptors (NSRs), the closest turbine location to the NSR-2 is chosen as the construction activity location. This closest turbine to NSR-2 is Turbine 13 (T13) with a distance of 477 m. As a result of calculations, noise level generated from construction activities at the closest NSR (NSR-2) is calculated as 59.0 dBA.. Therefore, the noise levels at the NSR during the construction periods will be in compliance with the Turkish RAMEN construction period noise limit of 70 dBA. In addition to the regulatory compliance demonstrated above, construction noise is temporary and transient in nature and can be controlled through good site working practices, limiting construction hours and adopting noise control measures where necessary. Thus, noise impact associated with the construction activities is not expected to be a significant issue for the proposed Project.

The potential noise impact of the wind turbines on sensitive receptors is determined by noise modeling. This noise assessment study has demonstrated that the operational noise of the proposed wind farm Project will not exceed the Turkish RAMEN daytime, evening time and nighttime and IFC/WB Guideline daytime and nighttime noise limits. During the operation of the wind turbines, the likelihood and magnitude of the potential noise impact will be likely and medium, respectively. Thus, the significance of potential noise impact is expected to be moderate.

Noise levels during decommissioning are expected to be similar to the noise levels during construction. Thus, noise impacts associated with the decommissioning activities are not expected to be a significant issue for the proposed Project.

The Environmental and Social Action Plan (ESAP) for Karova WF lists a number of mitigation measures for noise control during construction and operation. Considering the mitigation measures no adverse impacts are anticipated during the construction and operation activities of the proposed project.

5.2 Air Emissions

Dust will be generated during civil works during the construction phase. Various construction vehicles and machines will also result in mobile source emissions such as SO_2, NO_x, CO and PM. The Environmental and Social Action Plan (ESAP) for Karova WF lists a number of mitigation measures for dust and mobile emissions control. Considering the mitigation measures and the short duration of the activity, no adverse and permanent impacts on air quality are anticipated during the construction activities of the proposed Project. Besides, no air emissions will be generated during operation.

During decommissioning phase, potential impacts of air emissions are likely to be similar in scale to those associated with construction and an adverse impact is not expected.

5.3 Water Supply and Wastewater

Water will be mainly used for the construction works and domestic usage. The total water demand for the construction of wind turbines, switchyard and energy transmission lines is estimated to be 16.75 m^3 per day, whereas the operation period water demand is estimated to be as 1.8 m^3 per day.

During construction and operation periods, a leak-proof septic basin will be used for the collection of domestic wastewater since there is no municipal sewer system in the vicinity of the Project site. Wastewater collected in the septic tank will be disposed of in accordance with Water Pollution Control Regulation. Hence, no adverse impact is anticipated due to wastewater generated in the scope of the Karova WFP.

During decommissioning phase, potential impacts of water supply and wastewater are likely to be similar in scale to those associated with construction and an adverse impact is not expected.

5.4 Hazardous Waste

During the construction phase, no explosive or toxic materials will be used for the preparation of the site. Limited amounts of hazardous material will be used during the construction and operation phase of the proposed Project. Waste oils, waste battery and accumulators will be generated during construction and operation.

Any hazardous waste will be collected in leak-proof containers and removed to a licensed disposal facility by licensed transporters. The hazardous wastes will be handled, stored, transported and disposed of according to the Turkish Hazardous Wastes Control Regulation, Waste Oils Control Regulation and Waste Batteries and Accumulators Control Regulation, and the IFC/WB guidelines. Thus, an adverse impact on the local environment is not expected.

5.5 Non-Hazardous Waste

Domestic waste will be produced during the construction and operation phases. Domestic solid waste will be transported to the disposal area of local Municipality. Recyclable waste such as paper, plastics, metal, etc. will also be produced during the construction and operation phases. These wastes will be collected separately and will be sent to the licensed recycling facilities.

Excavated soil will be re-used for the filling of the turbine foundation, location of energy transmission line pylons and site leveling purposes. Hence, no excavated soil will be transported and stored outside the Project site.

Small amounts of hazardous wastes will be generated during the proposed construction activity. Liquid hazardous wastes will be collected in leak-proof and safe containers stored in an area with a concrete surface and a proper secondary containment to prevent potential spills and leakages reaching to the soil and groundwater. Hazardous wastes will be sent to the licensed recover/disposal facilities by licensed transporters.

Non-hazardous wastes are not expected to affect the environment adversely during the construction, operation and decommissioning period.

5.6 Soil and Groundwater

All chemical storage containers, including diesel fuel, and hazardous liquid waste drums/containers will be placed so as to minimize the risk of soil and groundwater contamination and water pollution. Such chemicals and fuel will be stored in concrete areas with proper secondary containments and drip trays during construction. When necessary, spill kits, absorbent pads or materials, and absorbent sands will be provided near the chemical storage areas at all times.

As a summary, it is anticipated that the significance of impacts on the soil and ground water during construction, operation and decommissioning will be minor. The residual impact after taken all necessary measures can be defined as negligible.

5.7 Impacts on Flora and Fauna

There are no flora species in the Project site and its vicinity in accordance with the CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) which was ratified in Washington, D.C. on March 3, 1973. In addition, there are no flora species in accordance with the Bern Convention (Convention on the Conservation of European Wildlife and Natural Habitats) which was ratified by Turkey on January 9, 1984. None of the species identified in the Project site are involved in the conservation lists.

There will be a biomass loss to be incurred by the plant species in the regions where stripping works will be performed; but the works will not affect their populations. Therefore, it is concluded that the proposed wind farm project will not disturb the general vegetation structure particularly.

The most important potential concern of the Project is the risk of collision of birds and bats with the wind turbines. Turbines will be painted and lighting will be installed properly to minimize bird collision risk.

When observation data is evaluated, it can be stated that Project area is on a minor migration route where is passing from Western Anatolia. While Western Anatolian Migration Route is not as intense as İstanbul-Hatay Route, it can be still used by some birds. Especially bird presence of the individuals flying to Africa through Mediterranean Sea was proved by satellite transmitters. But also it is not possible to say that all birds that are directed to southwest are crossing Mediterranean Sea. They can also go through Hatay Province by following Aegean and Mediterranean Sea.

Although there aren’t high numbers of individuals passing through the region, their frequencies must be taken into account. During the bird surveys, bird species which are migrating and trying to gain altitude within the area spent their times on the hills where turbines will be situated. Especially native and migrating Eurasian Sparrowhawks were flying low on the region. There is no high risk for Western Marsh Harrier due to they fly on high altitudes. More accurate information is needed about native raptors’ behaviors and their frequency of field use during the breeding season in the region.

In terms of displacement, there are no vital habitats for breeding birds in the area, because of the forest assets outside of the turbine sites. Also, using of the fire safety road as turbine access roads, will decrease the habitat loss and fragmentation in the forest area.

Due to the fact that the number of turbines is relatively low, the location is not suitable for a major migration, alternative corridors for bird migration exist and the distance from the other nearby wind farms is more than 4 kilometers, creation of a barrier effect is not expected.

As a result, there is no negatively remarkable expectation for birds resulting from the construction and operation of the wind farm. However, a monitoring study will be useful in order to identify the threats that may occur in the future or unforeseen in this ESIA report.

As a result the impact on flora and fauna is expected to be not significant during the construction, operation and decommissioning phases.

5.8 Visual Impact

In order to demonstrate the visual impact, views of the Project site from five different locations have been prepared. Three dimensional models were used in order to represent wind turbines, towers and blades and these models were located on photographs of the Project site.

Visual impact is a subjective issue, a significant number of people in Turkey associate wind farms with clean energy and view the towers as symbols of modern and civilized living. There is no known public opposition on wind farms in terms of potential visual effects. Moreover, there are a number of operating wind power plants located in provinces around Muğla. Therefore, residents of the settlements around the Project site are familiar with wind farms. Thus, it is expected that public and NGOs will view this development favorably and visual impacts will not considered as significant.

Nevertheless, the finish of the proposed turbines will be colored so as to blend in with the receiving landscape and background. It is likely that turbines will have a light grey matt (non-reflective) finish.

5.9 Shadow Flicker and Blade Glint

A shadow modeling study is carried out in order to estimate the shadow casting areas. Shadow receptors, which are the closest farm houses in the close vicinity of the Project Site, are determined.

There is no limit stated in both Turkish legislations and IFC/World Bank guidelines regarding to shadow flickering. The duration of the shadow flickering at the shadow receptors were determined with the modeling study. The modeling results were determined without taking the screening features around the receptors into account which means that in real life, the total duration of the shadow flickering at the receptors will be lower than the results of the modeling study and the shadow flickering at the receptors can be considered as negligible and it can be stated that the proposed wind power plant will not cause significant shadow flickering impact on the closest settlements. In addition, blade glint is not expected to be an important issue since the blades will be made of and painted non reflective materials.

5.10 Cumulative Impacts

Cumulative impacts mainly regarding noise, visual and birds were identified and assessed in this report. The existing and planned wind farms and existing ETLs that are situated in the vicinity of Karova WF are taken into consideration.

During the operation phase, the ETLs have impacts mainly associated with landscape and birds. In addition to the impact on landscape and birds, the wind farms may also have noise impact on the nearest settlements. Although there are some other issues such as traffic (*due to access to the turbine locations*) and air quality (*fugitive emissions of SF_6, Sulfur hexafluoride used in switchgear and circuit breakers*), it is

anticipated that these issues do not have significant impacts and do not interact resulting in cumulative impacts. Therefore only noise, landscape and birds are assessed in terms of cumulative impacts.

Table 5-1 Cumulative Impacts due to the Presence of Other Facilities in the Vicinity

Facility	Noise	Landscape (Visual)	Birds
154kV Bodrum TC – Yeniköy TC ETL	-	X	X
31.5kV Meselik TC – Mazı TC ETL	-	X	X
Karova WF	X	X	X
Alapınar WF	X	X	X
Güllük WF	X	X	X
Cumulative Impact	**-**	**X**	**X**

As seen in Table 5-1, although each wind farm has individual noise impact, a cumulative noise impact is not anticipated due to the distances between the wind farms. Therefore, only cumulative impacts on visual and birds are anticipated. These impacts and associated mitigation measures are presented below.

5.10.1 Noise

The operation of ETLs does not cause noise however, operating wind turbines generate noise varying with wind speed. The sources of sounds emitted from wind turbines consist of mechanical sounds and aerodynamic sounds. The assessment of cumulative noise impact concludes that the operation of wind farms will have no cumulative noise impact on the settlements. Therefore, no mitigation measures are proposed.

5.10.2 Visual

The cumulative visual impact assessment of Karova WF turbines and the turbines of other wind farms located in the vicinity of Karova WF is carried out according to the visibility of the Karova WF turbines together with the visibility of the turbines of other wind farms in the same view shed from the settlements and roads which are the major principle visual receptors. In order to determine the areas that will be able to observe Karova WF turbines and other wind farm turbines, ZTV diagrams for each wind farm were generated.

Regarding the significance of the cumulative visual impact on the settlements, it is unlikely that an impact will occur. The magnitude on the views will be low, since the wind farms will not be visible in the same view shed and scene although they constitute apparent features. In addition, there are other factors that reduce the magnitude. The turbines will be seen against the skyline, where their vertical form will not create contrast strongly with the baseline characteristics of the view. Thus, the significance of the effect on these views will be negligible.

As in the case of wind farms, the visibility of the energy transmission lines mainly depends on the height of the transmission towers and cables. The higher the transmission lines, the greater the distance of

visibility. In addition to height, topography, land use, vegetation and local nature along the route of an ETL are the other factors affecting its visibility from the viewpoints.

Regarding the cumulative visual impacts and necessary mitigation measures, visual impacts of moderate and above are considered as significant, as this is the level at which changes would be clearly perceived. Since the cumulative visual impacts at the viewpoints in this study are classified below moderate, no mitigation measures are proposed.

5.10.3 Birds

During the operation phase, wind farms and ETLs have impacts mainly associated with terrestrial flora and fauna, mainly with birds. The IFC/World Bank EHS Guidelines for Electric Power Transmission and Distribution is utilized for the Cumulative Impact Assessment Study for Karova WF and associated ETL. In order to understand the interaction between Karova WF and the two ETLs with the other industrial facilities within the vicinity, the Ornithological Reports for the Karova Wind Farm (Bilgin *et al.*, 2013) and (Bilgin *et al.,* 2014) is reviewed and assessed. A vantage point methodology was used in the ornithological assessment conducted for Karova WF. A study area having 5 km radius is considered in cumulative impacts assessment of Karova WF and the two energy transmission lines.

According to Bilgin *et al.* (2013), the location of Karova WF is away from the known major migratory routes in Turkey. Nevertheless, due to the close proximity to the coast, minor migratory routes may occur away from the main routes and there are potential movements of migratory birds through the area.

Although Karova WF is a small wind farm comprises 13 wind turbines, there are a number of wind farms and other energy transmission lines in the region.

The wind turbines are known to present a risk of collision mortality to diurnal and nocturnal migrant birds. The greatest losses seem to occur at wind farms situated at narrow migration routes or near wetlands, which attract congregations of waterfowl and other large birds.

According to the Ornithological Assessment of Karova WF (2013), these sensitive groups were found to use the area in migration period. Yet, both Karova WF and the two ETLs are away from any known migration route of soaring birds.

In addition, according to Bilgin *et al.* (2013 and 2014), the collision rate for migratory soaring birds and Karova WF was found to be insignificant in the study area. However the energy transmission lines are too close to the Karova WF project area and the protected areas. Therefore, more detailed monitoring studies covering the two ETLs and surrounding wind farms are required for assessment of the cumulative impact.

According to the results of the ornithological studies in the area, it can be stated that the study area is not located within migration corridors. During the site visit, it was observed that marker balls with red-white strike color which are known as main bird diverting equipments with their ability to reduce collisions significantly are not positioned on the lines of 34.5 kV ETL. Therefore, during the construction of 154 kV Bodrum TC – Yeniköy TC ETL positioning of marker balls should be considered.

In addition to marker balls, painting the higher parts of the towers is another mitigation measure that provides awareness of the towers to the birds. During the site survey, it was not observed that the higher parts of the towers of 34.5 kV ETL was not painted to red color.

Regarding the cumulative impacts, it can be stated that the risk of avian collision can be considered as medium by taking the results of the ornithological studies and the taking of the other wind farms and energy transmission lines into account.

The studies in the literature show that the mitigation measures taken such as marker balls and painting the higher parts of towers significantly reduces the impact on birds. Therefore, these should be applied to the 154 kV Bodrum TC – Yeniköy TC ETL which is under construction. Nonetheless, the cumulative impacts on birds can only be suggested more clearly with the monitoring studies that will be conducted in the area. Hence, these studies will give more accurate and detailed results in the determination of the impacts. At the end of the monitoring studies, the findings will help in determining if the existing mitigations are sufficient to minimize the level of impact or more mitigation measures should be taken

6.0 Occupational and Community Health and Safety

The main community health and safety issues related with this project were determined as lightning, aviation safety and public access to the project site.

The wind turbine will be equipped with lightning protection systems which have the task of diverting the lightning currents arising from lightning strikes and the energy associated with the lightning into the ground in a controlled manner. The turbine will be equipped with receptors, e.g. on the blades, that receive the lightning current and divert it through predefined paths within the turbine to the ground.

In case request of a local authority, anti-collision lighting and marking systems will be used on the blades in order to provide aviation safety.

In order to prevent entrance of un-authorized access to the Project site, farm area will be fenced. In addition, there will be two security personnel during the operation period.

7.0 Analysis of Alternatives

There are various technical alternatives of producing electricity from different energy resources. However, in order to combat with the global warming problem, sustainable and renewable energy resources must be used as much as possible. Karova WF aims at utilizing wind energy, which is a renewable energy, potential of Turkey via wind turbine technology to generate electricity. Hence, the wind farm will not only provide benefit to Turkey by producing electricity but also to global atmosphere by reducing CO_2 emissions.

General Directorate of Renewable Energy (former General Directorate of Electrical Power Resources Survey and Development Administration) evaluated the natural wind energy potential for most parts of Turkey using monthly wind speed and direction data from the State Meteorological Service. As a result of these studies, Turkish Wind Energy Potential Atlas had been prepared in order to evaluate the wind energy potential (REPA, 2007). The location of the Project in Muğla Province is within moderate to high wind energy potential regions in Turkey according to Turkish Wind Energy Potential Atlas. The Project site is selected in this region in order to utilize this wind energy potential in this region.

8.0 Socio-Economic Impacts

This Social Impact Assessment (SIA) aims to build on the existing EIA studies to analyze Project impact. SIA involves the processes of analyzing the intended and unintended socioeconomic and community impacts, both positive and negative, of the Project and will help:

- Understand the potential impacts and manage any change that may occur;
- Predict potential impacts and identify mitigation strategies to minimize adverse impacts.

Broadly speaking, changes may effect: Employment, income, production, way of life, culture, community, social environment, health and well-being, personal and property rights, and fears and aspirations. There may be differential social impacts and the Project may affect different groups differently. Some people may tend to benefit, whereas some may not.

The aim of this study is to define the project affected people and the households, portray the socio-economic features of the project affected households and the project neighborhood; within a social impact assessment framework. Both qualitative and quantitative, a variety of primary methods are used to collect relevant data in this social impact assessment study, which are;

- Statistical data obtained from official resources such as Turkish Statistical Institute and YerelNET,
- Surveys (household questionnaire);
- In-depth interviews with the headmen of the affected villages.

41 people are interviewed in the scope of the study. Household questionnaires are conducted with the male households as a rule, and its natural result, all interviewed people are male with 100% percent. The results of this interview are given in below paragraphs;

The vast majority of the villagers haven’t heard about the Project before. Secondly; they may have seen the masts or the project workers in the field which are their information sources.

Majority of the villagers are inclined with live stocking. When primary livelihood is agriculture, villagers also feed animals for their needs as a secondary livelihood.

Accordingly, villagers are questioned about the presentation, their level of information about the Project and their desired way of gathering information.

A vast majority of the villagers do not feel informed enough about the Project.

When questioned about their desired way of information; the villagers are willing to gather more information from the Project authorities.

Under live stocking; bovine breeding (60.9%) and poultry raising (20.1%) are the most common livelihood activities.

Under cultivation; wheat (57.1%) barley (25%) and oat (10.7%) are the primary agricultural products in the surveyed villages.

A vast majority of the people or a member of their households own land.

Retirement is the main formation of breadwinning in Pınarlıbelen, Yeniköy and Çamarası villages. Other common occupations are woodcraft and farming.

Village local economy/household income depends on income from agriculture and civil service pension, with a much smaller percent.

The majority of the household head are graduates of primary school. The level of literacy is not high in the village.

Each household has approximately 3 members, 1 at minimum and 5 at maximum; which is lower than the Turkey average (3.7).

The family type is generally nuclear family in the village, which can also explain the migration phenomena. Related with the means of the household head ages; the population seems to be aging.

Nearly all of the interviewed villagers have been living in the village since their born.

Majority of the respondents own their houses.

Building material of the vast majority is brick. Stone is also a common construction material.

The vast majority of the insurance owning consists of Farmers Social Insurance Institution. However, all household members do not have their own insurance; this is the current situation for the household head. An important ratio of villagers is insured by Social Security for Artisans and the Self-employed and yet another important ratio does not have any social insurance.

The common/chronic diseases in the villages are; chronic respiratory diseases, KOAH and diabetes. While encountering a health issue; people choose go to see the doctor in Mumcular Province (32%), go to Muğla (32%) or to see their own family physician (28.4%).

The average household income per month is 1,517 TL, which is under the Turkey average hunger limit.

When asked “How do you perceive your household according to your income?” not related with the real amount of income, the vast majority of the respondents perceive themselves earning middle level income. A smaller amount perceive themselves poor.

Bank loan usage is relatively common in the village, due to economic conditions. The type of the loan is the bank loan with a high percent (78.6%)

White goods ownership is one of the basic socio-economic indicators. However, except crucial ones, the villagers do now own any extra or luxury goods.

There is not a common sewage system working in the village properly the interviewed households. Instead, villagers own their own cesspools with a high percent. Discharge of the cesspools depends on the accessibility of the municipal services.

The villagers who are interviewed use fuel wood with a 75% percent. Fuel wood together with coal usage is also common.

There is no regular system in dumping of wastes. Villagers use different methods to get rid of them, vast majority throw their solid waste to the village garbage as a method for disposal. Municipality service is the second and burning is the third common way.

Villagers are asked to define the most important problems they strive to encounter. According to the surveyed house heads, the most important three problems respectively in the village are as the following:

Insufficient drainage system seems to be the first crucial problem being encountered in all surveyed villages.

As a second problem; the importance of insufficient drainage system remains. However; poor roads as an infrastructure problem and unemployment are counted as the other problems.

As can be seen on the tables; some options such as poor road infrastructure, low income and unemployment are repeating themselves, which can be inferred to be seen crucial problems.

There are no villagers met throughout the field study who opposes the Project. But there is a vast majority of people who claims to be uninformed about the Project. A vast majority of the villagers support the project. Besides, there is a group of villagers undecided.

When villagers are asked to mention the most important benefits of the Project, they accept the positive impact of the project on an international level; however, they hardly believe that the project may cause any impact on local levels:

The villagers claim that they are not informed much about the project. However, the informed villagers are still afraid of any harm on their livelihood.

Stakeholder Engagement and Grievance Mechanism

Informative activities concerning the public involvement meeting are held by GTE Carbon. E-mail and faxes are sent before the meeting in order to inform people. Adding to that, the announcement of the meeting was prepared for local newspapers.

A public grievance mechanism will be established for the Project. Any comments or concerns can be brought to the attention of Fina Enerji orally or in writing (by post or e-mail) or by filling in a grievance form.

Social risks are very context specific and could include factors such as:

- Economic changes such as inflationary trends.
- Political changes which may make it difficult to implement particular mitigation measures.
- Unforeseen events such as natural disasters.
- Lack of skilled people to implement mitigation measures.

After the social impact assessment study, it can be stated that basic needs and wills of the villagers are revealed:

- First of all; this study shows that the villagers are in the need of continuous information and public disclosure throughout the life cycle of the Project.

- Second, the villagers deprive of employment opportunities especially for the youngster.

- Any effect on migration is not expected due to the duration of construction works.

- Villages lack of a sufficient drainage system and efficient roads.

- Finally, they want support in social and recreational facility opportunities and cheaper electricity. Some of these demands are not directly related with the project owner, however, all of the demands are tried to be reflected. Providing the rest is based upon the resources and the availability of the firm.

General recommendations are provided below.

Both in the construction and operation phases; some recommendations can be stated as follows:

General recommendations;

- Screening the potential socio-economic impacts within the wind energy value chain
- Assessing impacts on tourism, if any; and maximizing the tourism potential of the development of the wind farm.
- Improving the quality of studies by asking specialists to undertake socio-economic studies, complementary to the EIA lead consultancy.

Entrenched perceptions:

- Raising awareness and communicating with factual information.
- Avoiding, minimizing and managing noise impacts.
- Using appealing ways to disseminate a broad positive communication on wind energy.

Proximity to housing:

- Mapping of most suited sites to avoid landscape saturation.
- Raising awareness and communicating with factual information.
- Assessing the visual impacts of the wind farm.
- Integrating wind turbines in the landscape.
- Careful siting and pre-construction assessment with respect to human activities especially residential development to minimize impacts.
- Avoiding, minimizing and managing noise impacts.
- Developing clear, transparent spatial planning to improve social acceptance.

Benefit schemes:

- Creating and maintaining up-to-date and complete websites, social media networks and newsletters about the project and its environmental and economic impacts and benefits to the locality.
- Communicating positively on local initiatives: from cooperatives, local authorities, associations.
- Supporting and helping local community participation in wind energy projects to increase citizen ownership and secure equitable profit sharing.
- Facilitating the implementation of conditions enabling an equitable distribution of benefits.
- Using the profits from wind energy as leverage for developing other RE projects.

Involvement of local community:

- Securing a positive dialogue between the project promoter, the consenting authorities and the communities.
- Fostering early communication between project developer, local communities and economic actors.
- Creating and maintaining up-to-date and complete websites, social media networks and newsletters about the project and its environmental and economic impacts and benefits to the locality.
- Raising awareness and communicating with factual information.
- Providing detailed information on local benefits.
- Organizing events around wind energy.
- Communicating positively on local initiatives: from cooperatives, local authorities, associations.
- Supporting and helping local community participation in wind energy projects to increase citizen ownership and secure equitable profit sharing.
- Developing clear, transparent and strict rules as a frame for the consenting process, to improve social acceptance.
- Facilitating the implementation of conditions enabling an equitable distribution of benefits.
- Using the profits from wind energy as leverage for developing other RE projects.
- Finding the right balance securing both community involvement and efficient wind farm development.

Sustainable development:

- Maximizing the tourism potential of the development of the wind farm.
- Considering compatibility with other human activities.
- Fostering early communication between project developer, local communities and economic actors.
- Creating and maintaining up-to-date and complete websites, social media networks and newsletters about the project and its environmental and economic impacts and benefits to the locality.
- Providing detailed information on local benefits.
- Avoiding, minimizing and managing noise impacts.
- Include socio-economic criterions while granting the permits.
- Considering socio-economic impact assessments in EIAs.

- Monitoring and evaluating socio-economic impacts to track and understand changes to local communities.

For better engagement and corporate communications:

- Organizing events around wind energy.
- Assessing the visual impacts of the wind farm.
- Avoiding, minimizing and managing noise impacts.
- Communicating positively on local initiatives: from cooperatives, local authorities, associations.
- Supporting and helping local community participation in wind energy projects to increase citizen ownership and secure equitable profit sharing.
- Developing clear, transparent and strict rules as a frame for the consenting process, to improve social acceptance.
- Developing clear, transparent spatial planning to improve social acceptance.

Facilitating the implementation of conditions enabling an equitable distribution of benefits.