# ANNEX-1
# ECOSYSTEM EVALUATION REPORT

# HİLAL-2 WIND POWER PLANT PROJECT

# ECOSYSTEM EVALUATION REPORT

**JUNE, 2016**

**ANKARA**

# HİLAL-2 WIND POWER PLANT PROJECT

## ECOSYSTEM EVALUATION REPORT

| Version | Revision | Date | Prepared by | | Checked by | Approved by |
|---|---|---|---|---|---|---|
| Final | C.1 | 28 June 2016 | Şafak Bulut<br>Mammologist &<br>Bat Expert | Dr. Okan Ürker<br>Ecologist & Ornithologist | Turgay Eser<br>Environmental Engineer | G. Ozenirler<br>Environmental Engineer<br>M.S. |
| | | | | | | |

*Revision Codes: A: Draft, B: Final Draft, C: Final*

**Project No: 16/007**

**June 2016**

**Client:**

SANKO ENERJİ

SANKO Rüzgar Enerjisi Sanayi ve Ticaret A.Ş.
HİLAL-2 RES Şubesi
Elmadağı Köyü Sayharmankırı Mevkii
Merkez İlçe – KARAMAN / TÜRKİYE
☎: +90 338 266 2096
🖷: +90 338 266 2077

**Consultant:**

2U1K Mühendislik ve Danışmanlık A.Ş.

Tepe Prime İş ve Yaşam Merkezi
Mustafa Kemal Mahallesi Dumlupınar
Bulvarı No:266 C Blok Kat:5 Daire:73
Çankaya – ANKARA / TÜRKİYE
☎: +90 (312) 287-2507
🖷: +90 (312) 295-6200

## TABLE OF CONTENTS



## LIST OF TABLES

## LIST OF FIGURES



## LIST OF PHOTOS



## ANNEX:

# 1 INTRODUCTION

Hilal-2 Wind Power Plant (Hilal-2 WPP) Project which is at the stage of operation by Sanko Rüzgar Enerjisi Sanayi ve Ticaret A.Ş. The Project is located within the border of Karaman Province in middle-southern Turkey.

This Report presents an ecological assessment of the Hilal-2 WPP Site and its environs. Given the types of Project impacts, the Report focuses on flora and vegetation elements as well as fauna and ornithological evaluations. As another significant valued ecosystem component, possible impacts on bats are discussed separately in the Bat Assessment Report, attached as an annex of this Report (See Annex-A).

The Rapid Ecological Assessment has been conducted in accordance with the World Bank Operational Policy on Natural Habitats (OP 4.04) and IFC's Performance Standard 6 (Biodiversity Conservation and Sustainable Management of Living Natural Resources), which have been guided by the Convention on Biological Diversity.

# 2 METHODOLOGY

The methodology for the ecosystem assessment is comprised of literature surveys and site observations. A comprehensive search was carried out in order to determine the wildlife species in and around the Project site.

A series of literature sources have been reviewed for different types of species. The most significant sources referred are highlighted below:

Birds:

- Birds of Turkey and Europe: Guidebook (Heinzel et al., 1995),
- Songbirds of Turkey: Atlas of Biodiversity of Turkish Passerine Birds (Roselaar, 2000),
- Birds Data from Turkey's Important Nature Areas (Doğa Derneği, 2004).

Amphibians and Reptiles:

- IUCN redlist (www.redlist.org),
- Lists of Biltek, TUBİTAK,
- Turkish Herpetofauna, Baranand Atatür, 1998
- Taxonomic Revision and Geographic Distribution of Turkish Snakes, Baran, İ. 1976.

In the scope of the terrestrial fauna study; butterflies, amphibians, reptiles, birds and mammals were identified within the Project site and its environs. In addition to that, the habitats of the fauna elements have been reviewed.

Mammals

- "Vertebrates of Turkey, Mammals, Demirsoy, 1996.
- Türkiye'nin Av ve Yaban Hayvanları, Memeliler (Turan, 1984),
- IUCN Redlist (2009) www.redlist.org,
- Mammals of Turkey and Cyprus : introduction, checklist, insectivora (Kryštufek B, Vohralik V. 2001),
- Mammals of Turkey and Cyprus, Rodentia I : Sciuridae, Dipodidae, Gliridae, Arvicolinae (Kryštufek B, Vohralik V. 2005)
- Mammals of Turkey and Cyprus, Rodentia II : Cricetinae, Muridae, Spalacidae, Calomyscidae, Capromyidae, Hystricidae, Castoridae. (Kryštufek B, Vohralik V. 2009)

During the field studies, EUNIS and Habitat Directive's Codes have been taken into account when ranking the habitat types and ecosystem assessments.

Before the field assessments, availability of relevant data has been checked, in terms of published records of reasonably recent surveys, satellite images, etc. The methodology included the working topics below.

- Identification of Habitat and Vegetation Descriptions
- Identification of Major Ecological and Environmental Features
- Assessment of Major Threats
- Identification of Protection Status
- Identification of No-Go Areas

As a result of literature surveys and site observations, specific measures have been recommended to avoid/reduce/mitigate potential negative impacts on the (non-critical) natural habitats (e.g. recommendations for location or design of infrastructure, monitoring measures and thresholds for acceptable change, etc. to extent possible (at rapid assessment level). We used the ecological corridor approach for planning alternative measures.

Cumulative Impacts of the other projects (wind farm, energy, infrastructure, highways, transmission lines, railways etc.) have been taken into consideration as well.

# 3 RESULTS

## 3.1 Vegetation

In order to determine the flora elements, endemic and rare plant species and vegetation properties within the Project site and its vicinity, botanical surveys were coordinated by PhD Ecologist Okan Ürker (See **Photo 1**).

Photo 1. Site Surveys General for Plants Ecology and Vegetation

The results are supported by detailed literature survey. This section includes the ecological and botanical assessment, the flora inventory, characteristics of their vegetation and the conservation status.

The terrestrial ecosystem in the project area is represented mainly by steppe ecosystem. This ecosystem is formed under the effects Mediterranean and terrestrial climate.

Hilal-2 WPP Project area is located in the intersection of Irano-Turanian and Mediterranean Phytogeographical Zone. For that reason the endemism rate is very high. In the field surveys

a total of four vegetation types: forest, rocky shrub, frigana and steppe vegetations are observed in the Project area. These vegetation types are generally develops in these types of soils of which main source is lime.

Most of the Project area is used as pasture land. Since animal farming is quite common in the region, grazing pressure is high in the region. The dominant vegetation type in the Project area is steppe and the pastures that provide suitable conditions for grazing.

Steppe and forest vegetation communities exist in the Sertavul-Karaman region which is a mountain passage that connects Central Taurus to Central Anatolia. Sub-alpine mountain step vegetation is found in Sertavul passage at altitudes of 1600-1650 m. The forest vegetation which is dominated by *Juniperus excelsa* in the region of the Project site is mainly covered by rocky lime soils (See **Photo 2**).

Photo 2. Juniper Trees Around the Site

The second dominant forest vegetation which is represented by *Pinus nigra* subs. *pallasiana* and *Juniperus drupacea* in around the Project site as Elmadağ, Ağaçyurdu, Değirmenbaşı, Kozlubucak villages respectively to the Central Anatolia and at 1350-1550m heights follows this (See **Photo 3**).

Photo 3. Mixed Forest Vegetation

The passage areas where the forest vegetation is disturbed include shrubs textured grassy steppe vegetation which is sparsly distributed short *Juniperus oxycedrus* subsp. *oxycedrus* bushes. Finally, *Thymus spyleus, Astragalus sp.* dominated herbaceous step vegetation follows in Central Anatolia plateu plains in Karaman region (Vural, 1981).

The steppe vegetation is represented by dwarf bushes and herbaceous species dominated plains and low altitude mountains and dwarf shrubs, thorny cushions in subalpine and alpine areas.

The steppe vegetation with thorny cushions in subalpine and alpine areas is generally dominated by *Astragalus* sp. It is represented by *Sileno-Pterocephaletum pinardii* alliance the north of Ermenek at 1500-1600m height. In addition to this, it is represented by *Sileno- Pterocephaletum onobrychidetosum* suballiance from the same alliance at the stony ridges in the Sertavul Passage and between 1600-1700m heights (Akman *et al.* 1996). *Sileno- Pterocephaletum onobrychidetosum* suballiance expands in the rocky and stony places in the Sertavul Pass at limestone bedrock in the 1630-1680 m height (See **Photo 4**).

Photo 4. Step Vegetation Dominant Around the Project Site

The indicator species in step vegetation are Pterocephaletum pinardii, Silene ermenekensis, Onobrychis cornuta, Thymus cherlerioides subs. cherlerioides, Lamium garganicum, Ajuga chamaepitys, Saxifraga trachidactylites, Erodium amenum, Asphodeline taurica, Ebenus longipes (Akman et al. 1996). The alliance has 25-35 cm long single layer vertical structure. In the south and southwest of the pass, the 0.50-1.5 m long bushes can be seen dispersedly. These shrubs are Berberis crataegina, Juniperus oxycedrus subs. oxycedrus, Cotoneaster nummularia and Juniperus excelsa (Vural, 1981).

The other vegetation, riverine vegetation was observed the small creeks that connect Han Dere which is the closest water resource to the Project site. The homogeneity of the vegetation changes according to the season: the drying out of these small creeks in summer. It is indicated that in the dry season where the water level decreases *Tamarix smyrnensis, Nerium oleander* and *Vitex agnus-castus* dominated plant communities occur, whereas the main riverbad there is a population dominated by *Populus euphratica* and *Salix alba* subsp*. coerulea* (Vural, 1981).

Although the Project area and surroundings are designated as forest lands, these areas do not have forest characteristics, but include solitary trees dispersed in the area.

Apart from thorny cushions subalpine mountain steppe in the project area, other areas that vegetations are present in riverine and semi-dry riverbeds which are also important for fauna species. The steppe vegetation in the project area holds many site specific endemics.

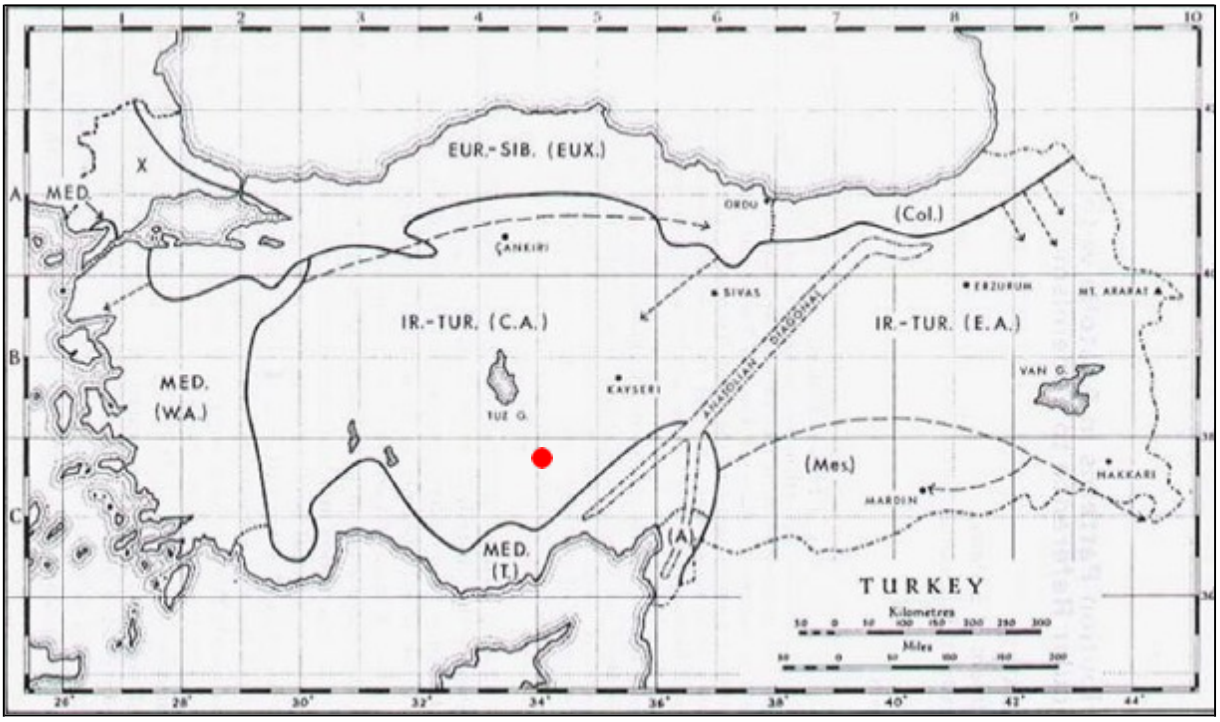
As a result of site visit and literature search, we can say that the region of the project area acts as a habitat for native plant and animal species. We can not rank the the region as Critical Natural Habitat as there are no legally protected areas officially proposed for protection, or unprotected but of known high conservation values.

Photo 5. Gardens and Vineyards Around the Project Site

## 3.2 Floristic Analysis

Anatolia has been divided into three main phyto-geographical regions: The European- Siberian (Black Sea), Iran-Turan (Central, Eastern and Southeastern Anatolia Regions) and Mediterranean (Aegean and Mediterranean Regions) Phyto-geography (Atalay, 1994).

The borders of the Mediterranean Phyto-geographical Region extend through Sertavul Pass and hereafter, Iran-Turanian flora is observed. Therefore, Sertavul Pass is also a transition zone for flora. The Project area, represented with the red dot in **Figure 1** is located in the junction of Mediterranean Phyto-geographical Region and Iran Turanian Phyto-geographical Region.

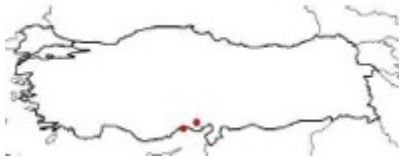


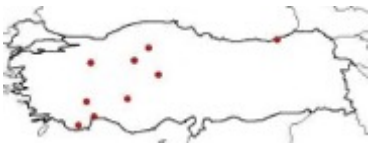

(Source: Davis P.H., Harper P.C. and Hege I.C. (eds.), 1971. Plant Life of South-West Asia. The Botanical Society of Edinburg)

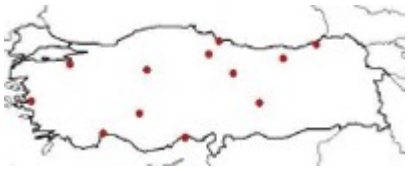
Figure 1. The Project Area and Phyto-geographical Regions of Turkey

The Project area lies within the C4 square according to P. H. Davis Grid System. According to the field studies that were conducted in April 2016, 157 species which belong to 39 familia were identified, and 29 of these species are listed as endemic (Ecosystem Evaluation Report, 2016), as listed in Table 1. List of the plant species in the Project Site is given in Table 2.

Table 1. List of the Endemic Flora Species in the Project Site

| | Scientific name | Conservation status | General info |
|---|---|---|---|
| ACANTHACEAE | | | |
| 1 | Acanthus dioscoridis var. perringii<br><br>IUCN:-<br>BERN:-<br>CITES:-<br>Endemic |  | Life form : Perennial<br>Structure : Herbaceous<br>Flowering : May- August<br>Altitude: 1300-2200m<br>Phytogeographical zone: not known<br>Habitat: Volkanic rocks, cliffs, limestone soil, hills, fallowing land<br>Distribution: South Anatolia |
| APIACEAE | | | |
| 2 | Eryngium polycephalum<br><br>IUCN:-<br>BERN:-<br>CITES:-<br>Endemic |  | Life form : Perennial<br>Structure : Herbaceous<br>Flowering : July- August<br>Altitude: 1450-1850m<br>Phytogeographical zone: Iran-Turanian<br>Habitat: steps<br>Distribution: South Anatolia |
| 3 | Ferulago pauciradiata<br><br>IUCN:-<br>BERN:-<br>CITES:-<br>Endemic |  | Life form : Perennial<br>Structure : Herbaceous<br>Flowering : June- August<br>Altitude: 200-1850m<br>Phytogeographical zone: Iran-Turan<br>Habitat: Mountain Steppe<br>Distribution: Terrestial and South Anatolia |
| ASTERACEAE | | | |
| 4 | Anthemis pauciloba var. sieheana<br><br>IUCN:-<br>BERN:-<br>CITES:-<br>Endemic |  | Life form : Perennial<br>Structure : Herbaceous<br>Flowering : April-july<br>Altitude: 500-1700m<br>Phytogeographical zone: E. Mediterranean<br>Habitat: Limestone rifts and edges, marl shores, disturbed steppe<br>Distribution: South Anatolia |
| 5 | Hieracium leucothecum<br><br>IUCN:-<br>BERN:-<br>CITES:-<br>Endemic |  | Life form : Perennial<br>Structure : Herbaceous<br>Flowering : June- July<br>Altitude: 1340-1960m<br>Phytogeographical zone: E. Mediterranean (mountain)<br>Habitat: rocky cliffs, steppe<br>Distribution: Western and South Anatolia |
| BORAGINACEAE | | | |

| | | | |
|---|---|---|---|
| 6 | Paracaryum ancyritanum<br><br>IUCN:-<br>BERN:-<br>CITES:-<br>Endemic |  | Life form : 2 years<br>Structure : Herbaceous<br>Flowering : June-July<br>Altitude: 500-1500m<br>Phytogeographical zone: Iran-Turanian<br>Habitat: steppes, Serpantine, calcerous and slopes, following fields<br>Distribution: Northern and Central Anatolia |
| BRASSICACEAE | | | |
| 7 | Alyssum praecox var. praecox<br><br>IUCN:-<br>BERN:-<br>CITES:-<br>Endemic |  | Life form : Perennial<br>Structure : Herbaceous<br>Flowering : June- July<br>Altitude: 1500-2600m<br>Phytogeographical zone: not known<br>Habitat: rocky cliffs<br>Distribution: Northern, Western,Southern and Eastern Anatolia |
| CAMPANULACEAE | | | |
| 8 | Asyneuma limonifolium subsp. pestalozzae<br><br>IUCN:-<br>BERN:-<br>CITES:-<br>Endemic |  | Life form : Perennial<br>Structure : Herbaceous<br>Flowering : June- July<br>Altitude: 400-2400m<br>Phytogeographical zone: not known<br>Habitat: steppes, meadows, rocky cliffs<br>Distribution: Southern, Western and Central Anatolia |
| CARYOPHYLLACEAE | | | |
| 9 | Arenaria acerosa<br><br>IUCN:-<br>BERN:-<br>CITES:-<br>Endemik |  | Life form : Perennial<br>Structure : semi-shrub<br>Flowering : June-August<br>Altitude: 1350-2450m<br>Phytogeographical zone: Iran-Turan<br>Habitat: stony slopes<br>Distribution: Eastern, Western, Central ans Southern Anatolia |
| 10 | Minuartia anatolica var. arachnoidea<br><br>IUCN:-<br>BERN:-<br>CITES:-<br>Endemic |  | Life form : Perennial<br>Structure : Herbaceous<br>Flowering : May-July<br>Altitude: 500-1400m<br>Phytogeographical zone: Iran-Turan<br>Habitat: stony places in steppes<br>Distribution: Central Anatolia |

| | | | |
|---|---|---|---|
| 11 | Silene ermenekensis<br><br>IUCN:-<br>BERN:-<br>CITES:-<br>Endemic |  | Life form : Perennial<br>Structure : Herbaceous<br>Flowering : May-June<br>Altitude: 1600-1700m<br>Phytogeographical zone: E. Mediterranean<br>Habitat: *Juniperus excelsa* forest openings, rocks and stony slopes<br>Distribution: Southern Anatolia (Cilician) |
| EUPHORBIACEAE | | | |
| 12 | Euphorbia cardiophylla<br><br>IUCN:-<br>BERN:-<br>CITES:-<br>Endemic |  | Life form : Perennial<br>Structure : Herbaceous<br>Flowering : March-June<br>Altitude: 0-2100m<br>Phytogeographical zone: not known<br>Habitat: Pinus forest openings, *Abies cilicica* forest, Quercus bushes, steppe and cliffs<br>Distribution: Southern, Northern and Central Anatolia |
| FABACEAE | | | |
| 13 | Astragalus chrysochlorus<br><br>IUCN:-<br>BERN:-<br>CITES:-<br>Endemic |  | Life form : Perennial<br>Structure : Herbaceous<br>Flowering : May-June<br>Altitude: 900-2530m<br>Phytogeographical zone: not known<br>Habitat: oak shrubs, mountain steppe, rocky Distribution: Southern Anatolia |
| 14 | Ebenus longipes<br><br>IUCN:-<br>BERN:-<br>CITES:-<br>Endemic |  | Life form : Perennial<br>Structure : Woody Herbaceous<br>Flowering : June-August<br>Altitude: 1100-2000m<br>Phytogeographical zone: Iran-Turan<br>Habitat: stony slopes<br>Distribution: Central and Southern Anatolia |
| 15 | Genista involucrate<br><br>IUCN:-<br>BERN:-<br>CITES:-<br>Endemic |  | Life form : Perennial<br>Structure : Shrub<br>Flowering : June-July<br>Altitude: 600-1500m<br>Phytogeographical zone: Iran-Turan<br>Habitat: shrubs, coniferous forests, limestone rocks and grazed slopes<br>Distribution: Central and Southern Anatolia |

| | | | |
|---|---|---|---|
| 16 | Astragalus acicularis<br><br>IUCN:-<br>BERN:-<br>CITES:-<br>Endemic |  | Life form : Perennial<br>Structure : Shrub<br>Flowering : June-July<br>Altitude: 1200-2200m<br>Phytogeographical zone: Iran-Turanian<br>Habitat: slopes<br>Distribution: Central Anatolia |
| 17 | Anthyllis vulneraria subsp. variegate<br><br>IUCN:-<br>BERN:-<br>CITES:-<br>Endemic |  | Life form : anual-two year or Perennial<br>Structure : Herbaceous<br>Flowering : June-July<br>Altitude: 1380-2000m<br>Phytogeographical zone: E. Mediterranean (Mount)<br>Habitat: rocky slopes<br>Distribution: Southern Anatolia |
| LAMIACEAE | | | |
| 18 | Phlomis capitata<br><br>IUCN:-<br>BERN:-<br>CITES:-<br>Endemic |  | Life form : Perennial<br>Structure : Herbaceous<br>Flowering : June- August<br>Altitude: 540-2400m<br>Phytogeographical zone: Iran Turanian<br>Habitat: steppes, oak shrubs, calcerous rocks, rocky cliffs<br>Distribution: Southern Anatolia |
| 19 | Thymus cherlerioides var. cherlerioides<br><br>IUCN:-<br>BERN:-<br>CITES:-<br>Endemic |  | Life form : Perennial<br>Structure : Shrub<br>Flowering : June-August<br>Altitude: 1600-2600m<br>Phytogeographical zone: E. Mediterranean<br>Habitat : open rocky and gravel<br>Distribution: Western and Southern Anatolia |
| 20 | Marrubium globosum subsp. globosum<br><br>IUCN:-<br>BERN:-<br>CITES:-<br>Endemic |  | Life form : Perennial<br>Structure : Herbaceous<br>Flowering : April-August<br>Altitude: 800-2500m<br>Phytogeographical zone: Iran-Turanian<br>Habitat: rocky slopes<br>Distribution: Southern and Central Anatolia |
| IRIDACEAE | | | |

| | | | |
|---|---|---|---|
| 21 | Crocus biflourus subsp. isauricus<br><br>IUCN:-<br>BERN:-<br>CITES:-<br>Endemic |  | Life form : Perennial<br>Structure : Herbaceous<br>Flowering : February-June<br>Altitude: 200-3000m<br>Phytogeographical zone: E. Mediterranean<br>Habitat: shrubs, coniferous woodland and rocky slopes<br>Distribution: Southern Anatolia |
| LILIACEAE | | | |
| 22 | Ornithogalum alpigenum<br><br>IUCN:-<br>BERN:-<br>CITES:-<br>Endemic |  | Life form : Perennial<br>Structure : Herbaceous<br>Flowering : July<br>Altitude: 0-2300m<br>Phytogeographical zone: E. Mediterranean<br>Habitat: hills, steppes, forests<br>Distribution: Southern and Southwestern Anatolia |
| RHAMNACEAE | | | |
| 23 | Rhamnus hirtellus<br><br>IUCN:-<br>BERN:-<br>CITES:-<br>Endemic |  | Life form : Perennial<br>Structure : Shrub<br>Flowering : March-May<br>Altitude: 30-1300m<br>Phytogeographical zone: Iran-Turan<br>Habitat: dry slopes, shrubs<br>Distribution: Central Anatolia |
| RUBIACEAE | | | |
| 24 | Galium cilicicum<br>IUCN:-<br>BERN:-<br>CITES:-<br>Endemic |  | Life form : Perennial<br>Structure : Herbaceous<br>Flowering : June- August<br>Altitude: 1250-2700m<br>Phytogeographical zone: E. Mediterranean (Mountain)<br>Habitat: steppes, rocks, fractured rock<br>Distribution: Southern and neighbouring Central Anatolia |
| RUTACEAE | | | |
| 25 | Haplophyllum myrtifolium<br><br>IUCN:-<br>BERN:-<br>CITES:-<br>Endemic |  | Life form : Perennial<br>Structure : Herbaceous<br>Flowering : May-June<br>Altitude: 750-2150m<br>Phytogeographical zone:Iran-Turanian<br>Habitat: steppes, rocky Limestone or volcanic slopes<br>Distribution: Western, Cental, Southern and Easten Anatolia |
| SCROPHULARIACEAE | | | |

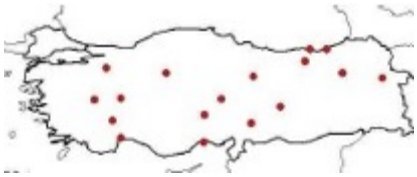
| | | | |
|---|---|---|---|
| 26 | Linaria corifolia<br><br>IUCN:-<br>BERN:-<br>CITES:-<br>Endemic |  | Life form : Perennial<br>Structure : Herbaceous<br>Flowering : May-August<br>Altitude: 0-2200m<br>Phytogeographical zone:Iran-Turanian<br>Habitat: steppes, rocky Limestone slopes, following fields<br>Distribution: Anatolia (apart from western, northeastern, extreme Eastern and Mezopotamia |
| 27 | Verbascum tossiense<br><br>IUCN:-<br>BERN:-<br>CITES:-<br>Endemic |  | Life form : two years<br>Structure : Herbaceous<br>Flowering : May- July<br>Altitude: 80-1700m<br>Phytogeographical zone: Iran-Turanian<br>Habitat: Quercus shrubs, steppes, vineyards<br>Distribution: Northern and Central Anatolia |
| PAPAVERACEAE | | | |
| 28 | Corydalis wendelboi<br><br>IUCN:-<br>BERN:-<br>CITES:-<br>Endemic |  | Life form : perennial<br>Structure : Herbaceous<br>Flowering : April - June<br>Altitude: 900-2000m<br>Phytogeographical zone: Unknown<br>Habitat: Shrubs, rocky slopes<br>Distribution: Southern and Southwestern Anatolia |
| GERANIACEAE | | | |
| 29 | Erodium amenum<br>IUCN:-<br>BERN:-<br>CITES:-<br>Endemic |  | Life form : perennial<br>Structure : Herbaceous<br>Flowering : May - August<br>Altitude: 1100-2900m<br>Phytogeographical zone: Unknown<br>Habitat: Rocky slopes<br>Distribution: North, Central, East and Southern Anatolia |

Table 2. List of the Possible Plant Species at the Project Site

| | Species | Common Name | Habitat | Endemism | Phyto-Geographical Region | IUCN TDB |
|---|---|---|---|---|---|---|
| | ACANTHACEAE | | | | | |
| 1 | Acanthus dioscoridis var.perringii | Bear's breeches | Volkanic rocks, cliffs, limestone soil, hills, fallowing land | + | - | VU |
| | ASPLENIACEAE | | | | | |
| | Asplenium trichomanes | Spleenwort | Between Rocks | - | E. Mediterranean | |
| | PINACEAE | | | | | |
| 3 | *Pinus nigra* Arn. ssp. *pallasiana* (Lamb.) Holmboe | Blackpine | Forest | - | - | LC |
| 4 | Pinus brutia Ten. | Redpine | Plantation | - | E. Mediterranean | LC |
| 5 | Cedrus libani A. Rich | Lebanon cedar | Plantation | - | Mediterranean (Mountain) | LC |
| | CUPRESSACEAE | | | | | |
| 6 | Cupressus sempervirens L. | Mediterranean-funeral- Italian Cypress | Slope, Limestone Reef | - | Mediterranean | LC |
| 7 | Juniperus excelsa M.Bieb. | Tall Juniper | Alpine schrubs, Pinewood, Oak Bushes, Maquis | - | - | |
| 8 | Juniperus drupacea Lab. | Juniper, Andız (Turkish name) | Slope, Bushes, Reefs, Forest | - | - | LC |
| 9 | Juniperus oxycedrus L. ssp. oxycedrus | Prickly juniper | Pinewood, Oak Bushes, Maquis | - | - | LC |
| | RANUNCULACEAE | | | | | |
| 10 | Eranthis hyemalis (L.) Salisb. | Winter aconite | Open (Bare) Area | - | - | |
| 11 | Delphinium peregrinum L. | Violet larkspure | Calcareous Slope, Cultivated Land, Vineyard | - | - | |
| 12 | *Anemone blanda* Schott et Kotschy | Eastern blue wood anemone | Rocky Slope, Bushes | - | - | |
| 13 | Thalictrum orientale Boiss. | Meadow-rue | Rocky Slope, Cracks | - | E. Mediterranean | |
| | PAPAVERACEAE | | | | | |
| 14 | Glaucium corniculatum (L.) Rud. Ssp. Corniculatum | Blackspot hornpoppy | Hill Slope | - | - | |

| | Species | Common Name | Habitat | Endemism | Phyto-Geographical Region | IUCN TDB |
|---|---|---|---|---|---|---|
| 15 | Papaver persicum Lindl. Ssp. Persicum | | Debris, Rocky Slope | - | - | |
| 16 | Fumaria cilicica Hausskn. | White ramping-fumitory | Empty Area, Roadside | - | - | |
| 17 | Corydalis wendelboi LIDEN subsp. Wendelboi | Crested lark | Rocky slopes, bushes | + | - | - |
| | PRIMULACEAE | | | | | |
| 18 | Anagallis arvensis L. | | Crop area, riverside, rocky slopes | - | - | |
| | BRASSICACEAE | | | | | |
| 19 | Clypeola jonthlaspi | Disc cress | Ruderal, roadside, empty area | - | - | |
| 20 | Sinapis arvensis L. | Wild mustard, charlock | Roadside, Empty Area | - | - | |
| 21 | Alyssum praecox var. praecox | | Rocky cliffs | + | - | LR(lc) |
| 22 | Iberis taurica DC. | Candytuft | Rocky Slope, Debris | - | - | |
| 23 | Fibigia eriocarpa (DC.) Boiss. | Aspidion | Slope, Bushes, Forest | - | - | |
| 24 | Alyssum strigosum Banks et Sol. Ssp. Strigosum | Madworth sp., hairy alyssum | Degraded Area | - | - | |
| 25 | *Alyssum strigosum* Banks et Sol. Ssp. *Cedrorum* (Schott et Kotschy) Dudley | Madworth sp., hairy alyssum | Rocky Area | - | - | |
| 26 | *Alyssum repens* Baumg. Ssp. *Trichostachyum* (Rupr.) Hayek var. *trichostachyum* (Rupr.) Hayek | | Bushes, Slope, Forest | - | - | |
| 27 | Alyssum mouradicum Boiss. Et Bal. | | Rocky Slope, Open Forest | - | - | |
| 28 | *Arabis caucasica* Willd. ssp. *brevifolia* (Dc.) Cullen | Garden arabis | Reef, Debris | - | E. Mediterranean (Mountain) | |
| 29 | Arabis nova Vill. | | Stony Area | - | - | |
| 30 | Malcolmia chia (L.) Dc. | Hairy rock-cress | Rocky Slope, away from the Sea | - | E. Mediterranean | |

| | Species | Common Name | Habitat | Endemism | Phyto-Geographical Region | IUCN TDB |
|---|---|---|---|---|---|---|
| 31 | Erysimum repandum L. | Spreading treacle mustard, bushy | Slope, Empty Area | - | - | |
| 32 | Noccaea iberida | - | Limestone, rocky areas | - | - | |
| | CISTACEAE | | | | | |
| 33 | *Helianthemum nummularium* (L.) Miller ssp. *tomentosum* (Scop.) Schinz et Thellung | Common rock-rose | Slope, Meadow, Rocky Area | - | - | |
| | VIOLACEAE | | | | | |
| 34 | Viola modesta Fenzl. | Violet | Stony Area, Slope | - | - | |
| 35 | Viola heldreichiana Boiss. | Violet | Rock Cracks, Debris, Slope | - | E. Mediterranean | |
| | POLYGALACEAE | | | | | |
| 36 | Polygala anatolica Boiss. et Heldr. | Sütotu (Turkish name) | Slope | - | - | |
| | CARYOPHYLLACEAE | | | | | |
| 37 | *Minuartia juniperina* (L.) Marie et Petitm. | Sandwort | Rocky Areas | - | - | |
| 38 | Minuartia multinervis (Boiss) Bornm. | | Coppice Forests and Open Grounds | - | - | |
| 39 | Minuartia anatolica var. arachnoidea | | stony places in steppes | + | Iran-Turan | LR(lc) |
| 40 | Telephium imperati L. ssp. orientale (Boiss.)Nyman | | Dry Stony Slopes, Rocky Water Springs, Pinewoods, Oak Bushes | - | - | |
| 41 | Velezia rigida L. | Velezia | Stony Areas, Open Fields | - | - | |
| 42 | Silene italica (L.) Pers. | Italian catchfly | Open Fields, mostly Pinus Nigra Open Fields | - | - | |
| 43 | Silene macrodanta Boiss. | Catchfly | Open Fields | - | - | |
| 44 | Silene ermenekensis | | Juniperus 29ussia forest openings, rocks and stony slopes | + | E. Mediterranean | EN |
| | ILLECEBRACEAE | | | | | |
| 45 | Herniaria incana Lam. | Gray rupturewort | Dry and Stony Areas | - | - | |
| | POLYGONACEAE | | | | | |

| | Species | Common Name | Habitat | Endemism | Phyto-Geographical Region | IUCN TDB |
|---|---|---|---|---|---|---|
| 46 | Rumex tuberosus L. ssp. Tuberosus | Dock | Hillsides, Fields, Forests | - | - | |
| | RHAMNACEAE | | | | | |
| 47 | Rhamnus hirtellus | | dry slopes, shrubs | + | Iran-Turan | LR(lc) |
| | GUTTIFERAE | | | | | |
| 48 | Hypericum lydium Boiss. | Lydian St John's-wort | Rocky Slopes and Pinus Coppice Forests | - | - | |
| | MALVACEAE | | | | | |
| 49 | Althaea 29ussian L. | Rough marsh-mallow | Open Fields | - | - | |
| | GERANIACEAE | | | | | |
| 50 | Geranium macrostylum Boiss. | Cranesbill | Oak, Juniper and Cedar Forests, Mountain Slopes | - | E. Mediterranean | |
| 51 | Geranium asphodeloides Burm. Fil. Ssp. Asphodeloides | Hedgerow Geranium | Forests, Bushes | - | Euro-Siberian | |
| 52 | *Erodium amenum* BOISS. ET KOTSCHY | Storksbill | Rocky and stony slopes | + | - | LR(lc) |
| | FABACEAE | | | | | |
| 53 | Genista albida Willd. | White Genista | Rocky, Generally Calcareous Slopes, Pinus brutia greenwoods | - | - | |
| 54 | Genista involucrate | | shrubs, coniferous forests, limestone rocks and grazed slopes | + | Iran-Turanian | LR(lc) |
| 55 | Astragalus suberosus Banks et Sol. Ssp. Suberosus | Corky milk-vetch | Coppice forests, Fields, Slopes | - | - | |
| 56 | Astragalus chrysochlorus | | oak shrubs, mountain steppe, rocky | + | - | LR(nt) |
| 57 | Astragalus acicularis | | slopes | + | Iran-Turanian | LR(lc) |

| | Species | Common Name | Habitat | Endemism | Phyto-Geographical Region | IUCN TDB |
|---|---|---|---|---|---|---|
| 58 | Cicer pinnatifidum Jaub. Et Spach | | Pinus brutia Forest, Volcanic or limestone Reefs, Active Reefs | - | - | |
| 59 | Ebenus longipes | | stony slopes | + | Iran Turanian | LR(cd) |
| 60 | *Vicia villosa* Roth ssp. *Eriocarpa* (Hausskn.) P. W. Ball | Hairy/winter/sand/ 30ussian vetch | Pinewood | - | - | |
| 61 | Lathyrus laxiflorus (Desf.) O. Kuntze ssp. Laxiflorus | | Forest, Bushes, Shady Coasts | - | - | |
| 62 | Lathyrus cassius Boiss. | | Pinus brutia greenwoods | - | E. Mediterranean | |
| 63 | Anthyllis vulneraria subsp. Variegate | | Rocky slopes | + | E. Mediterranean (mountain) | LR(lc) |
| 64 | Ononis pubescens L. | Downy Rest-harrow | Pine coppice forests | - | Mediterranean | |
| 65 | Trifolium caucasicum Tausch | Caucasian clover | Grassy Areas and Shady Areas on the Mountains | - | - | |
| 66 | Trifolium leucanthum Bieb. | | Grassy Areas, Mountainous Slopes, Open Forest Fields | - | - | |
| 67 | Trigonella brachycarpa (Fisch.) Morris | Fenugreek | Pine Coppice Forests | - | Iran-Turan | |
| 68 | Medicago rigidula (L.) All. Var. rigidula | Tifton bur-clover, Tifton medic | Pine Coppice Forests | - | - | |
| 69 | Dorycnium pentaphyllum Scop. ssp. anatolicum (Boiss.) Gams | Prostrate canary clover, scarillo | Pinus brutia, Pinus Nigra Forest | - | - | |
| 70 | Onobrychis cornuta | Rest harrow | Roadsides, Cedrus-Pinus Coppice Forests | - | - | |
| | ROSACEAE | | | | | |
| 71 | Prunus x domestica L. | Mirabelle plum | Hills, Mountain Slopes, Roadsides | - | - | |
| 72 | Cerasus prostrata (Lab.) Ser.var. prostrata | Mountain cherry | Rocky Areas | - | Mediterranean | |

| | Species | Common Name | Habitat | Endemism | Phyto-Geographical Region | IUCN TDB |
|---|---|---|---|---|---|---|
| 73 | Rubus canescens Dc. var. canescens | Blackberry | Loose Forests, Bushes | - | Euro-Siberian | |
| 74 | Potentilla micrantha Ramond ex Dc. | Pink Barren Strawberry | Forests | - | - | |
| 75 | Orthurus heterocarpus (Boiss) Juz. | | Shady Limestone Rocky Forests, Sub-Juniperus | - | - | |
| 76 | Crataegus orientalis Pallas ex Bieb. var. orientalis | Quick, Hawthorn, Black thorn | Rocky Areas, Forests | - | - | |
| 77 | Crataegus monogyna Jacq. ssp. monogyna | Medlar, hawthorn, Mary's mayflower, common hawthorn | Hillsides, Roadsides | - | - | |
| 78 | Sorbus persica Hedl. | | Juniperus Forest, Rocky Open Slopes, Bushes, Forests, Individual | - | Iran-Turan | LC |
| | APIACEAE | | | | | |
| 79 | Eryngium polycephalum | Slime Mold | steps | + | Iran Turanian | LR(lc) |
| 80 | Ferulago pauciradiata | | Mountain steppe | + | Iran Turanian | LR(lc) |
| 81 | Scandix iberica Bieb. | Hepherd's needle, venus comb | Juniper Bushes | - | | |
| 82 | Scandix pecten-veneris L. | Shepherd's/venus'needle, venus-comb | Pinus Plantations | - | - | |
| 83 | Ferula elaeochytris Korovin | - | Rocky Slopes | - | E. Mediterranean | |
| | ASTERACEAE | | | | | |
| 84 | Inula oculus-christi L. | - | Slope, Forest Open Fields | - | Euro-Siberian | |
| 85 | Filago eriocephala Guss. | Cudweed | Forest Open Fields, Roadsides | - | E. Mediterranean | |
| 86 | *Senecio vernalis* Waldst. et Kit. | Eastern groundsel, spring groundsel | Empty Areas, Slope | - | - | |
| 87 | *Anthemis cretica* L. ssp. *cassia* (Boiss.) Grierson | Mountain dog-daisy | Limestone Spring Areas, between Juniperus or Cedrus | - | - | |
| 88 | Anthemis pauciloba var. sieheana | | Limestone rifts and edges, marl shores, disturbed steppe | + | E. Mediterranean | LR(cd) |

| | Species | Common Name | Habitat | Endemism | Phyto-Geographical Region | IUCN TDB |
|---|---|---|---|---|---|---|
| 89 | Hieracium leucothecum | | rocky cliffs, steppe | + | E. Mediterranean (mountain) | LR(lc) |
| 90 | Achillea falcata L. | Silk-leaved milfoil | Rocky Slope, Pinus Forest | - | Iran-Turan | |
| 91 | Tanacetum cadmeum (Boiss) Heywood ssp. cadmeum | Feverfew | Juniperus-Cedrus Forest, Grassland Calcareous Slope, Field Sides | + | - | LR(lc) |
| 92 | Serratula cerinthifolia (Sm.) Boiss. | | Pinus brutia Forest, Bushes | - | - | |
| 93 | Centaurea triumfettii All. | Spreading Thistle, Squarrose Knapweed | Pinus Forest | - | - | |
| 94 | Crupina crupinastrum (Moris) Vis. | False Saw-wort,Southern Crupina | Pinus brutia Forest Open Fields | - | - | |
| 95 | Xeranthemum inapertum (L.) Miller | Immortelle | Pinus Forest Open Fields | - | - | |
| 96 | *Lapsana communis* L. ssp. *pisidica* (Boiss. et Heldr.) Rech. Fil. | Nipplewort | Forest Open Fields | - | - | |
| 97 | Lapsana communis L. ssp. intermedia (Bieb.) Hayek | Nipplewort | Pinus Forest Open Fields | - | - | |
| 98 | Crepis reuterana Boiss. ssp. reuterana | | Quercus Forest, Pinus Forest, Slope | - | E. Mediterranean | |
| | CAMPANULACEAE | | | | | |
| 99 | Campanula rapunculus L. var. rapunculus | Rampion bellflower | Forests, Bushes | - | - | |
| 100 | *Asyneuma rigidum* (Willd.) Grossh. ssp. *rigidum* | | Forests | - | Iran-Turan | |
| 101 | Asyneuma limonifolium subsp. pestalozzae | | steppes, meadows, rocky cliffs | | | |
| | OLEACEAE | | | | | |
| 102 | Phillyrea latifolia L. | Broad-Leaved Phillyrea | Pinus brutia Forest | - | Mediterranean | |
| | THYMELAEACEAE | | | | | |
| 103 | Daphne sericea Vahl. | Fake Daphne | Maquies, red pine forests | - | E.Mediterranean | |
| | BORAGINACEAE | | | | | |

| | Species | Common Name | Habitat | Endemism | Phyto-Geographical Region | IUCN TDB |
|---|---|---|---|---|---|---|
| 104 | Alkanna orientalis | | Steppe, rocky areas | - | Iran-Turanian | |
| 105 | *Rochelia disperma* (L. Fil.) C. Koch var. *disperma* | - | Juniperus Bushes | - | - | |
| 106 | Buglossoides arvensis | Field Gromwell | calcerous and slopes, following fields | - | - | |
| 107 | Paracaryum ancyritanum Boiss. | | steppes, Serpantine, calcerous and slopes, following fields | + | Iran-Turanian | LR(lc) |
| 108 | Cynoglossum montanum L. | Dog's-tongue | Juniperus Bushes | - | Euro-Siberian | |
| 109 | Onosma tauricum Pallas ex Willd. var. tauricum | Longtube golddrop onosma | Limestone Active Reefs, Pinus and Cedrus Forests | - | - | |
| | SCROPHULARIACEAE | | | | | |
| 110 | Scrophularia catariifolia Boiss. et Heldr. | Figwort | Pinus Nigra greenwoods | - | Iran-Turan | |
| 111 | Scrophularia libanotica Boiss. ssp. libanotica* var. libanotica | Figwort | Rocky Slopes and Rifts | - | E. Mediterranean | |
| 112 | Linaria simplex (Willd.) Dc. | Toadflax | Stony Areas, Fallow Fields | - | Mediterranean | |
| 113 | Veronica orientalis | Fingered speedwell | Pinus forests | - | - | |
| 114 | Linaria corifolia | | steppes, rocky Limestone slopes, following fields | + | Iran-Turanian | LR(lc) |
| 115 | Verbascum tossiense | | Quercus shrubs, steppes, vineyards | + | Iran-Turanian | LR(lc) |
| | LAMIACEAE | | | | | |
| 116 | Ajuga orientalis L. | Oriental Bugle, Eastern Bugle | Bushes | - | - | |
| 117 | *Ajuga chamaepitys* (L.) Schreber ssp. *Chia* (Schreber) Arcangeli var. *chia* | Ground-pine, yellow bugle | Stony Slopes | - | - | |
| 118 | Scutellaria diffusa Bentham | Turkish Skullcap | Pinus Forests | - | E. Mediterranean | |
| 119 | Lamium garganicum | Large red dead-nettle | Shadowy lime rocky slopes | - | - | |

| | Species | Common Name | Habitat | Endemism | Phyto-Geographical Region | IUCN TDB |
|---|---|---|---|---|---|---|
| 120 | Phlomis samia L. | Greek Jerusalem Sage | Pinus and Cedar greenwoods | - | E. Mediterranean | |
| 121 | Phlomis capitata Boiss. | | Steppes, oak shrubs, calcerous rocks, rocky cliffs | + | Iran Turan | LR(lc) |
| 122 | Phlomis pungens Willd. Var. pungens | Prickly 34ontana34m sage | Roadsides, Dry Stony Slopes, Pinus greenwoods | - | - | |
| 123 | Phlomis monocephala P. H. Davis | Jerusalem sage | Cedar, Rocky Calcareous Woods | + | E. Mediterranean | LR(lc) |
| 124 | Marrubium globosum subsp. Globosum | | Rocky slopes | | Iran Turanian | |
| 125 | *Sideritis 34ontana* L. ssp. *Remota* (D'urv.) P. W. Ball ex Heywood | Mountain ironwort | Pinus greenwoods | - | Mediterranean | |
| 126 | *Stachys woronowii* (Schischkin ex Grossh.) R. Mill | - | Juniperus Bushes | - | Iran-Turan | |
| 127 | Calamintha nepeta (L.) Savi ssp. nepeta | White cloud, lesser calamint | Open Regions | - | Mediterranean | |
| 128 | *Thymus cilicicus* Boiss. et Bal. | Sicily Thyme | Open Rocky and Gravely Areas | - | E. Mediterranean | |
| 129 | Thymus cherlerioides var. cherlerioides | | open rocky and gravel | + | E. Mediterranean | LR(nt) |
| 130 | Salvia frigida Boiss. | Sage sp. | Pinus nigra, Juniperus | - | Iran-Turan | |
| 131 | Salvia viridis L. | Green Salvia | Maquies, frigana, rocky slopes | - | Mediterranean | |
| | SAXIFRAGACEAE | | | | | |
| 132 | Saxifraga trachidactylites | Saxifrage | Rocky and stony areas | - | - | |
| | EUPHORBIACEAE | | | | | |
| 133 | Euphorbia kotschyana Fenzl | Spurge sp. | Cedrus Or Juniperus Excelsa Forest Open Fields | - | E. Mediterranean (Mountain) | |

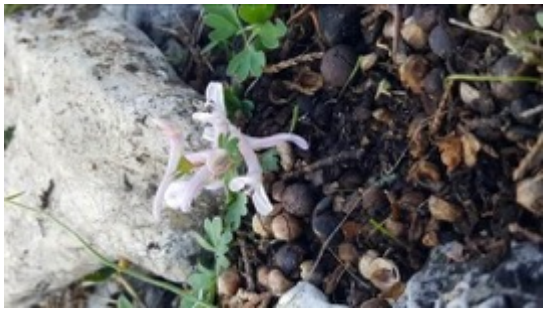
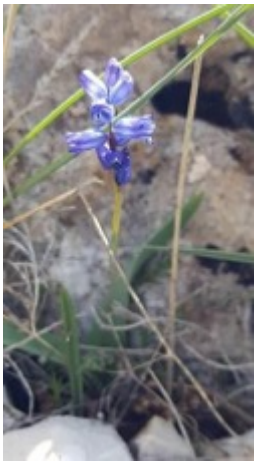
| | Species | Common Name | Habitat | Endemism | Phyto-Geographical Region | IUCN TDB |
|---|---|---|---|---|---|---|
| 134 | Euphorbia cardiophylla | Spurge sp. | Pinus forest openings, Abies cilicica forest, Quercus bushes, steppe and cliffs | + | - | LR(lc) |
| | RUBIACEAE | | | | | |
| 135 | Sherardia arvensis L. | Field madder | Forest Open Fields | - | Mediterranean | |
| 136 | Asperula stricta Boiss. ssp. stricta | Woodruff sp. | Slopes | - | E. Mediterranean | |
| 137 | Galium verum L. ssp. glabrescens Ehrend. | Lady's bedstraw, yellow bedstraw | Rocky Slopes, Bushes, Cultivated Fields | - | Iran-Turan | |
| 138 | Galium cilicicum | | steppes, rocks, fractured rock | + | E. Mediterranean (Mountain) | LR(lc) |
| | RUTACEAE | | | | | |
| 139 | Haplophyllum myrtifolium | | steppes, rocky Limestone or volcanic slopes | + | Iran-Turanian | LR(lc) |
| | ARACEAE | | | | | |
| 140 | *Arum detruncatum* C. A. Meyer virescens (Stapf) K. Alpinar et R. Mill | - | Juniperus Bushes | - | Iran-Turan | |
| | ASPARAGACEAE | | | | | |
| 141 | Asparagus acutifolius L. | Narrow-leaved asparagus | Pine Coppice Forests, Degraded Fields, Roadsides | - | Mediterranean | |
| 142 | Hyacinthella sp. | Mountain hyacinth | Rocky slopes, mountains | - | - | |
| | LILIACEAE | | | | | |
| 143 | *Allium cupani* Rafin. ssp. *hirtovaginatum* (Kunth) Stearn | Onion | Pinus Nigra Forests | - | Mediterranean | |
| 144 | *Allium flavum* L. ssp. *tauricum* (Besser ex Reichb.) Stearn tauricum | Small yellow onion | Pinus brutia, Juniperus, Cedrus greenwoods | - | Mediterranean | |
| 145 | Muscari tenuiflorum Tausch | Forget me not sp. | Pinus Nigra and P.Brutia Forests, Juniper Bushes | - | - | |

| | Species | Common Name | Habitat | Endemism | Phyto-Geographical Region | IUCN TDB |
|---|---|---|---|---|---|---|
| 146 | Gagea sp. | Spiked ornithogalum | Roadsides, meadows, dry steppes | - | - | |
| 147 | Asphodeline taurica (PALLAS) KUNTH | Asphodel | Open forests, Stony meadows | - | E.Mediterranean | |
| 148 | Ornithogalum alpigenum | Ornithogalum | hills, steppes, forests | + | E. Mediterranean | LR(nt) |
| | ORCHIDACEAE | | | | | |
| 149 | Limodorum abortivum | Wild orchid | Mixed foretsts, Maquies | - | - | |
| | IRIDACEAE | | | | | |
| 150 | *Crocus biflorus* Miller ssp. *tauri* (Maw) Mathew | Miss vain | Rocky Slopes, Bushes, Dispersed Coniferous Coppice Forests | - | Iran-Turan | |
| 151 | Crocus biflourus subsp. isauricus | | shrubs, coniferous woodland and rocky slopes | | E. Mediterranean | |
| | CYPERACEAE | | | | | |
| 152 | Carex otrubae Podp. | False fox-sedge | within the Forest | - | Euro-Sibirian | |
| 153 | Carex divulsa Stokes ssp. divulsa | Grey sedge | Forests, Shady and Open Fields | - | Euro-Sibirian | |
| | POACEAE | | | | | |
| 154 | Brachypodium pinnatum (L.) P. Beauv. | Tor-grass | Non-Shady Habitats | - | Euro-Sibirian | |
| 155 | *Elymus hispidus* (Opiz) Melderis ssp. *Barbulatus* (Schur) Melderis | Intermediate Wheatgrass | Black Pine Forest | - | - | |
| 156 | *Milium pedicellare* (Bornm.) Roshev. ex Melderis Apud Rech. Fil. | - | Mountain Slopes, with Juniperus | - | Iran-Turan | |
| 157 | *Stipa bromoides* (L.) Dörfler | Achnatherum bromoides | Bush Open Fields, Stony Areas, on Limestone | - | Mediterranean | |

Photos of some of the floristic elements captured at the Project Site and its environs are presented in Photo 6 below.

| | |
|---|---|
|  |  |
| Clypeola jonthlaspi | Asphodeline taurica |
|  |  |
| Limodorum abortivum | Onobrychis cornuta |
|  |  |
| Alkanna orientalis | Centaurea triumfettii |

| | |
|---|---|
|  |  |
| Daphne sericea | Noccaea iberidea |
|  |  |
| Anagallis arvensis | Asplenium trichomanes |
|  |  |
| Veronica orientalis | Juniperus excelsa |

| | |
|---|---|
|  |  |
| Corydalis wendelboi | Lamium garganicum |
|  |  |
| Buglossoides arvensis | Ajuga chamaepitys |
|  |  |
| Hyacinthella sp. | Saxifraga trachidactylites |

| | |
|---|---|
|  |  |
| Gagea sp. | Viola heldreichiana |
|  |  |
| Anemone blanda | Juniperus oxycedrus |
|  |  |
| Erodium amenum | Ornithogalum alpigenum |

| | |
|---|---|
|  |  |
| Salvia viridis L. | Astragalus sp. |

Photo 5. Some Floristic Elements of the Project Area and Its Vicinity

## 3.3 Faunistic Analysis

### 3.3.1 Butterflies

The Project area is very rich in terms of butterflies. The Sertavul Pass is located in C4 grid according to Koçak (Koçak, 2012), where 77 species are recorded. 1 species from IUCN, 11 species from Turkey Red List and 3 endemics from Red Book of Butterflies in Turkey are evaluated as DD (Data Deficient) and the others are found to be LC (Least Concern). *Polyommatus cilicius*, *Polyommatus sertavulensis* and *Polyommatus wagneri* are the 3 endemics of the region (Karataş, 2012). The main threats for Turkish butterflies are determined in the publication Conservation Strategy for Butterflies in Turkey (2011), Nature Conservation Centre. Wind farms in general may have low risk level for butterflies. The Project area is in the Sertavul Pass Prime Butterfly Area, and conservation measures are given (See Table 3).

Table 3. Important Butterfly Species of the Region and the Project Area

| Scientific name | Conservation status | | | | | | | | Habitat |
|---|---|---|---|---|---|---|---|---|---|
| | Endemic | Near endemic | CR | EN | VU | NT | DD | Natura 2000 | |
| **Papilionidae** | | | | | | | | | |
| ***Papilio alexanor*** | | | | | | | | + | Prefers warm and slopes with intense flowers<br>A spring butterfly, spends winter as pupa<br>Flight: May-July |
| **Lycaenidae** | | | | | | | | | |
| ***Glaucopsyche Astraea*** | + | | | | | | | | Prefers wet meadows, wetlands, riverine vegetation and pine forest openings.<br>Observed till May-June<br>If hgh altitude than 1700 m. till July. |
| ***Pseudophilotes bavius*** | | | | | | | | + | Prefers rocky areas.<br>Flight: April-July |
| ***Polyommatus ossmar*** | + | | | | | | | | Prefers shrubby, stony, dry and semi-dry regions, open habitats.<br>Flight: June-August |
| ***Polyommatus cornelia*** | + | | | | | | | | Observed in rocky slopes and steppes.<br>Flight: May-August |
| ***Polyommatus sertavulensis*** | + | | | | | | + | | Prefers dry, mountain slopes with low densty vegetations<br>Flight: July. |
| ***Polyommatus menalcas*** | + | | | | | | | | Prefers bushes, meadows, dry and semi-dry regions<br>Observed from the beginning of June till the end of August |
| ***Polyommatus mithridates*** | + | | | | | | + | | Prefers warm and dry regions. Stony, rocky slopes.<br>Flight is between July and August |
| ***Polyommatus hopfferi*** | + | | | | | | | | Dry stony meadows, males observed in watersheds, flight is between Juy-August |
| ***Polyommatus poseidon*** | + | | | | | | | | Prefers meadows and water edges<br>Flight is between June and August |
| ***Polyommatus wagneri*** | + | | | | | | + | | Rocky steppes and meadows.<br>Flight time is July |

| Scientific name | Conservation status | | | | | | | | Habitat |
|---|---|---|---|---|---|---|---|---|---|
| | Endemic | Near endemic | CR | EN | VU | NT | DD | Natura 2000 | |
| ***Polyommatus cilicius*** | + | | | | | | + | | Eastern Mediterranean<br>Observed between altitudes 1400-1900 m.<br>Flight time: July |
| **Satyridae** | | | | | | | | | |
| ***Hipparchia mersina*** | | + | | | | | | | Sunny meadows higher than 500 m altitude and edges of pine forests. Flies sunny planted openings in pine forests.<br>Flight: End of May-October. In the southern Turkey, April-end of June; above 500 m altitude observed 1 month later. |
| ***Hipparchia mersina*** | | + | | | | | | | Sunny meadows higher than 500 m altitude and edges of pine forests. Flies sunny planted openings in pine forests.<br>Flight: End of May-October. In the southern Turkey, April-end of June; above 500 m altitude observed 1 month later. |
| ***Pseudochazara Lydia*** | + | | | | | | | | Prefers rocky, dry, relatively low vegetation.<br>Also observed in meadows near the mixed forests Flight: June-August |

### 3.3.2 Amphibians

Amphibians include terrestrial and aquatic salamanders and frogs. Reptilians include tortoises, lizards and snakes. Amphibians and reptiles are poikilothermic animals and it is hard to observe these animals in winter period. The most important elements of amphibians are tailed amphibians (Urodela) which are salamanders and frogs (Anura) which are tailless amphibians. These species need wetlands at least during breeding. Therefore, habitats of amphibians within the Project site were searched in the first hand in the scope of this study. The amphibian species listed in the Project site and its vicinity, their national and international conservation status and information on their population are presented in Table 4 below.

Table 4. Amphibians in the Project Area and its Impact Zone

| Species name | Turkish name | Common name | Habitat | Habitat Directive | Bern |
|---|---|---|---|---|---|
| *Bufo bufo* | Siğilli Kurbağa | Common toad | Nocturnal-moist meadows and forest underlayer | - | Annex-III |
| *Bufo viridis* (*Pseudepidalea viridis*) | Gece Kurbağası | European green toad | Nocurnal- moist meadows and forest underlayer | Annex-IV | Annex-II |
| *Pseudepidalea variabilis* | *Değişken Desenli Gece Kurbağası* | | | | Annex-III |
| *Hyla arborea* | Ağaç Kurbağası | Tree frog | Diurnal-riperian zone, moist environment, on bush and weed | Annex-IV | Annex-II |
| *Rana ridibunda* (*Pelophylax ridibundus*) | Ova Kurbağası | Marsh frog | Diurnal- densely vegetated ponds, lakes and slow fowing waters | - | Annex-III |
| *Rana macrocnemis* | *Uludağ Kurbağası* | The long-legged wood frog | It is mainly found in humid areas included broadleaved, mixed and coniferous forests, swamps, steppes, sub alpine and alpine meadows. | | |

*Bufo bufo* is a widespread and adaptable species present in coniferous, mixed and deciduous forests, groves, bushlands, meadows, arid areas, parks and gardens. It is usually in damp areas with dense vegetation, and large open areas are generally avoided. The species spawns and larval development takes place in still waters and slow-moving parts of rivers and streams. It is present in many modified habitats (IUCN, 2013).

*Bufo viridis* species lives in a wide range of forests, forest steppe, scrubland, grassland and alpine habitats. Animals may be present in modified areas including urban centers (e.g. Bucharest), city parks and gardens - and often benefits from disturbed habitats. Spawning and larval development occurs in a diverse range of temporary and permanent water bodies including swamps, ponds, lakes, pools in streams and rivers, reservoirs, ditches and puddles (IUCN, 2013).

*Hyla arborea* is generally associated with open, well-illuminated broad-leaved and mixed forests, bush and shrublands, meadows, gardens, vineyards, orchards, parks, lake shores and low riparian vegetation. Dark and dense forests are avoided. Populations can tolerate periods of dryness and can be encountered in dry habitats. Spawning and larval development takes place in stagnant waters such as lakes, ponds, swamps and reservoirs, and sometimes in ditches and puddles. The species has been reported from anthropogenic landscapes, including large cities.

*Pelophylax ridibundus* is a highly opportunistic amphibian, living in mixed and deciduous forests, forest steppe, and steppe and other grasslands, semi-desert and desert zones. Arid areas are largely colonized through river valleys and channels. The frog prefers open, well-warmed areas with abundant herbaceous vegetation. It is a semi-aquatic species, inhabiting (and breeding in) a wide variety of flowing and stagnant water habitats, from shallow puddles and ponds to large lakes, reservoirs, rivers and brooks.

*Rana macrocnemis* is mainly found in humid areas included broadleaved, mixed and coniferous forests, swamps, steppes, sub alpine and alpine meadows. In dry areas this species is generally limited to areas close to permanent lakes, rivers, brooks and springs that are often surrounded by dense herbaceous and shrubby vegetation. It breeds in various stagnant and slow-flowing waterbodies.

### 3.3.3 Reptiles

27 reptile species are identified in the region. Among these reptilian species, Spur headed tortoise (*Testudo graeca)* is a protected species in Europe its conservation status according to RDB is VU "Vulnerable". There is one endemic reptile species: *Lacerta danfordi* listed in the Project area. This species is not protected and the conservation status is Least Concern.

Both steppic and riverine species are present in the Project area in accordance with the vegetation variances. Considering the region's herpetofauna; 14 species are in the Strictly Protected Species (Annex II) according to the Bern Convention, and 12 species are in the category of Protected Species (Appendix III). These species are widespread; except *Lacerta danfordi*.

Table 5. Reptilians in the Project Area and its Impact Zone

| SCIENTIFIC NAME | TURKISH NAME | HABİTAT | BERN | IUCN |
|---|---|---|---|---|
| **TESTUDINES** | | | | |
| *Testudo graeca* | Yaygın Kara Kaplumbağası | The forests and forest openings around WFP area | Annex-II | VU |
| AGAMIDAE | | | | |
| *Agama stellio* | Dikenli keler<br>Sling-Tailed Agama | Reefs, stony areas and stone walls | Annex-II | NE |
| *Trapelus lessonae* | Bozkır Keleri | close to rocky areas in semi-arid and steppe habitats | Annex III | LC |
| **SQUAMATA** | | | | |
| **GEKKONIDAE** | | | | |
| *Cyrtopodion kotschyi* | İnce parmaklı keler | Rocky places and walls of buildings | Annex-II | LC |
| *Mediodactylus kotschyi* | İnce Parmaklı Keler | found climbing or on the ground in dry, rocky or stony places. It can be found in scrubland, under the bark of old juniper trees, on cliffs, on stone walls and on the outside and inside of buildings | ANNEX II | LC |
| *Hemidactylus turcicus* | Geniş Parmaklı Keler | shrubland, rocky areas, salt marshes, coastal areas, cliffs, caves, on stone walls in agricultural areas and it is common in urban environments, including inside buildings | Annex III | LC |
| **LACERTIDAE** | | | | |
| *Lacerta viridis* | Küçük yeşilkertenkele | Weeds and bushes in the forests | Annex-II | LC |

| SCIENTIFIC NAME | TURKISH NAME | HABİTAT | BERN | IUCN |
|---|---|---|---|---|
| *Lacerta danfordi* | Toros kertenkelesi Danford's Lizard | Creek banks, forest and bushes, reefs and stony areas | Annex-III | LC |
| *Lacerta laevis* | Hatay kertenkelesi Lebanon Lizard | Loose or dense grassy stony areas and reefs | | LC |
| *Lacerta media* | Ortanca Yeşil Kertenkele | Woodland with a scrub or grassy understory, with stony and rocky areas. Cultivated land, plantations and rural gardens. It is restricted to humid or moist areas in the south of its range. It is often found in trees. | Annex III | LC |
| *Ophisops elegans* | Tarla Kertenkelesi | The forest openings around WFP area | Annex-II | NE |
| *Parvilacerta parva* | Cüce Kertenkele | pland steppe areas with sparse vegetation and stony substrates | ANNEX II | LC |
| **SCINCIDAE** | | | | |
| *Ablepharus kitaibeli* | İnce kertenkele Snake-eyed Skink | short planted open fields, loose greenwoods The forest openingsand moist places | Annex-II | LC |
| *Trachylepis aurata* | Tıknaz Kertenkele | In rocky and well vegetated areas that are often close to water. It can be found in cultivated land, among ruins and in rural gardens | Annex III | LC |
| *Trachylepis vittata* | Şeritli Kertenkele | Open areas of sandy or stony soil with sparse grass or bushy vegetation. Animals may also be found at the edge of fields, on the banks of irrigation canals, or in rural gardens | Annex III | LC |
| *Mabuya aurata* | Tıknaz kertenkele Levant Skink | stony parts of open fields with little plants | Annex-III | LC |
| *Mabuya vittata* | Şeritli kertenkele Bridled Skink | Bushes and stony areas in open and forest lands | Annex-III | LC |
| AMPHISBAENIDAE | | | | |
| *Blanus strauchi* | Kör kertenkele Anatolian Worm-lizard | Stony parts in forest and open fields | Annex-III | LC |
| COLUBRİDAE | | | | |
| *Malpolon insignitus* | Çukurbaşlı Yılan | | Annex III | LC |
| *Elaphe longissima (Zamenis longissimus)* | Eskülap yılanı | Under soil in the forest | Annex-II | LC |
| *Elaphe quatuorlineata* | Sarı yılan | Under soil in the forest, Loose forest and bushes, stony parts, between the gardens | Annex-II | NT |
| *Natrix natrix* | Yarısucul yılan | Meadows close to water | Annex- III | LC |
| *Natrix tesellata* | Su yılanı | In waters and watersides | Annex-II | - |
| *Coluber najadum* | İnce yılan Dahl's Whip Snake | Stony areas, bushes, dry places | Annex-II | LC |

| SCIENTIFIC NAME | TURKISH NAME | HABİTAT | BERN | IUCN |
|---|---|---|---|---|
| *Eirenis aurolineatus* | - | Loose greenwoods and stony parts | Annex- III | E |
| *Dolichophis jugularis* | Kara Yılan | lowland mountain areas in a wide variety of habitats including arid open areas, meadows, rocky and stony regions, swampy areas, open woodland, beaches, vineyards, agricultural land and ruins. | ANNEX II | LC |
| VIPERIDAE (ENGEREKLER) | | | | |
| *Montivipera xanthina* | Şeritli Engerek, Osmanlı Engereği | in Mediterranean scrubland and mountain steppe habitats. It can be found in rural gardens, cultivated land, olive groves and among ruins. | ANNEX II | LC |

### 3.3.4 Mammals

In the scope of the fauna survey, mammals such as insectivores, bats, rodentia, predators, and ungulates and characteristics of their habitats have been investigated. The inventory of mammals formed as a result of site survey and habitat inspections are presented in Table 7. 25 mammal species (except for Bat species) are distributed in and around the Project area. No endemic species are observed (Karataş, 2012). Red Fox (*Vulpes vulpes*), Golden Jackal (*Canis aureus*), Beech Marten *(Martes foina*), Least Weasal (*Mustela nivalis*) and Wild Boar (*Sus scrofa*) naturally occur in the region covering the Project area. The mammal species in the impact zone of the Project area and close vicinity are identified either from the trace, droppings and observations and interviews with local people.

Table 6. Mammals (except bats) in and around the Project Area

| Scientific name | Turkish name | CHC | IUCN | BERN | CITES |
|---|---|---|---|---|---|
| ERINACEOMORPHA | | | | | |
| Erinaceidae | | | | | |
| *Erinaceus concolor* | Kirpi | Annex I | LC | - | - |
| SORICOMORPHA | | | | | |
| SORICIDAE | | | | | |
| *Crocidura suaveolens* | Sivriburunlu Bahçefaresi | - | LC | Annex III | |
| LAGOMORPHA | | | | | |
| LEPORIDAE | | | | | |
| *Lepus europaeus* | Yabani Tavşan | ANNEX III | LC | Annex III | - |
| RODENTIA | | | | | |
| SCIURIDAE | | | | | |
| *Sciurus anomalus* | Sincap | ANNEX I | LC | Annex II | - |

| Scientific name | Turkish name | CHC | IUCN | BERN | CITES |
|---|---|---|---|---|---|
| *Spermophilus xanthoprymnus* | Anadolu Yersincabı | ANNEX I | NT | - | - |
| CRICETIDAE | | | | | |
| *Cricetulus migratorius* | Cüce Avurtlak | | LC | - | - |
| *Mesocricetus brandti* | Türk Avurtlağı | | NT | - | - |
| *Meriones tristrami* | Anadolu Çölfaresi | | LC | - | - |
| *Microtus levis* | Tarlafaresi | | LC | - | - |
| *Microtus guentheri* | Akdeniz Tarlafaresi | | LC | - | - |
| MURIDAE | | | | | |
| *Apodemus mystacinus* | Kaya Faresi | | LC | - | - |
| *Apodemus flavicollis* | Sarıboyunlu Ormanfaresi | | LC | - | - |
| *Apodemus witherbyi* | Ormanfaresi | | LC | - | - |
| *Mus domesticus* | Evfaresi | | LC | - | - |
| *Mus macedonicus* | Sarı Evfaresi | | LC | - | - |
| SPALACIDAE | | | | | |
| *Nannospalax nehringi* | Anadolu Körfaresi | | DD | - | - |
| GLIRIDAE | | | | | |
| *Dryomys nitedula* | Hasancık, Ağaç Yediuyuru | | LC | Annex III | - |
| DIPODIDAE | | | | | |
| *Allactaga williamsi* | Araptavşanı | | LC | - | - |
| HYSTRICIDAE | | | | | |
| *Hystrix indica* | Oklukirpi | | NE | - | - |
| CANIDAE | | | | | |
| *Canis lupus* | Kurt | ANNEX III | LC | Annex II | Annex II |
| *Vulpes vulpes* | Tilki | ANNEX III | LC | - | - |
| MUSTELIDAE | | | | | |
| *Mustela nivalis* | Gelincik | ANNEX III | LC | Annex III | |
| *Martes foina* | Kaya Sansarı | ANNEX III | LC | Annex III | - |
| *Meles meles* | Porsuk | ANNEX III | LC | Annex III | - |
| ARTIODACTYLA | | | | | |
| SUIDAE | | | | | |
| *Sus scrofa* | Yabandomuzu | ANNEX III | LC | - | - |

No endemic or endangered mammal species were found in the Project area in accordance with the IUCN Red List of Threatened Species and Bern Convention.

## 3.4 Birds

In order to determine the bird species within the Project site and its vicinity, ornithological surveys were conducted. The results are supported by detailed literature survey. This section includes the ecological and ornithological assessment, the fauna inventory, characteristics of their habitats and the conservation status.

When the interactions with other habitats evaluated, the springs, wet and dry riverbeds form the ecologically important and sensitive areas in the project area. For this reason protection of these habitats during the operation activities is important. The turbines and the other structures are distant from Çokum Spring, Sarıali Spring and the Sayharman Riverbed.

The altitude of the Project site is 1650 m and the Project area include dense rocky habitats covered by *Juniperus excelsa* (Greek juniper). The region is suitable for *Alectoris chukar and Oenanthe oenanthe*.

In the 2016 field survey, an intense use of passerine birds such as *Petronia petronia, Passer domesticus, Oenanthe oenanthe, Galerida cristata* and *Carduelis carduelis* was reported to be observed. Frequently recorded species during the field surveys were from Alaudidae, Turdidae, Passeridae ve Fringillidae families.

In order to determine avifauna, create a bird inventory and define the ecologic status of bird populations in the Project area an ornithologic survey was conducted in spring migration period in 2016 (April). The relationship between the birds, migration routes and important areas evaluated.

In scope of ornithological and ecological assessment there are additional field observations, interviews that have been performed with the local people and the literature surveys.

In both assessment reports, the site and the species are evaluated using national and international databases and according to national and international requirements. The habitat information of the target species are indicated particularly (See **Table 8**).

The species forming the avian fauna of the Project site and the conservation status of the bird species were evaluated according to the updated lists of the Bern Convention Annexes, the European Red List (ERL) prepared by the IUCN (International Union for the Conservation of Nature) and the national RED DATA BOOK categories, “Turkish Birds Red List” (Kiziroglu, 2008).

Birds and Turkey and Europe: Guidebook (Heinzel et al., 1995), Songbirds of Turkey: Atlas of Biodiversity of Turkish Passerine Birds (Roselaar, 2000), Birds Data from Turkey’s Important Nature Areas (Doğa Derneği, 2004), TRAKUŞ 2016. (www.trakus.org), State of World's Birds: Indicators for Our Changing World (Birdlife International, 2008) are the important sources that are used in bird research.

Most of the bird species were recorded according to visual methods. During the field surveys direct observations, point counts and transect counts were performed and the records are evaluated (See Photo 6).

Photo 6. Bird Observations During the Field Study

The remaining species are identified from their calls. Not only the Project area, but the basin of the Project area is also evaluated. Equipment such as binoculars, telescope and camera are used in the identification. Moreover, interviews were conducted with local people and shepherds.

Table 7. Major Bird Species in and around the Project Area

| Scientific name | Turkish name | Habitat | RDB | IUCN | BIE | BERN | CHC | CITES | STATUS REGIONAL |
|---|---|---|---|---|---|---|---|---|---|
| CICONIIFORMES | | | | | | | | | |
| CICONIIDAE | | | | | | | | | |
| Ciconia nigra | Kara Leylek | inhabits old, undisturbed, open from sea-level up to mountainous regions. It forages in shallow streams, pools, marshes swampy patches, damp meadows flood-plains, pools in dry riverbeds and occasionally grasslands especially where there are stands of reeds or long grass. It generally avoids large bodies of water and dense forest. | A.3 | LC | II | Annex II | Annex I | Annex-II | YZ |
| Ciconia ciconia | Leylek | inhabits open areas, generally avoiding regions with persistent cold, wet weather or large tracts of tall, dense vegetation such as reedbeds or forests, shallow marshes, lakesides, lagoons, flood-plains, rice-fields and arable and especially where there are scattered trees for roosting. | A.3.1 | LC | II | Annex II | Annex I | -- | YZ |
| GRUIFORMES | | | | | | | | | |
| GRUIDAE | | | | | | | | | |
| Grus grus | Turna | Wetlands | A.3 | LC | II | Annex II | Annex I | Annex II | Y,T |
| FALCONIFORMES | | | | | | | | | |
| ACCIPITRIDAE | | | | | | | | | |
| Milvus migrans | Kara çaylak | found ubiquitously throughout habitats, although avoiding | A.3 | LC | III | Annex II | Annex I | Annex-II | T |

| Scientific name | Turkish name | Habitat | RDB | IUCN | BIE | BERN | CHC | CITES | STATUS REGIONAL |
|---|---|---|---|---|---|---|---|---|---|
| | | dense woodland | | | | | | | |
| Circaetus gallicus | Yılan kartalı | a variety of habitats within warm temperate and tropical environments, and is recorded up to 2,300 m | A.4 | LC | III | Annex II | Annex I | Annex-II | YZ |
| Accipiter nisus | Atmaca | Loose greenwoods, agricultural lands with trees | A.3 | LC | IV | Annex II | Annex I | Annex-II | KZ |
| Buteo buteo | Şahin | a wide variety of habitats but requires at least some tree cover for nesting and roosting; ideal habitat appears to be forest edge, or mosaics of forest and open areas | A.3 | LC | IV | Annex II | Annex I | Annex-II | Y |
| Buteo rufinus | Kızıl şahin | open areas, particularly steppe and semi-desert, and has been recorded up to 3,500 m | A.3 | LC | III | Annex II | Annex I | Annex-II | KZ |
| Pernis apivorus | Arı Şahini | a wide variety of habitats but requires at least some tree cover for nesting and roosting; ideal habitat appears to be forest edge, or mosaics of forest and open areas | A.3 | LC | III | Annex III | Annex I | Annex-II | Y |
| Circus cyaneus | Gökçe delice | Mainly marshland, wet, low denity grazed meadows, old fields, wetlands with saline and alkaline peat bogs, highland prairieland, grazing land, agricultural areas, cold desert shrub steppes and the plains of riverine woodlands. Escapes from dense forest. | A.1.2 | LC | | Annex II | Annex I | Annex II | KZ |
| Circus aeruginosus | Saz delicesi | extensive areas of dense marsh vegetation, in fresh or brackish water, generally in lowlands but up to 2,000-300m | A.3 | LC | IV | Annex II | Annex I | Annex-II | Y |

| Scientific name | Turkish name | Habitat | RDB | IUCN | BIE | BERN | CHC | CITES | STATUS REGIONAL |
|---|---|---|---|---|---|---|---|---|---|
| Circus macrourus | Bozkır delicesi | Lives in infrequent herbaceous or dry steppes. The valleys with steppe vegetation and semi deserts. They form huge grups during the migration and wintering areas | A.1.2 | NT | | Annex II | Annex I | Annex II | Y |
| Circus pygargus | Çayır delicesi | Fields, plants, meadows and around marshlands.<br>Depends on wetland and riverine areas | A.1.2 | LC | | Annex II | Annex I | Annex II | T |
| Accipiter brevipes | Yaz atmacası | woody plains, often near water, and usually ranges up to 1,000 m | A.2 | LC | | Annex II | Annex I | Annex II | T |
| Hieraaetus pennatus | Küçük kartal | open woodland, preferring patches of forest interspersed with open areas; it is recorded up to 3,000 m | A.3 | LC | III | Annex II | Annex I | Annex-II | Y |
| Accipiter gentilis | Çakır | Deciduous and coniferous forests | A.1.2 | LC | IV | Annex II | Annex I | Annex II | Y |
| Neophron percnopterus | Küçük akbaba | These vultures are very elastic. They can adapt various habitat types. Can be observed feeding around garbage. The natural distribution inckudes plains, wetlands, pastures and mountains. | A.3 | EN | | Annex II | Annex I | Annex II | Y |
| Aquila pomarina | Küçük orman kartalı | High mountains, rocks, forests. Nest in the rocky cliffs. If the topography is not suitable sometimes nest on pine trees | A.3 | LC | | Annex II | Annex III | | G,T |
| Aquila pennatus | Küçük kartal | High mountains, rocks, forests. Nest in the rocky cliffs. if the topography is not | A.3 | LC | | Annex III | Annex III | Annex II | Y |

| Scientific name | Turkish name | Habitat | RDB | IUCN | BIE | BERN | CHC | CITES | STATUS REGIONAL |
|---|---|---|---|---|---|---|---|---|---|
| | | suitable sometimes nest on pine trees | | | | | | | |
| Aquila chrysaeto | Kaya kartalı | High mountains, rocks, forests. Nest in the rocky cliffs. if the topography is not suitable sometimes nest on pine trees | A.1.2 | LC | | Annex II | Annex I | Annex II | Y |
| FALCONIDAE | | | | | | | | | |
| Falco naumanni | Küçük kerkenez | a colonial breeder, often in the vicinity of human settlements. It forages in steppe-like habitats, natural and managed grasslands, and non-intensive cultivation. | A.2 | VU | I | Annex II | Annex I | Annex-II | T |
| Falco tinnunculus | Kerkenez | Reefs, buildings | A.2 | LC | III | Annex II | Annex I | Annex-II | Y |
| Falco subbuteo | Delice doğan | occurs in open wooded areas, and has been recorded up to 4,000 m | A.3.1 | LC | IV | Annex II | Annex I | Annex-II | YZ |
| Falco peregrinus | Gökdoğan | No main habitat,<br>Generally they prefer hollows in the long rocky place for the formation of nest. | A.1.2 | LC | | | | | |
| GALLIFORMES | | | | | | | | | |
| PHASIANIDAE | | | | | | | | | |
| Coturnix coturnix | Bıldırcın | | A.3 | LC | | Annex III | Annex III | Annex II | T |
| Alectoris chukar | Kınalı keklik | | A.2 | LC | III | Annex II | Annex I | Annex II | Y |
| CORACIIFORMES | | | | | | | | | |
| CORACIIDAE | | | | | | | | | |
| Coracias garrulus | Gök Kuzgun | sparse forests, open areas with woodland or shrub, forest edges | A.2 | NT | -- | Annex II | Annex I | | T |

| Scientific name | Turkish name | Habitat | RDB | IUCN | BIE | BERN | CHC | CITES | STATUS REGIONAL |
|---|---|---|---|---|---|---|---|---|---|
| PICIFORMES | | | | | | | | | |
| PICIDAE | | | | | | | | | |
| Dendrocopos syriacus | Alaca ağaçkakan | Pinewoods | A.2 | LC | -- | Annex II | Annex I | | Y |
| Picus viridis | Yeşil Ağaçkakan Green Woodpecker | Pinewoods | A.2 | | 1 | II | - | | Y |
| Dendrocopos minor | Küçük ağaçkakan | Pinewoods | A.1.2 | LC | -- | Annex II | Annex I | | Y |
| COLUMBIFORMES | | | | | | | | | |
| COLUMBIDAE | | | | | | | | | |
| Columba livia | Kaya güvercini | | A.5 | LC | IV | Annex III | Annex III | -- | Y |
| Streptopelia decaocto | Kumru | | A.5 | LC | IV | Annex III | Annex II | -- | Y |
| Streptopelia turtur | Üveyik | | A.3.1 | LC | III | Annex III | Annex III | -- | T |
| Columba palumbus | Tahtalı güvercin | | A.4 | LC | -- | Annex III | Annex III | | KZ |
| CUCULIFORMES | | | | | | | | | |
| Cuculus canorus | Guguk | Forests, open fields with trees and fences | A.2 | LC | IV | Annex II | Annex I | -- | G |
| STRIGIFORMES | | | | | | | | | |
| STRIGIDAE | | | | | | | | | |
| Athene noctua | Kukumav | | A.2 | LC | III | Annex II | Annex I | Annex II | Y |
| Bubo bubo | Puhu | Widespread reefs and rifts, and sometimes in forests | A.1.2 | | | | | | Y |
| CAPRIMULGIFORMES | | | | | | | | | |
| CAPRIMULGIDAE | | | | | | | | | |
| Caprimulgus europaeus | Çobanaldatan | | A.1.2 | LC | II | Annex II | Annex I | -- | YZ |
| APODIFORMES | | | | | | | | | |
| APODIDAE | | | | | | | | | |

| Scientific name | Turkish name | Habitat | RDB | IUCN | BIE | BERN | CHC | CITES | STATUS REGIONAL |
|---|---|---|---|---|---|---|---|---|---|
| Apus apus | Ebabil | | A.3.1 | LC | IV | Annex III | Annex I | -- | T |
| Tachymarptis melba | Akkarınlı ebabil | | A.3.1 | LC | -- | Annex II | Annex I | | T |
| CORACIIFORMES | | | | | | | | | |
| MEROPIDAE | | | | | | | | | |
| Merops apiaster | Arıkuşu | | A.3.1 | LC | III | Annex II | Annex I | -- | T |
| UPUPIDAE | | | | | | | | | |
| Upupa epops | İbibik | | A.2 | LC | III | Annex II | Annex I | -- | YZ |
| PASSERIFORMES | | | | | | | | | |
| ALAUDIDAE | | | | | | | | | |
| Galerida cristata | Tepeli toygar | | A.3 | LC | III | Annex III | Annex II | -- | Y |
| Melanocorypha calandra | Boğmaklı toygar | | A.5 | LC | | Annex II | Annex I | -- | Y |
| Calandrella brachydactyla | Bozkır toygarı | | A.3 | LC | | Annex II | Annex I | -- | YZ |
| Lullula arborea | Orman toygarı | | A.3 | LC | II | Annex III | Annex II | -- | KZ |
| Alauda arvensis | Tarlakuşu | | A.4 | LC | III | Annex III | Annex II | -- | KZ |
| HIRUNDINIDAE | | | | | | | | | |
| Hirundo rustica | Kır kırlangıcı | | A.5 | LC | III | Annex II | Annex I | -- | YZ |
| Ptyonoprogne rupestris | Kaya kırlangıcı | | A.5 | LC | IV | Annex II | Annex I | | G |
| Hirundo daurica | Kızıl kırlangıç | | A.3 | LC | -- | Annex II | Annex I | | T |
| Delichon urbicum | Ev kırlangıcı | | A.3 | LC | -- | Annex II | Annex I | | T |
| MOTACILLIDAE | | | | | | | | | |
| Anthus campestris | Kır incirkuşu | | A.2 | LC | III | Annex II | Annex I | -- | T |
| Anthus trivialis | Ağaç incirkuşu | | A.3 | LC | IV | Annex II | Annex I | -- | T |
| Anthus pratensis | Çayır incirkuşu | | A.3 | LC | IV | Annex II | Annex I | -- | KZ |

| Scientific name | Turkish name | Habitat | RDB | IUCN | BIE | BERN | CHC | CITES | STATUS REGIONAL |
|---|---|---|---|---|---|---|---|---|---|
| Motacilla alba | Akkuyruksallayan | | A.3.1 | LC | IV | Annex II | Annex I | -- | Y |
| Motacilla flava | Sarı kuyruksallayan | | A.3.1 | LC | -- | Annex II | Annex I | | YZ |
| TROGLODYTIDAE | | | | | | | | | |
| Troglodytes troglodytes | Çit kuşu | | A.1.2 | LC | IV | Annex II | Annex I | | Y |
| PRUNELLIDAE | | | | | | | | | |
| Prunella modularis | Dağ bülbülü | | A.1.2 | LC | IV | Annex II | Annex I | | Y |
| MUSCICAPIDAE | | | | | | | | | |
| Muscicapa striata | Benekli sinekkapan | | A.3 | LC | III | Annex II | Annex I | -- | T |
| Ficedula semitorquata | Alaca sinekkapan | | A.3 | LC | -- | Annex II | Annex I | | T |
| Ficedula hypoleuca | Kara sinekkapan | | A.1.2 | LC | -- | Annex II | Annex I | | T |
| Luscinia megarhynchos | Bülbül | | A.2 | LC | -- | Annex II | Annex I | | YZ |
| Saxicola torquatus | Taşkuşu | | A.3 | LC | -- | Annex II | Annex I | | YZ |
| Erithacus rubecula | Kızılgerdan | | A.3 | LC | IV | Annex II | Annex I | -- | KZ |
| Phoenicurus ochruros | Karakızılkuyruk | | A.2 | LC | IV | Annex II | Annex I | -- | KZ |
| Phoenicurus phoenicurus | Kızılkuyruk | | A.3 | LC | II | Annex II | Annex I | -- | T |
| Saxicola torquata | Karagerdanlı taşkuşu | | A.3 | LC | IV | Annex II | Annex I | -- | KZ |
| Oenanthe isabellina | Boz kuyrukkakan | | A.3 | LC | IV | Annex II | Annex I | -- | YZ |
| Oenanthe oenanthe | Kuyrukkakan | | A.3 | LC | III | Annex II | Annex I | -- | YZ |
| Phoenicurus ochruros | Kara kızılkuyruk | | A.2 | LC | | Annex II | Annex I | -- | KZ |
| Saxicola rubetra | Çayır taşkuşu | | A.3 | LC | IV | Annex II | Annex I | -- | T |
| TURDIDAE | | | | | | | | | |
| Turdus merula | Karatavuk | | A.3 | LC | IV | Annex III | Annex III | -- | Y |
| Turdus philomelos | Öter ardıç | | A.2 | LC | IV | Annex III | Annex II | -- | KZ |

| Scientific name | Turkish name | Habitat | RDB | IUCN | BIE | BERN | CHC | CITES | STATUS REGIONAL |
|---|---|---|---|---|---|---|---|---|---|
| Turdus viscivorus | Ökseotu ardıcı | | A.2 | LC | IV | Annex III | Annex II | -- | KZ |
| Turdus pilaris | Tarla ardıcı | | B.2 | LC | -- | Annex III | Annex II | | KZ |
| Turdus iliacus | Kızılardıç | | B.2 | LC | -- | Annex III | Annex II | | KZ |
| SYLVIIDAE | | | | | | | | | |
| Sylvia curruca | Küçük akgerdanlı ötleğen | | A.2 | LC | | Annex II | Annex I | | YZ |
| Sylvia atricapilla | Karabaşlı ötleğen | | A.2 | LC | IV | Annex II | Annex I | -- | T |
| Sylvia communis | Çalı ötleğeni | | A.3 | LC | IV | Annex III | Annex III | | G |
| Phylloscupus collybita | Çıvgın | | A.3.1 | LC | IV | Annex II | Annex I | -- | KZ |
| Phylloscopus trochilus | Söğüt bülbülü | | A.3.1 | LC | IV | Annex II | Annex I | -- | T |
| Regulus regulus | Çalıkuşu Goldcrest | | A.1.2 | LC | | | | | Y,KZ |
| AEGITHALIDAE | | | | | | | | | |
| Aegithalos caudatus | Uzun kuyruklu baştankara | | A.2 | LC | IV | Annex III | Annex II | -- | KZ |
| SITTIDAE | | | | | | | | | |
| Sitta krueperi | Küçük Sıvacıkuşu Krüper's Nuthatch | Pinewoods | | | | Annex II | Annex I | | Y |
| Sitta neumayer | Kaya sıvacısı | | A.2 | LC | | Annex II | Annex I | -- | Y |
| PARIDAE | | | | | | | | | |
| Parus major | Büyük baştankara | | A.3.1 | LC | IV | Annex II | Annex I | -- | Y |
| Parus caeruleus | Mavi baştankara | | A.2 | LC | -- | Annex II | Annex I | | Y |
| Parus ater | Çam baştankarası | | A.3 | LC | IV | Annex III | Annex I | | Y |
| ORIOLIDAE | | | | | | | | | |
| Oriolus oriolus | Sarı asma | | A.2 | LC | IV | Annex III | Annex I | -- | YZ |
| LANIIDAE | | | | | | | | | |

| Scientific name | Turkish name | Habitat | RDB | IUCN | BIE | BERN | CHC | CITES | STATUS REGIONAL |
|---|---|---|---|---|---|---|---|---|---|
| Lanius collurio | Kızıl sırtlı örümcek kuşu | | A.3 | LC | III | Annex II | Annex I | -- | YZ |
| Lanius minor | Kara alınlı örümcek kuşu | | A.3 | LC | II | Annex II | Annex I | -- | T |
| Lanius senator | Kızıl başlı örümcek kuşu | | A.2 | LC | II | Annex II | Annex I | -- | YZ |
| CORVIDAE | | | | | | | | | |
| Garrulus glandarius | Ala karga | | A.3.1 | LC | IV | Annex III | Annex III | -- | Y |
| Pica pica | Saksağan | | A.5 | LC | IV | Annex III | Annex III | -- | Y |
| Corvus monedula | Cüce karga | | A.5 | LC | IV | Annex III | Annex III | -- | Y |
| Corvus corone | Leş kargası | | A.5 | LC | | Annex III | Annex III | | Y |
| Corvus corax | Kuzgun | | A.5 | LC | IV | Annex III | Annex II | | Y |
| STURNIDAE | | | | | | | | | |
| Sturnus vulgaris | Sığırcık | | A.5 | LC | III | Annex III | Annex II | -- | KZ |
| PASSERIDAE | | | | | | | | | |
| Passer domesticus | Ev serçesi | | A.5 | LC | III | Annex III | Annex III | -- | Y |
| Passer hispaniolenisis | Bataklık serçesi | | A.3 | LC | IV | Annex III | Annex I | | Y |
| Petronia petronia | Kaya serçesi | | A.3 | LC | | Annex II | Annex I | -- | Y |
| Montifringilla nivalis | Kar serçesi | | A.2 | LC | | Annex II | Annex I | -- | Y |
| FRINGILLIDAE | | | | | | | | | |
| Fringilla coelebs | İspinoz | | A.4 | LC | IV | Annex III | Annex II | -- | KZ |
| Serinus serinus | Küçük İskete | | A.3 | LC | IV | Annex II | Annex I | -- | KZ |
| Serinus pusillus | Kara İskete | | A.3 | LC | | Annex II | Annex I | -- | KZ |
| Carduelis chloris | Florya | | A.3 | LC | IV | Annex II | Annex I | -- | Y |
| Carduelis carduelis | Saka | | A.3.1 | LC | IV | Annex II | Annex I | -- | Y |
| Carduelis cannabina | Keten kuşu | | A.3 | LC | II | Annex II | Annex I | -- | KZ |

| Scientific name | Turkish name | Habitat | RDB | IUCN | BIE | BERN | CHC | CITES | STATUS REGIONAL |
|---|---|---|---|---|---|---|---|---|---|
| Fringilla montifringilla | Dağ ispinozu | | A.3 | LC | | Annex III | Annex II | -- | KZ |
| Carduelis spinus | Karabaşlı iskete | | A.3 | LC | | Annex II | Annex I | | KZ |
| Coccothraustes coccothraustes | Kocabaş | | A.3 | LC | | Annex II | Annex I | | KZ |
| EMBERIZIDAE | | | | | | | | | |
| Emberiza hortulana | Kirazkuşu | | A.3 | LC | II | Annex III | Annex II | -- | YZ |
| Emberiza cia | Kaya kirazkuşu | | A.2 | LC | | Annex II | Annex I | | Y |
| Emberiza citrinella | Sarı kirazkuşu | | A.2 | LC | -- | Annex II | Annex I | | KZ |
| Emberiza caesia | Kızıl kirazkuĞu | | A.2 | LC | | Annex II | Annex I | | YZ |
| Emberiza melanocephala | Kara başlı kirazkuşu | | A.4 | LC | | Annex II | Annex I | -- | YZ |
| Miliaria calandra | Tarla kirazkuşu | | A.4 | LC | | Annex III | Annex II | -- | Y |

Abbreviations in the Table

**RDB:** Red Data Book for Birds of Turkey

**A.1.0 =** Species that are extinct and no more observed in the nature.

**A.1.1** = Domestic species that are extinct in the wild or cannot be observed in the nature at least last 15-25 years time, however, they live in cages and other artificial environment.

**A.1.2** = Population of these species has decreased throughout Turkey. They are found to be 1 individual-10 pairs (=1-20 individuals) where they are observed. They are considered to be facing a high risk of extinction; therefore, these species should be protected in Turkey.

**A.2**= Population of these species varies around 11-25 pairs (22-50 individuals). They are considered to be facing risk of extinction.

**A.3=** Population of these species varies around 26-250 pairs (52-500 individuals). They are also considered to be facing a high risk of extinction.

**A.3.1=** Population of these species has decreased in recent years. Population of these species varies around 251-500 pairs (502-1000 individuals) and has decreased comparing to the previous records.

**A.4**= According to the criteria of IUCN, these species are not considered yet to be facing a high risk of extinction, but their populations have decreased locally and have potential of facing risk of extinction in time. Population of these species varies around 501-5000 pairs (1002-10000 individuals).

**A.5=** There is no risk of extinction for these species and their populations have not decreased yet.

**A.6=** There is inadequate information to make an assessment of its risk of extinction based on its distribution and/or population status. Since they are based on one or two observations, there is no chance to make a reliable assessment on these species. Therefore, they have to be well studied.

**A.7=** It is not possible to make an assessment on these species, because the records of these species in Turkey are not reliable.

**(ERL) IUCN:** European Red List, IUCN

**LC**=(Least Concern): A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.

| Scientific name | Turkish name | Habitat | RDB | IUCN | BIE | BERN | CHC | CITES | STATUS REGIONAL |
|---|---|---|---|---|---|---|---|---|---|

**BIE:** Evaluation in Birds in Europe
**BERN:** Bern Convention
Appendix II: List of strictly protected fauna species
Appendix III: List of protected fauna species
**CHC:** 2013-2014 Decisions of Central Hunting Commission
Appendix -I (species protected by the MoFWA)
Appendix -II (species protected by the CHC)
Appendix -III (species allowed to be hunted for a time period)
Status of the Bird:
G: Breeding species-only summer birds; breeds regularly or irregularly
Y: Breeding species- year birds-breeds regularly
T: Invasion species; occurs irregularly but usually in great numbers
KZ: Winter visitors

# 4 PROTECTED AREAS

In accordance with the national environmental legislation, there are no national parks, nature park, nature reserves, natural monuments, wildlife protection areas and wildlife improvement areas within the Project site and its close vicinity. Special types of protected areas described below are fairly far from the Project Site, yet they still carry significance particularly in terms of bird migrations over the Site.

## 4.1 Key Biodiversity Areas (KBAs)

### 4.1.1 Ermenek Valley Key Biodiversity Habitat

Ermenek valley is formed by splitting of Taurus Mountain via Ermenek River which is an important branch of Göksu River. The valley is in the north of Taşeli Plateau. The KBA is located in the Ermenek district and Ermenek River and the plateaus surrounded by its branches. The geological structure of the KBA is formed by limestone rocks and caves. The Ermenek valley is rich in terms of endemic and rare plants. 13 species which exist only in this region are present in here (Eken *et al.*, 2006). The valley is at about 27 km to the Project Site.

### 4.1.2 Gökdere Key Biodiversity Area

Gökdere KBA is located in the northwest of the project area at about 1 km distance. It is between Karaman-Mut and Karaman-Ermenek highways. It includes the upper part of Göksu valley and the surrounding slopes. Gökdere KBA is important in terms of plant biodiversity. There are 4 plant species of which distribution is restricted to this area (Eken et al., 2006). Gökdere KBA is at about 1 km to the Project Site.

### 4.1.3 Göksu Valley Key Biodiversity area

The Göksu river forms a wide and steep-sided valley which trends south-east to north-west from the Göksu delta in the south towards the Taurus Mountains in the north. This major valley is likely to function as a migratory corridor for raptors, storks and cranes migrating from the Göksu delta IBA in southern Turkey towards the Anatolian plateau, through the Taurus Mountains, during the spring migration period. Thermal updrafts associated the south/south- west facing slopes of the valley would provide favorable conditions for large migratory soaring birds. The valley is at about 34 km to the Project Site.

### 4.1.4 Göksu Delta Important Bird Area/Göksu Delta Ramsar Area/ Göksu Delta Wetland

Göksu delta Ramsar Site and IBA is a delta formed where the Göksu River flows into the Mediterranean Sea. Most of the delta is intensively used by man and consists of irrigated and non-irrigated agricultural land, settlements, dunes and beaches (Magnin et al 1997). The valley is at about 90 km to the Project Site.

The IBA (total 14,480 ha) is located approximately 85 km to the south-east of the Project Site, near Silifke Parts of the IBA also have a high level of national protection: 4.3 ha are covered by Permanent Wildlife Reserve, 14.4 ha are covered by conservation areas and 14.4 ha is covered by Mediterranean Specially Protected Area (Magnin et al. 2000).

A total of 332 bird species have been recorded, of which 70 are proven to breed (Magnin *et al.* 1997). The site is of major importance for a range of breeding water birds, including the largest numbers of Marbled Duck (*Marmaronetta angustirostris*) known in Turkey. It is also important for wintering raptors and waterbirds, and as a stop-over site for large numbers of Great White Pelican (*Pelecanus onocrotalus*) and White Stork (*Ciconia ciconia*) (Magnin *et al.* 2000). There is a small wintering population (max 400) of Crane (*Grus grus*) (Magnin *et al.* 1997).

### 4.1.5 Sertavul Pass Prime Butterfly Area

The region encompassing the project area is rich in terms of butterfly biodiversity. Conservation Strategy for Butterflies in Turkey was published in 2011, defining 65 Prime Butterfly Areas (PBA).

Glaucopsyche astraea, Turanana taygetica, Polyommatus ossmar, Polyommatus cornelia, Polyommatus cilicius, Polyommatus sertavulensis, Polyommatus menalcas, Polyommatus wagneri, Hipparchia mersina and Pseudochazara lydia are the priority species in Sertavul Pass PBA.

Sertavul pass is at about 2 km to the Project Site.

## 4.2 Wetlands

According to the list of wetlands presented in the Official Website of Ministry of Forestry and Water Affairs, General Directorate of Nature Conservation and National Parks, the Project site does not lie within any wetland area.

The Project is located in the north of Göksu Delta Wetland (also one of the 13 RAMSAR sites of Turkey). Göksu Delta is a wetland that covers important feeding, sheltering and reproduction habitats. Many winter visitor species, mainly ducks and geeze species use this area. Thus, even though the Project area does not have proximity to a wetland, wetlands in the broader region of the Project area are important in terms of bird migration.

## 4.3 Ramsar Areas

Göksu Delta is a Ramsar site at about 90 km to the Project area. Despite the long distance, its location in the primary bird migration route is significant to account for bird migrations over the Project Site, underlining the need for ornithological monitorings.

# 5 IMPACTS

No negative impacts of the Project were observed during the site surveys, as related with flora, vegetation and fauna elements (except for birds and bats). The Report focuses on birds and bats for possible impacts.

During the spring 2016 field surveys, big flocks of migration were not observed. However, literature survey and the interviews with local people indicate that it is highly likely that migration takes place in the Project area. During the field surveys, some raptors have been observed in migration such as Black Kite, Egyptian Vulture and Honey Buzzard in small numbers.

In order to understand the magnitude of the impact of the wind farm development in the Project area, further monitoring of migration is required. After these monitoring surveys, a reliable evaluation can be made about the wind farm development and the impacts on the bird species which are particularly vulnerable to wind farm development, such as migratory soaring birds and water-birds.

The rotor swept height (35-135 m) should be considered in these bird monitoring courses. It is known that the collision rates of the raptor species are very low due to their high sighting ability to avoid the rotor swept area of the turbine.

During the field surveys which were conducted in 14-15 April 2016, crane migration was not observed. Whereas, during the interviews with the local people, it was stated that cranes fly over the Project area at very high altitudes in spring and autumn migration periods. The Project site is located at the main migration route of whitestork, blackstork, sparrowhawk, lesser spotted eagle, greater spotted eagle, black kite, and buzzard species; and the secondary route of Egyptian vulture. Moreover, the Project area is the possible breeding site of White-tailed eagle (*Haliaeetus albicilla*), Merlin (*Falco columbarius*), Saker falcon (*Falco cherrug*), Nothern harrier (*Circus cyaneus*). Buzzard, long legged buzzard, kestrel, Golden eagle, Goshawk and sparrowhawk are observed in the region throughout the year. Therefore, a 2-years monitoring which covers only the migration periods is recommended for the operation period of the Project. The monitoring report is expected to include list of birds which cover the conservation status of birds detected, habitat and behavior information, status of species (whether local or migratory) together with the height of flight, distance to the migration corridors, thermal air flows, climatic data of the region, agglomeration points, population status and the change in population. Furthermore, breeding bird surveys in the Project area should be conducted as well.

During monitoring, in case that the wind farm operation is noticed to endanger the breeding population of Egyptian vulture and other possible breeding species and migratory species, temporary or permanent shutdown orders (including partial orders relating to the turbines which have been identified as being of the greatest risk to birds) should be committed.

Göksu Delta and Göksu Valley are located in the south of the Project area and many waterfawls use the delta for wintering purposes. Although Göksu Delta has approximately a long distance of 90 km distance to the Project area, it is significant in terms of bird migration route crossing the Site. This may raise the risk for waterfowl species (ducks, geese, etc.) to use the Project area during migration period. Therefore, the collision risk for not only birds of prey or the gliding birds but also the waterfowls should be considered. If any increase in the number of turbines is planned in the future, a new and a more detailed evaluation with a broader scope of ornithological monitoring should be performed.

# 6 CUMULATIVE IMPACTS

A cumulative impact assessment has been performed by taking the other projects into consideration in order to predict whether there will be any additional impacts at the close settlements associated with other wind farm projects located around Hilal-2 WPP Project.

There are two licensed wind farm projects other than Hilal-2 WPP within the borders of Karaman Province: Yellibel Wind Farm and Akyel-1 Wind Farm, both at planning stage. In addition, there are three licensed wind farms situated in Mut District of Mersin Province: Mut Wind Farm, Mersin Wind Farm and Dağpazarı Wind Farm.

Given the close proximity of the Mut Wind Farm of Borusan, cumulative impacts can be of concern in terms of birds and bats, which is to be controlled with a well-coordinated monitoring plan with the joint efforts of Sanko and Borusan.

# 7 SUGGESTIONS FOR MITIGATION

Steppe and forest vegetation communities exist in the Sertavul-Karaman region is a mountain passage which connects Central Taurus to Central Anatolia. Sub-alpine mountain step vegetation whereas is found in Sertavul pass, 1600-1650 m. The forest vegetation which is dominated by *Juniperus excelsa* in the Project site and its vicinity where is mainly covered by rocky lime soils. According to the field studies that were conducted in April 2016, 157 species which belong to 39 familia were identified, and 29 of these species are listed as endemic.

Briefly, we can not rank the area as a critical natural habitat. And when we consider the project's operational 3 turbines, they are not so influential ecologically on the Project site and its vicinity. If we consider the fauna elements (except of birds & bats) around the Project site, there is not any critical or endemic species. The projects ecological effects on terrestrial fauna can be said to be temporary.

The project's effect may increase in the context of cumulative impacts especially when combined with Mut WF (Borusan Co.) which is the closest Wind Power Project to the Hilal-2 WPP. That's why two companies must work in cooperation for monitoring the cumulative impacts.

Apart from ornithological monitoring to be conducted, one particular mitigation measure is to paint the blades in appropriate colors. The most appropriate color is orange/red colour which is easily seen by the birds. The birds are able to see this color from the long distances especially during high visibility days. As a common practice, instead of painting the whole blade, the tips of the blades are painted with orange/red color in one or two bands. In this way, the colored blades will draw the attention of the birds during both migrating and daily flights. Therefore, birds will be able to notice the turbines from a distant location and adjust their routes accordingly. Because of 3 operational turbines belong to the Project have orange colour on their wings, they draw the attention of the birds already.

Hilal-2 WPP, with 3 operational turbines is not expected to form an appreciable risk in terms of the location and number of turbines on wildlife, native and migratory bird species, provided that the recommendations mentioned above are implemented. Moreover, additional detailed migratory bird monitoring surveys are required.

The most important potential concern of the wind farms during operation is the risk of collision of birds and bats with the wind turbines. The tips of the turbine blades that are used in the Project have already painted and lighting properly to minimize bird collision risk. The ornithological surveys were conducted in 2016. The area is quite important in terms of bird migration and bird passage. Therefore, the possible effects of the wind farm on bird fauna should be detailed via further surveys. According to the results of these surveys the need of further surveys should be reevaluated.

Due to the presence of sensitive sites, IBA and wetlands around the area and regular migration of waterfowl species, an expert (ornithologist) is suggested to temporarily be employed and monitor the area while operation period. Additional measures can be taken considering the results of this monitoring in case needed.

# 8 REFERENCES

Acha, A. 1997. Negative impact of wind generators on Eurasion Griffon Gyps fulvus in Tarifa, Spain. Vulture News 38: 10-18.

Awea, 2001, Facts about Wind Energy and Birds, American Wind Energy Association.

Bamberger, Michael. Integrating Quantitative and Qualitative Methods in Development Research.Washington, D.C.: World Bank, 2000.

Band, W., Madders, M., Whitfield, D.P. (2007). *Developing field and analytical methods to assess avian collision risk at wind farms*. In "Birds and Wind farms: Risk Assessment and Mitigation" Eds. Manuela de Lucas, Guyonne F. E. Janss and Miguel Ferrer. Quercus Books.

Birdlife International. 2004. Birds İn Europe: Population Estimates, Trends And Conservation Status. Birdlife Conservation Series No. 12.

Cameron, R.A.D., Cornwallis, L. Percival, M.J.L. Sinclair, A.R.E. 1967. The migration of raptors and storks through the Near East in autumn. Ibis 109; 489-501.

CEFAS (Centre for Environment, Fisheries and Aquaculture Science) (2001). *Cumulative environmental impacts of marine aggregate extraction*. Project Code AO903. Department for the Environment, Food and Rural affairs (Defra) London.

Council of Europe, 1999. Appendices to the Convention on the Conservation of European Wildlife and Natural Habitats. Secretariat Memorandum prepared by the Directorate of Environment and Local Authorities. Strasbourg, 26 pp.

Davis, P. H., 1965-1985. Flora of Turkey and the East Aegean Islands, vol. 1-9, University Press, Edinburgh.

Davis, P. H., Mill, R. R., Tan, K. 1988. Flora of Turkey and the East Aegean Islands, vol. 10, University Press, Edinburgh.

Eken, G., Bozdoğan, M., İsfendiyaroğlu, S., Kılıç, D.T. ve Lise, Y. (eds.). 2006. Türkiye'nin Önemli Doğa Alanları. 2 Cilt. Ankara: Doğa Derneği.

Environmental, Health and Safety Guidelines, Wind Energy, IFC, 2007.

Fielding, A. & Haworth, P. (2010). Golden eagles and wind farms. A Report to SNH.

Foden, J., Rogers, S. & Jones, A. (2010). Recovery of UK seabed habitats from benthic fishing and aggregate extraction – towards a cumulative impact assessment. *Marine Ecology Progress Series* 411, 259-270.

Grimmet, R.F.A. and Jones, T.A., 1989. Important Bird Areas in Europe. ICBP Tech. Publ. 9. Cambridge: International Council for Bird Preservation. UK.

Hötker, J., Thomsen, K.M, Köster, H. 2004. Auswirkungen regenerativer Energiegewinnung auf die biologische Vielfalt am Beispiel der Vögel und der Fledermäuse – Fakten, Wissenslücken, Anforderungen an die Forschung, ornithologische Kriterien zum Ausbau von

regenerativen Energiegewinnungsformen. Michael-Otto-Institut im NABU. Unpublished report. Available as pdf at. http://bergenhusen.nabu.de/bericht/VoegelRegEnergien.pdf

IUCN, 2016. IUCN Red List of Threatened Species. Version 2011.

IUCN Species Survival Commission. 2006. Guidelines for using the IUCN Red List Categories and Criteria. Ver. 6.2. Prepared by the Standards and Petitions Working Group of the IUCN SSC Biodiversity Assessment Sub-Committee in December 2006.

IUCN Red List Categories, IUCN Species Surrival Commision, 40 th Meeting of the IUCN Council, Gland, Switzerland, 1994.

IUCN (2001). Red List Categories: Version 3.1. Prepared by the IUCN Species Survival Commission. Gland, Switzerland, and Cambridge, UK: IUCN.

IUCN (2006). Guidelines for using IUCN Redlist Categories and Criteria: Version 6.2. Prepared by the Standards and Petitions Working Group of the IUCN SSC Biodiversity Assessments

Kılıç, D.T., Eken, G. 2004. Türkiye‟nin Önemli Kuş Alanları 2004 Güncellemesi. Doğa Derneği, 231 s. Ankara.

Kiziroğlu, İ., 1989. Türkiye Kuşları. OGM yayınları, Ankara, 314 s.

Kiziroğlu, İ., 2008. The Birds of Türkiye. (Species List in Red Data Book). Ankara.

Masden, E.A., Haydon, D.T., Fox, A.D., Furness, R.W., Bullman, R & Desholm, M. (2009). Barriers to movement: impacts of wind farms on migrating birds ICES J. Mar. Science. 66: 746-753

Official website of Turkish Plants Data Service (TUBIVES), 2016, http://www.tubives.com/

Orman ve Su İşleri Bakanlığı Doğa Koruma ve Milli Parklar Genel Müdürlüğü, Merkez Av Komisyonu 2015-2016 Av Sezonu Kararları.

Pearce-Higgins, J.W., Stephen, L., Langston, R.H.W., Bainbridge, I.P. & Bullman, R (2009). The distribution of breeding birds around upland wind farms. *Journal of Applied Ecology* **46**: 1323–1331

Pils, G. 2006. Flowers of Turkey, A Photo Guide. Friedrich VDV, 408s. Austria.

Sutherland, W. J. and Brooks, D. J., 1981a. Autumn migration of raptors, storks, pelicans and spoonbills at Belen Pass, southern Turkey. Sandgrouse 2: 1–21.

Sutherland, W. J. and Brooks, D. J., 1981b. The visible migration of passerines and near-passerines at the Belen Pass, southern Turkey, in autumn. Sandgrouse 3: 87–90.

Walker, D., McGrady, M., McCluskie, A., Madders, M. & McLeod, D. R. A. (2005). Resident Golden Eagle ranging behaviour before and after construction of a wind farm in Argyll. *Scottish Birds* 25: 24-40.

Whitfield, P. & Ruddock, M. (2007). *A Review of Disturbance Distances in Selected Species*. Natural Research Report to SNH.