

Ornithological Report as an appendix to:

**ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR
THE BAHCE WINDFARM PROJECT (135 MW)**

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Aim

ROTOR Elektrik Uretim Ltd. (ROTOR), a wind farm developer and a subsidiary of Zorlu Energy Group, is planning to construct and operate a 135 MW wind farm (Project) in Bahçe District of Osmaniye Province in south Turkey. There are concerns about whether this development will have negative impact on the bird population and especially on migrant birds. This preliminary ornithological report presents the baseline data, show locations of any sensitive areas and bird migratory routes and question whether these will not be impacted by the wind turbines and associated infrastructure and propose a monitoring plan.

Introduction

Wind farms alternative energy and benefit for the general environment. But there are also some cases where wind farms are proven to have negative affect on wildlife, especially bird populations. (Hötker et al. 2004).

Among powerful methods to reduce the negative impacts on birds of wind energy use are:

- choice of the right site for wind farms (avoidance of wetlands, woodlands, important sites for sensitive non-breeding birds and mountain ridges with high numbers of raptors and vultures),
- measures to reduce the attractivity of wind farm sites for potential collision victims,
- configuration of turbines within wind farms (placement of turbines parallel to and not across the main migration or flight directions of birds),
- Construction of wind turbines: replacement of lattice towers, wire-cables and overhead power lines.

Site choice

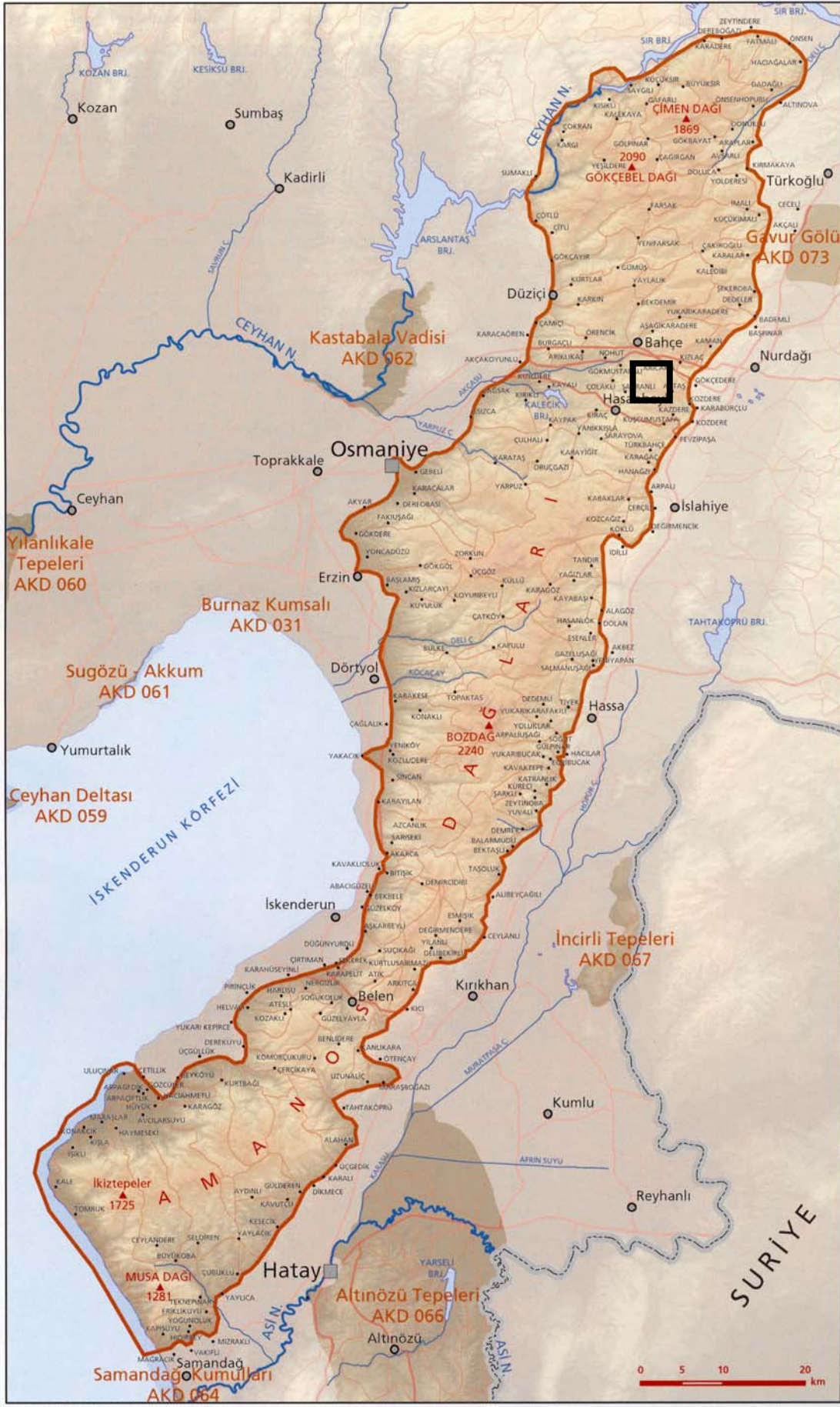
Site Location

The Project is located on Amanos Mountain in between Bahçe and Hasanbeyli district centres of the Osmaniye Province in the Eastern Mediterranean Region of Turkey. District Centre of Bahce is the nearest major settlement within a few kilometres to the Project Site. Other settlements near the Project Area are Gökmustafalı and Savranlı villages.

Important Bird Area

The first Important Bird Areas (IBA) of Turkey inventory was prepared by Ertan et al. (1989) and the second by Magnin and Yazar (1997). Later, Kılıç and Eken (2004) later updated the information on Yazar and Magnin (1997) and published the final inventory in the form of a concise inventory. Comprehensive information on those sites, were later published by Eken et al (2006) in the Key Biodiversity Areas (Önemli Doğa Alanları) book. The IBAs listed in Kılıç and Eken can also be found in the online database of BirdLife International at www.birdlife.org. Kılıç and Eken (2004) added the whole mountain range of Amanos Dağları to the list of Important Bird Area. The project site is located within the borders of Amanos Dağları (Amanos mountains) IBA.

The Natura 2000 network is a vast network of over 26,000 protected areas covering all the Member States of the EU. The legal basis for the Natura 2000 network comes from the Birds Directive (79/409/EEC) which dates back to 1979 and the Habitats Directive from 1991. Special Protection Areas (SPAs) are strictly protected sites classified in accordance with Article 4 of the Birds Directive. Under the Birds Directive Member States select the most suitable sites and designate them directly as Special Protection Areas (SPAs). These sites then automatically become part of the Natura 2000 network.



Amanos Dağları önemli doğa alanı topoğrafya haritası

Figure 1. The boundaries of Amanos Dağları IBA according to Kılıç and Eken (2004) published in Eken et al. (2006).

Turkey, as a country in the EU Accession period and does not have Natura 2000 areas. The IBA inventory published by Kılıç and Eken (2004) acts as the candidate list of Natura 2000 areas. Several sites identified as IBAs comprise immense areas of land, such as Doğu Karadeniz Dağları IBA in the Eastern Black Sea which as an area of 17283 km² which is equal to an area more than half of Belgium. Indeed Eken et al (2006) (in Vol 2. page 211) defined the IBA Doğu Karadeniz Dağları as a Ecoregion with a continuous habitat and expresses the need for more research to identify smaller units of land which will be candidates for Natura 2000 areas. Thus not all IBAs in Turkey should be regarded as candidates for Natura 2000 areas, this applies especially for extremely large IBAs that does not fit into strict conservation approach, unlike Natura 2000 sites.

Amanos Dağları IBA a huge area of 3625 km² and is distributed within borders of four districts, Gaziantep, Hatay, Kahramanmaraş and Osmaniye. Two large towns, Belen and Bahçe are both situated within the borders. Therefore the IBA should be treated as an Ecoregion, rather than a candidate for Natura 2000 site.

Bird Conservation Zones within Amanos Dağları IBA

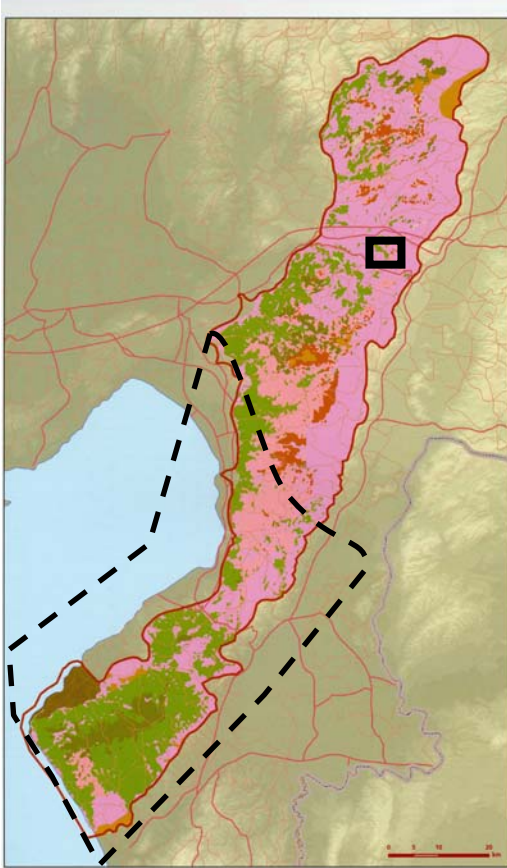
The IBA principally was identified for the high number of migrant birds that concentrate at the bottleneck area of Belen Pass, a single species of Special Conservation Concern and to a minor importance the presence of bird species of the Mediterranean biome.

Bird species that has populations of conservation concern in the IBA Amanos Dağları. (Kılıç and Eken 2004) are classified under three criteria:

Migrant Bottleneck species: White Pelican, Black Stork, White Stork, Crane

Special Conservation Concern: White-breasted Kingfisher

Mediterranean Biome: Black-eared Wheatear, Olive-tree Warbler, Subalpine Warbler, Sardinian Warbler, Ruppels's Warbler, Kruper's Nuthatch, Masked Shrike, Cinereous Bunting, Cretzschmar's Bunting.



The localities important for Migrant Bottleneck species concentrate in the southern half of the IBA, around Belen Pass and 30 km north and south from Belen Pass, extending to Bozdağ in the north and Musa Dağı in the south. Migration bottleneck and flyways of migrant birds are discussed in detail in "Bird Migration". The dashed area indicate the zone important for migrant birds.

The one species of Special Conservation Concern (White-breasted Kingfisher) occurs on lowlands, possibly along the western and eastern border of the IBA in the adjacent plains.

All the other species that are confined to the Mediterranean biome are all common species and found widespread through Amanos Dağları. As the map shows, most of the forests are marked in different tones of greens and are found in western slopes of Amanos Dağları.

The project area is outside both zones important for migrants and those confined to the Mediterranean Biome.

Bird Migration

Turkey is a major Palaearctic migration crossroads with corridors and bottlenecks in the NW, NW and S parts of the country (Grimmet and Jones 1989). In both spring and autumn migrating storks and birds of prey are funnelled by the narrow land bridges that links Europe and Asia. Bosphorus in Istanbul is the major concentration area of all birds breeding in Eastern Europe. A higher number of birds of prey migrate along the E Black Sea and mountain valleys of extreme NE Turkey in autumn. Once across the Bosphorus, most birds continue SE, crossing E Taurus Mountains and concentrated around the Gulf of Iskenderun and where the flight funnels through Belen Pass in Amanos Mountains.

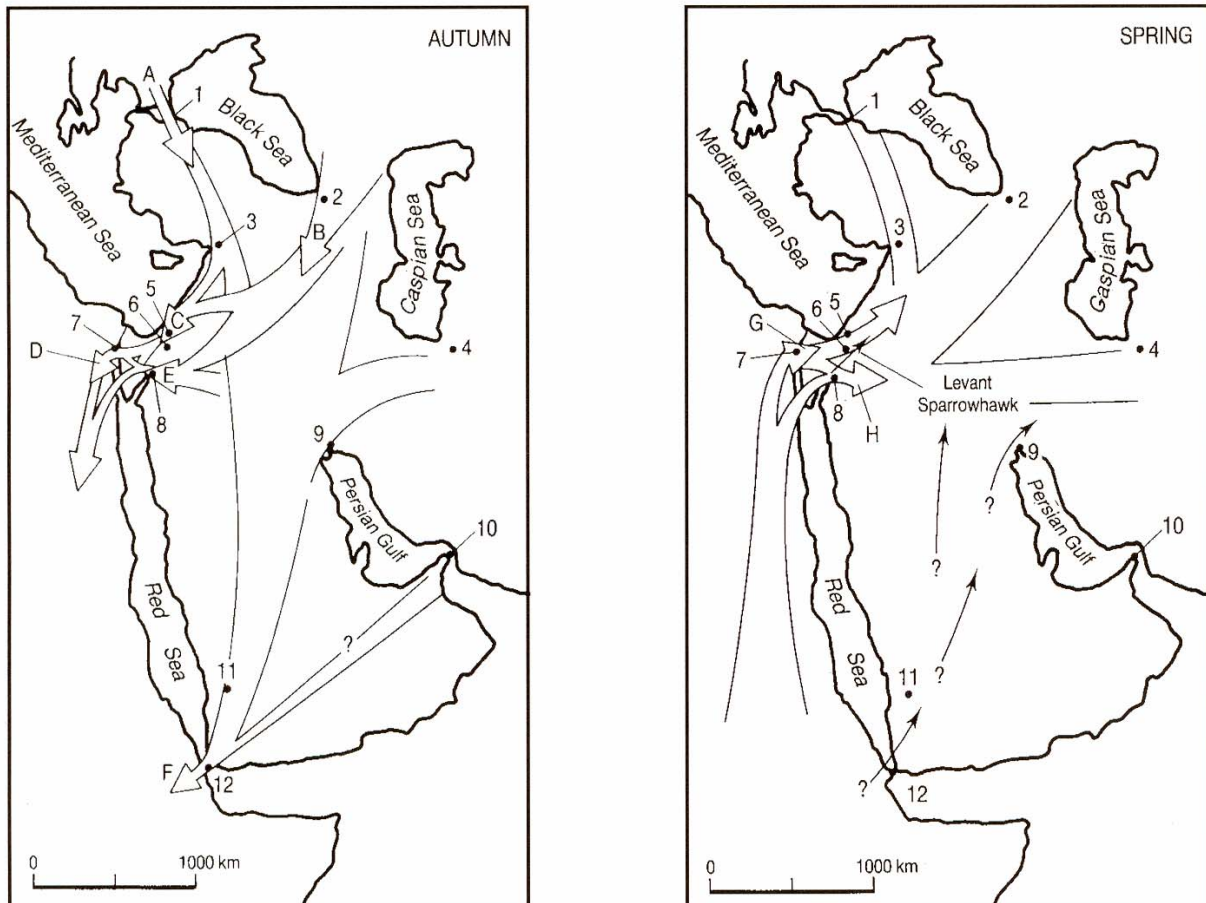


Figure 2. Migration route of soaring birds in the Middle East and Turkey. 1. Bosphorus 2. Çoruh Vadisi, 3. Belen Pass. (Shirihai et al. 2000).

Belen Pass has been studied very few times. Cameron et al. has first documented the migration event in 1967, but it was Sutherland and Brooks (1982) who made the first comprehensive count. Can (2002) made the first intent of a complete spring count, but the revealed a relatively number of White Storks in comparison of numbers migrating in autumn.

Spring and autumn migration seem to have differences. Some species such as Honey Buzzard, Black Kite and Egyptian Vulture occur in much lower numbers in spring, thus seem not to concentrate at Belen Pass on their way north to Europe. Spring counts in Israel support this finding; many birds of those species fly in NNE direction, presumably directly to NE Turkey and avoid Belen. This explains the absence of some species.

Most birds in autumn are thought to come from Bosphorus. It is unknown how much birds of the migration route along the eastern coast of the Black Black Sea use Belen Pass, as they are more likely to fly directly towards Israel and avoid Belen.

Three species are of special concern. Lesser Spotted Eagle, Levant Sparrowhawk and White Stork has most of the European population passing in autumn through Bosphorus and Belen Pass. Therefore Belen Pass has international importance for those species.

Table 2. List of species that migrate through Belen Pass in significant numbers. Maximum number of birds is counted between 2 August and 23 September 1982. (Sutherland and Brook) The maximum number of cranes are counted in 2000 (Kılıç and Eken, 2004).

Species	Spring	Autumn	Max.
White Pelican (<i>Pelecanos onocrotalus</i>)	+	+	6.203
White Stork (<i>Ciconia ciconia</i>)	+	+	82.887
Black Stork (<i>Ciconia nigra</i>)	+	+	3.300
Spoonbill (<i>Platalea leucorodia</i>)	?	+	586
Honey Buzzard (<i>Pernis apivorus</i>)	–	+	15.967
Black Kite (<i>Milvus migrans</i>)	–	+	506
Egyptian Vulture (<i>Neophron percnopterus</i>)	–	+	874
Short-toed Eagle (<i>Circaetus gallicus</i>)	+	+	726
Levant Sparrowhawk (<i>Accipiter brevipes</i>)	+	+	2.951
Lesser Spotted Eagle (<i>Aquila pomarina</i>)	+	+	1.886
Booted Eagle (<i>Hierraetus pennatus</i>)	+	+	587
Common Crane (<i>Grus grus</i>)	+	?	3.000

Known Migration Bottlenecks and Corridors in Amanos Dağları

In autumn raptors fly s along the foothills of W Nur Dağları of flying directly across the Gulf of Iskenderun (Cameron et al 1967 and Sutherland and Brooks 1981). Detailed maps show the routs of migrant birds. Belen bottleneck area where migrant birds concentrate in high numbers is located 80 km South of the project area.

While the majority of the migrant birds follow the narrow straight of Belen Pass, some of them may use other minor routes. In autumn Belen Pass clearly funnels all birds that arrive west to Amanos Dağları. Many birds are known to cross Iskenderun Körfezi. Some birds are known to cross over Sarısekili at altitude of 1100m. (Sutherland and Brooks 1982).

The map clearly present smaller alternative routes above İskenderun, Sarısekili and Dörtüol. Even minor flyways stay 40 km SW of the Bahçe. The birds are not known to cross over Amanos Dağları north of Bozdağ near Dörtüol.

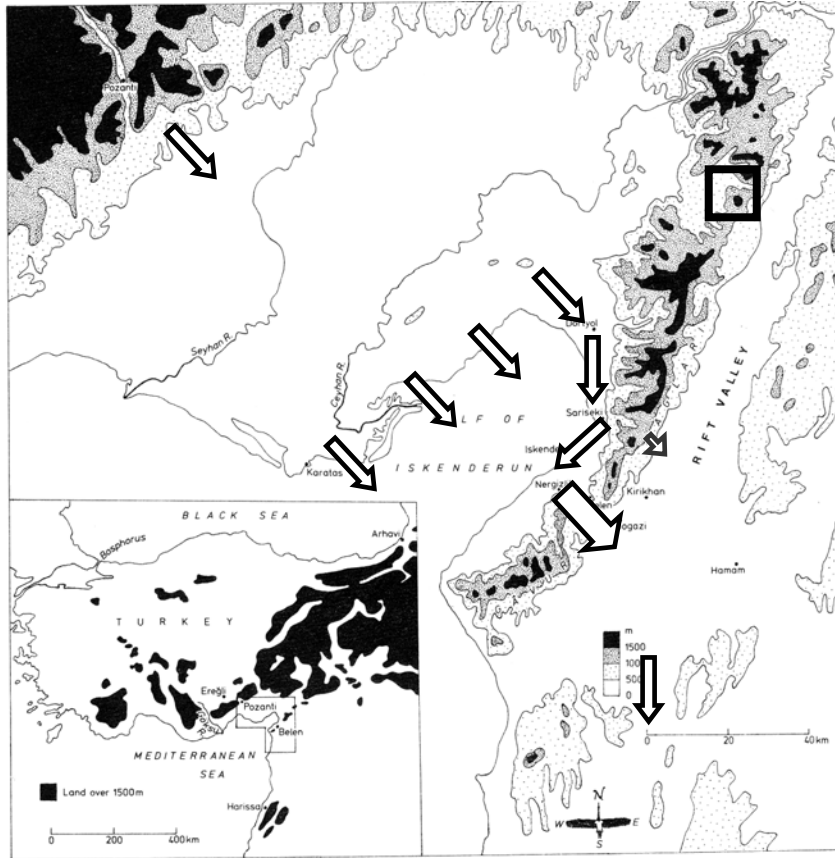


Figure 2. Migration route of soaring birds over Amanos Dağları in autumn. The project site is indicated with a circle. (Sutherland and Brooks 1982).

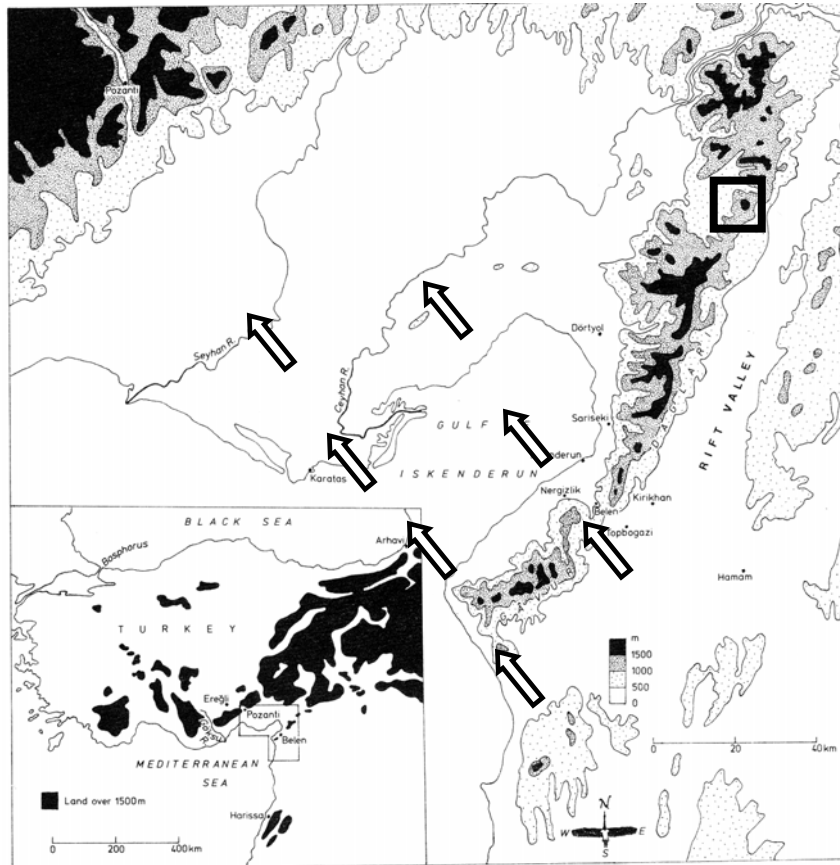


Figure 2. Possible Migration route of soaring birds over Amanos Dağları in spring. The project site is indicated with a circle. (Ali Atahan and Okan Can pers comm.).

The Habitat and Breeding Birds.

Wind turbines of the Project will be located on a hilly area with an elevation ranging from 1,046 m to 1,707 m (see Figure 2 for topographical map and locations of turbines). A plateau is situated at the north of the hill where settlements are located. There are meadow lands and communities of oak trees on the hills. (ESIA)

Deciduous forests are concentrated in the Amanos Mountains in the eastern part of the ecoregion. This is mainly due to the locally high precipitation rate (c.1,000 mm) which results from the fact that these mountains lie at right angles to the humid onshore winds. The habitat in the windfarm is hilly, dry woodland. (ecological zone). (ESIA)

The songbirds listed in the IBA inventory (Black-eared Wheatear, Olive-tree Warbler, Subalpine Warbler, Sardinian Warbler, Ruppels's Warbler, Kruper's Nuthatch, Masked Shrike, Cinereous Bunting and Cretzschmar's Bunting) occur on both slopes of the area and are very common at the area. The construction and activity of wind turbines may certainly cause displacement of some birds, but the effect can be neglected.

Birds of Mountain Ridges

Birds were in high risks at wind farms on mountain ridges. in USA and Spain where many raptors are killed. In Germany high numbers of killed Red Kites and White-tailed Eagles were killed and caused a concern.

The area is relatively poor of resident raptors. All breeding raptors in the area, Short toed Eagle (*Circaetus gallicus*), Sparrowhawk (*Accipiter nisus*), Long-legged Buzzard (*Buteo rufinus*) and Kestrel (*Falco tinnunculus*) are very common and widespread species with relatively health populations. Golden Eagle and Bonelli's Eagle are resident in the SW part of Amanos Dağları, (Atahan et al 2008) where they have been observed during migration counts (Sutherland and Brooks 1976). The habitats south and west of Amanos Dağları is more pristine for such raptors that require extensive territories for breeding.

The project area does not hold big population of breeding birds of prey such as vultures and eagles.

Non-breeding birds

The impact of wind farms on non-breeding birds was stronger. Wind farms have significant effect on local population of geese, ducks and waders. The area is situated far away from the wintering areas of geese, ducks and grassland waders. Moreover there are no wetlands in the project area. Therefore it does not pose any threat for grassland and wetland birds such as geese, cranes, lapwing, plovers, ducks and waders.

Barriers to Movement of birds.

Non-breeding birds are known to have daily movements between feeding areas, roosting areas and resting areas. Large birds, such as gulls, cranes, geese and ducks often take such daily movement. (Birdlife International 2005)

Theoretically some birds might move in a east-west direction from their feeding areas east of Amanos Dağları to roosting areas in the west, or vice versa. In this case Bahçe-Nurdağı road valley could act as a movement corridor for birds. In the case of the existence of such a east-west movement over the project site, the wind farm could potentially act as a barrier.

Theoretically the closest IBAs in the west of Amanos Dağları are Seyhan Deltası and Ceyhan Deltası. Those sites hold important population of wintering Great White Egret (max. 147), Greylag

(max. 301) and Crane (max. 800). The only IBA on the eastern foothills of Amanos Dağları is Gavur Gölü being 28 km away from the project site. The lake has been drained to Asi River, and land has been almost completely converted into agricultural land. Thus such a movement is very unlikely to happen.

Another site within Amik Ovası is the former Lake of Amik, which is completely dry and does not hold any regular population of waterbird, thus does not qualify as an IBA any more. The fields in the valley are not known to support any population of wintering geese or cranes. Dry fields in the valley do not seem to be attractive for such birds. Thus the area does not possess any risk of acting as a barrier of to movement of birds.

There are no known movement in east-west direction of birds over the project area.

Measures to Reduce the Attractivity

Regarding the transmission lines, TEIAS determines the final route for the connection, based on the preliminary routing design made by another consultant of the ROTOR, to the substation. TEIAS Routing Department considers the environmental sensitive areas, if any, on the route while choosing the locations for pylons. TEIAS is the authority for the approval of the route selection and connection to the national grid. (EISA report)

Configuration of Turbines within Wind Farms

Bird migration is not limited on soaring large birds that depend on thermal air currents and concentrate at bottleneck areas such as Belen Pass. The big majority of species, especially smaller bird migrate at night in a broad front. Along the whole east west axis of Mediterranean countries millions of birds migrate every year.

The flight direction of migrant birds in spring and autumn is north-south. The turbines are positioned parallel to the migration route in a north-south line and thus follow the suggestions of BirdLife Internationals Position Statement on Wind Farms and Birds (2005). This configuration will minimise any mortality of migrant birds that fly at night.

Conclusion

The report has clearly demonstrates possible effects of the Bahçe Windfarm Project to the wild bird population, with special attention to migrating pelicans, storks and raptors.

The project site is located about 80km away from the main migration bottleneck. The closest route associated to the stream of migrant birds passes 50 km SW of the project site. Bahçe is not known to be on the migration route of storks, pelicans and raptors. The effect of the activity of the wind turbines and its construction on resident breeding birds is minor and can be neglected. The choice of the site is also correct for non-breeding birds, there are no important sites for sensitive non-breeding birds that depend on wetlands therefore it does not pose any threat for grassland and wetland birds such as geese, cranes, lapwing, plovers, ducks and waders. The area does not possess any risk of acting as a barrier of to movement of birds. The positioning of turbines parallel to the migration direction of non-soaring birds minimises any negative effect on birds.

The site choice of Bahçe Windfarm Project is located away from important bird populations and avoids flyways of migrant routes as well as populations of breeding or non-breeding birds. It's north-south configuration minimises any possible effect to migrant birds.

Monitoring Plan

The main hazards to birds from wind farms are disturbance leading to displacement or exclusion and collision mortality. The effects on birds cannot be assessed without field work. This field work aims to collect information on bird migration directly on and around the project site. This is the only way to verify whether minor migration paths exist over the project site. To have good migration coverage the visits are arranged in the peak migration period of selected species that make up the great majority of the soaring birds migration through the area.

	Visiting dates	Target species
Spring	March 22-24	White Stork, Black Stork, Crane, Buzzard, Lesser Spotted Eagle
	April 2-4	Buzzard, Lesser Spotted Eagle
	April 25-27	Levant Sparrowhawk, Honey Buzzard
Autumn	August 26-28	White Stork and Honey Buzzard
	September 20-22	Levant Sparrowhawk, Booted Eagle, Egyptian Vulture
	October 7-9	Buzzard, Lesser Spotted Eagle, Short-toed Eagle

The surveys will be made between 0900 and 1800 from hills suitable for watching raptors. 3 visits in spring and 3 visits in autumn on the peak days will allow to give a general idea how much the area is used by the migrant soaring birds. Visit dates are selected for the peak migration period of the target species. The behaviour of migration will be observed, with special attention on the composition of species, number of migrants, flight attitude and change of migration course in relation with the wind.

Moreover resident raptors such as Long-legged Buzzard, Short-toed Eagle and rarer Bonelli's Eagle and Golden Eagle will be done.

On addition to the census of soaring birds, breeding birds and potential collision victims will be surveyed. Early morning transects along the towers collision mortality my migrants, of large soaring birds and nocturnal passerines (smaller migrant birds that migrant during night). All breeding activity will be noted. This will make up the basis of any possible mitigation project to avoid displacement in breeding birds.

During surveys binoculars 10x and a spotting telescope 30x will be used. The bird sounds will be identified by the consultant.

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