Environment and Climate Regional Accession Network ECRAN

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Appropriate Assessment of the likely impact of Tuz Cargo Airport on Natura 2000 SCI/SPA site Lake Tuz

September 2015, Turkey

ENVIRONMENT AND CLIMATE REGIONAL ACCESSION NETWORK

Appropriate Assessment

of the likely impact of Tuz Cargo Airport on Natura 2000 SCI/SPA site Lake Tuz (Turkey)

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Disclaimer

The project of Lake Tuz Cargo Airport is a fiction made up solely for the purpose of demonstrating the procedure of Appropriate Assessment pursuant to Art. 6(3) of the Habitats Directive within the EU ECRAN Project. It has no relation to any really existing or planned development in Turkey.

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LIST OF ABBREVIATIONS	
AA	Appropriate assessment
BD	Birds Directive
CO	Carbon monoxide
NOx	Nitrogen oxides
HC	Hydrocarbons
LTO	lLnding and take-off cycle
MS	Member State
ICAO	International Civil Aviation Organization
EU	European Union
SAC	Special Area of Conservation (Natura 2000)
SEPA	Special Environmental Protection Area (Turkish)
SCI	Site of Community Importance (Natura 2000)
SPA	Special Protection Area (Natura 2000)
pSCI	proposed Site of Community Importance
pSPA	proposed Special Protection Area

1. Insight into the project

1.1. Data on the project

(View of project proponent)

Developer:

This project has been elaborated for educational needs only. That is the reason why the developer is not defined. Part of the data concerning budget, scale and visualisations concerning the Tuz Cargo Airport project were found in public sources concerning the never operating newly built airport Ciudad Real Central in Spain.

Location:

Turkey, municipality of Kulu.

Rough budget:

650 million €.

Aims of the project:

Tuz Cargo Airport will be used for civil use only, mainly as a logistic intersection for the Turkish international trade. This airport will reduce the load of the busy civil airports in Istanbul (including truck traffic across Istanbul urban area) and smaller airports in tourist areas on the Mediterranean Sea cost (like Antalya). This cargo airport will help the industrial as well as agricultural development of central Anatolia.

Two runways are planned at the airport; one runway five kilometres long and the second one 4 km long. A rough schema of the runways including navigation technique (lights, radars, safety areas) is depicted in the map below (see 0). A service area for necessary services as well as regular (periodical) aircraft maintenance will be a constituent part of the airport.

A crucial part of the airport area will be 13,000 m2 of storage capacity and a logistic centre, including freezing boxes for meat, fish, fruit and vegetables. In front of the logistic centre, there will be a large car park for trucks, including basic services for drivers waiting for loading (showers, toilets, fast foods and restaurants, and a petrol station).

The area of the planned airport is situated near a local road between the town of Kulu and the village of Fevziye. This road will be adapted for heavy trucks and a bypass to highway D715 will be built to protect Kulu town inhabitants from traffic, noise and emissions. Highway D715 is a direct connection between Ankara and Konya. Crossroads between Kulu and Ankara, and Kulu and Konya, provide access to many other areas without influencing the traffic in these municipalities.

The frequency of air traffic at the planned airport is about 80 landings and 80 take-offs per day at the beginning of the airport operation with an increase up to 200 landings and 200 take-offs per day at normal operation. Rush frequency of the airport could reach up to 500 landings and 500 take-offs per day, which is the highest capacity of the runways as well as the capacity of the logistic centre.

1.2. Basic data

Location of the project

The planned Tuz Cargo Airport is situated about 100 km south of Ankara within the Kulu municipality. The airport and all the accessory structures (hangars, buildings, car parks, and roads) are situated on current arable land between the highway D715 from Ankara to Konya and Lake Tuz. The location of the airport is presented in Fig. 1 and 0.

The project is located to the area with a convenient morphology for the construction on a large flat area where it is possible to build runways, warehouses and hangars for airplane services. The location of the cargo airport will not complicate air traffic at Ankara airport and its position makes it easy to supply the capital of Turkey as well as Kulu region and other cities and municipalities within central Anatolia without influencing the flow of traffic in Ankara conurbation.

All the development areas depicted in 0 are situated on farmland, mainly on arable land. Inside the area there is no settlement and therefore no resettlement is necessary to deal with. Minimal population density is affected by noise within the flight corridors of the airport, therefore air traffic of the airport will not be limited to day time as is the case of plenty of current big airports.

The whole airport and logistic area will be fenced by steel fencing and patrolled by private security agency selected in tendering process.

Fig. 1. Location of the Lake Tuz area within Turkey

Fig. 2. Location of the project within Kulu region

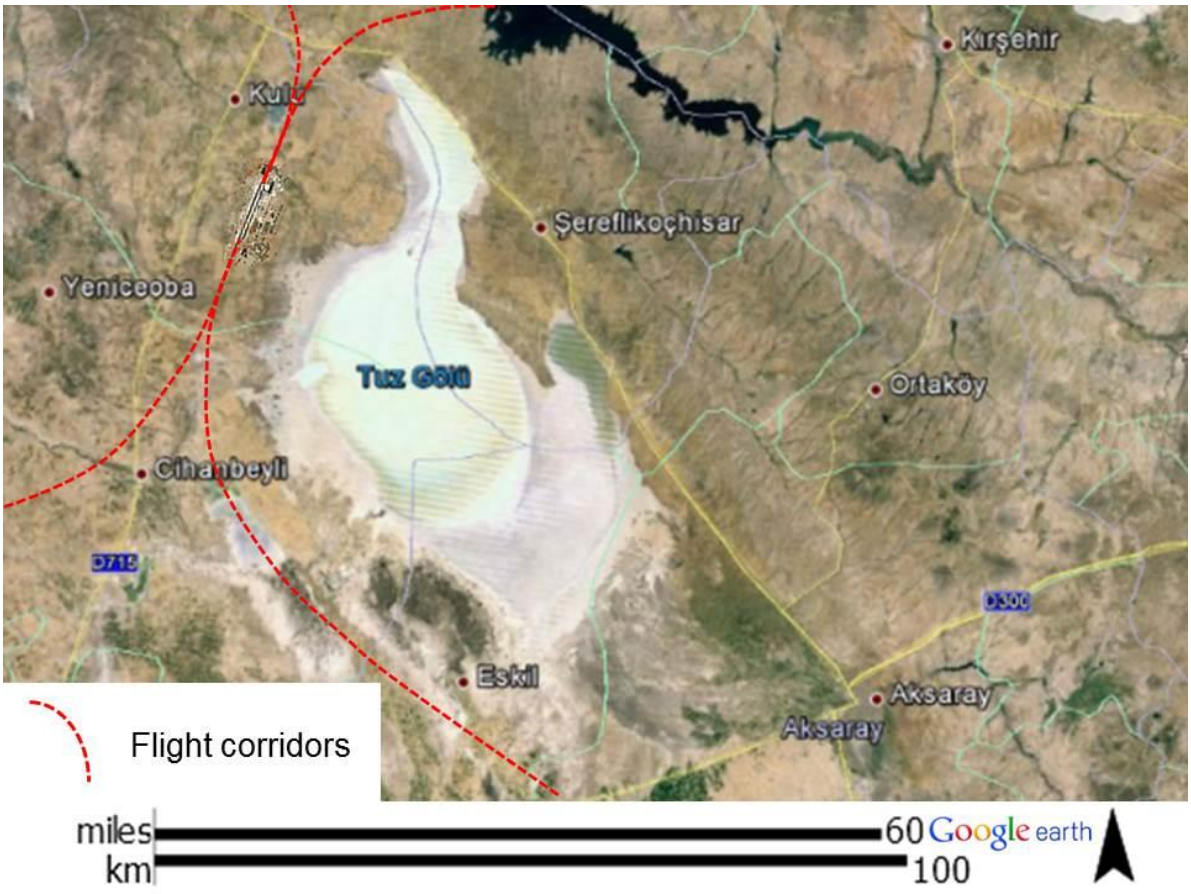
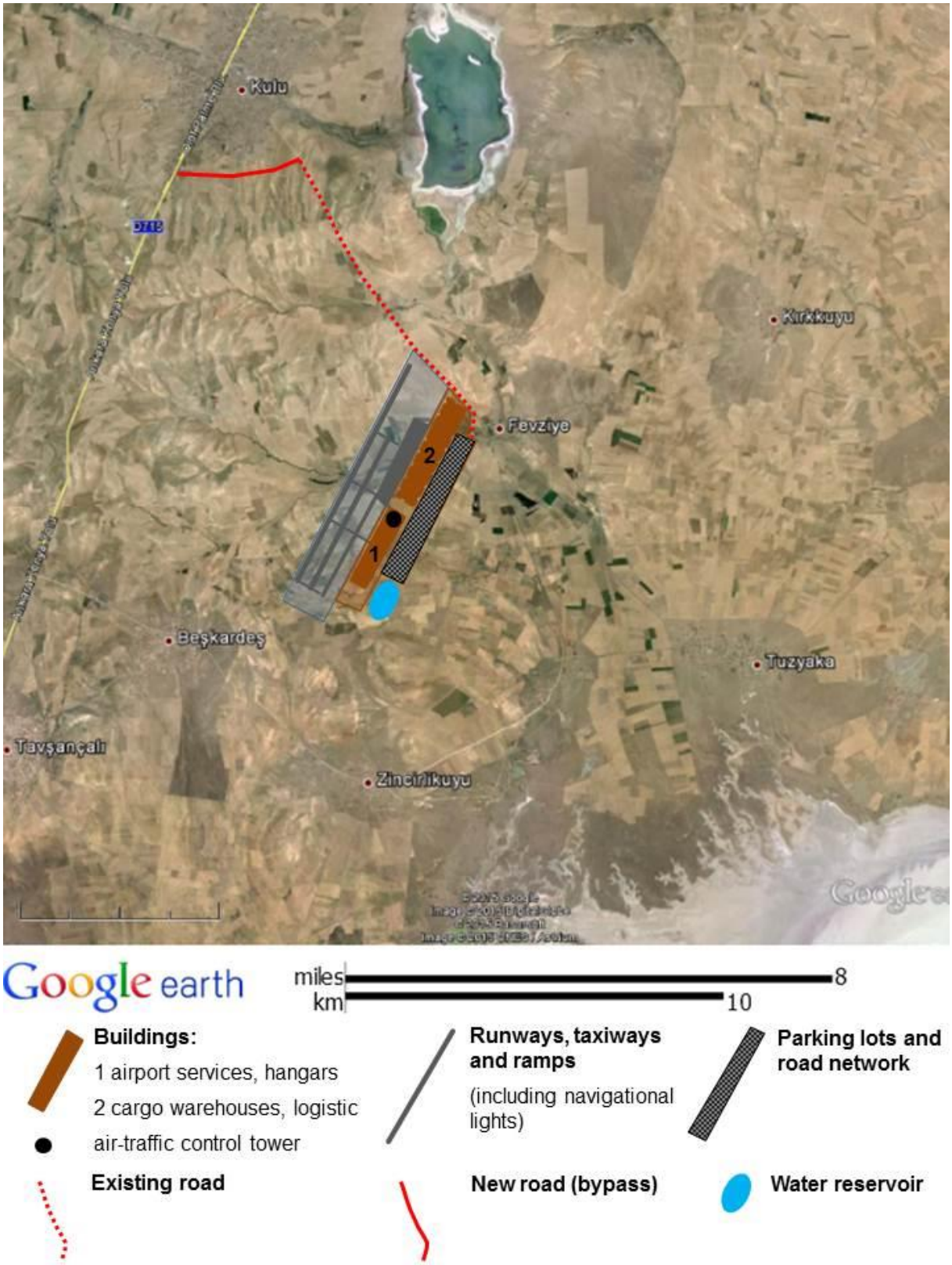


Fig. 3. Schema of planned airport development areas



1.2.2. Location of the sources of material for construction (gravel, stone)

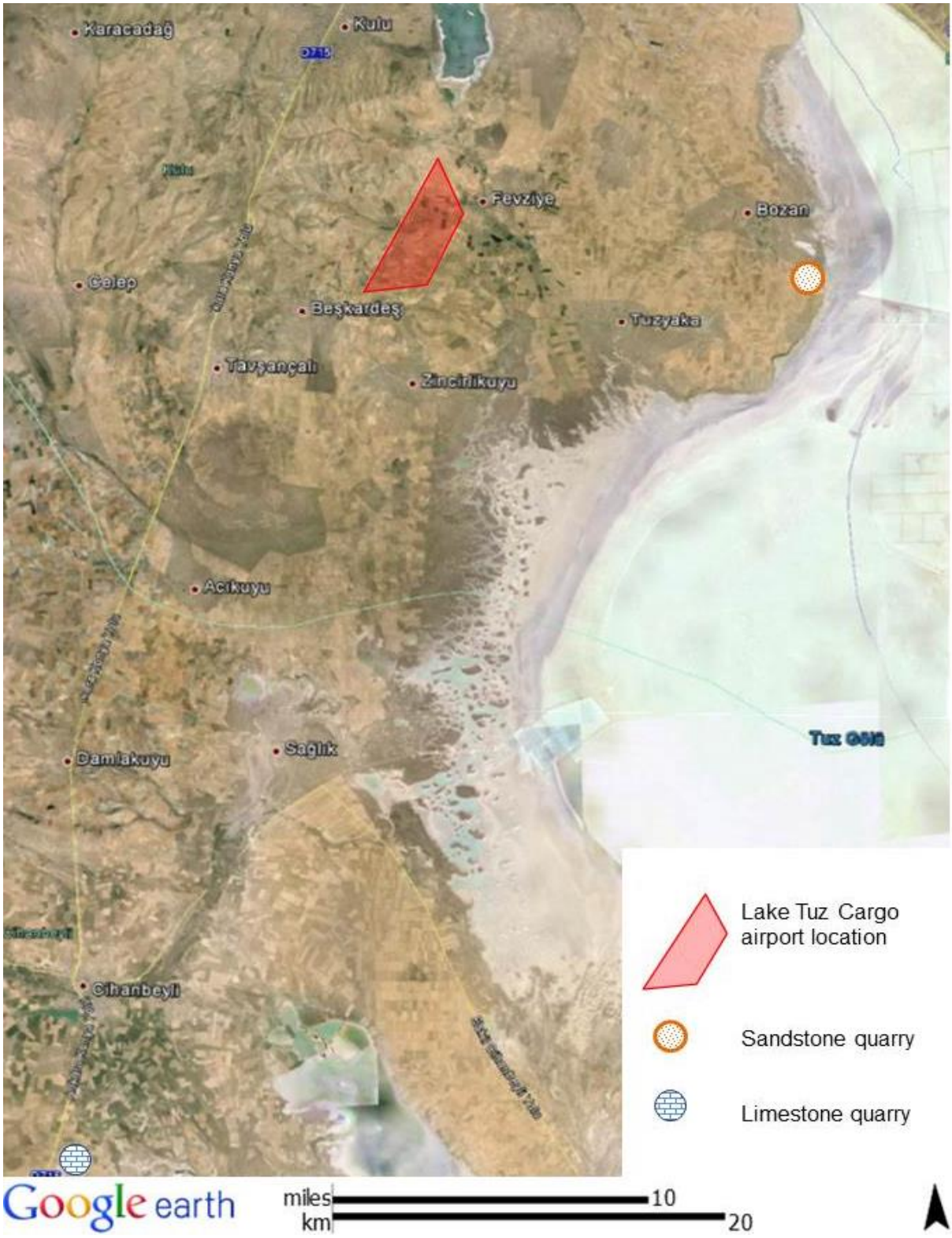
The location of the airport within mostly flat area will minimize the quantity of material for necessary surface levelling. The construction of the runways, taxiways, car parks, hangars and warehouses will consume about 150 thousand m3 of concrete. Cement will be produced within Cihanbeyli municipality, where there are rich sources of limestone and a cement mixing plant exists. Limestone will be exploited from an existing quarry nine kilometres south of Cihanbeyli near the Highway D715 (see Fig. 4) and the total distance to the site of the airport construction is about 80 km. No additional quarries of limestone will be opened. Sand for concrete mixing will be excavated in an old sandstone quarry south of the hamlet of Bozan (see 0). This quarry will be reopened for airport construction only because it is very close, only nine kilometres from Fevziye. This quarry provided sand for the construction of 7 km long embankment of the road across Lake Tuz (Tuzgölü üzerindeki yol) between the hamlet of Bozan and the town of Şereflikoçhisar. After the completion of the airport the quarry will be revitalised with the aim to enhance local biodiversity. Both quarries are situated inside the proposed SCI and SPA Lake Tuz (see Fig. 6).

Other necessary materials (steel, plastic components, steel fences, wood) will be prefabricated and brought from Ankara and other industrial areas within Turkey.

Fig. 4. Limestone quarry near Cihanbeyli

Fig. 5. Old sandstone quarry near Bozan

Fig. 6. Position of the quarries within the area



1.2.3. Location of the depositions from the building site (excavated soil, solid waste)

As described above, the building site of the airport is almost flat (see Fig. 7) and it will be possible to arrange the surface purely by local material. That is why it will not be necessary to relocate material from the building site to any depositions.

Before the construction of the airport about 8 million m3 of topsoil will be removed and used for the regeneration of more than 800 ha of arable land within Kulu and Cihanbeyli municipalities. Primarily, land destroyed by wind and water erosion will be regenerated.

Fig. 7. Landscape in the proposed airport area

1.3. Data on inputs

1.3.1. Land take

The planned airport involves a really large land take. As described above, almost all the land taken for the airport is covered by arable land. The overall land take by the project is about 9.5 km2 (950 ha).

About 800 ha of the area will be covered by paved surface (runways, taxiways, car parks, buildings) and about 150 ha inside the airport territory will be maintained as green zones. A bigger part, about 100 ha, will account for grassland between runways, and the remaining 50 ha will be used for the greenery between the car parks.

1.3.2. Volume of materials brought in during the construction of the project

During the construction it will not be necessary to bring any material for surface levelling. The terrain of the planned airport, especially runways, is flat enough and necessary material is available within the area.

For the pavement of the runways, taxiways, car parks and the construction of hangars and warehouses, it will be necessary to bring about 150 thousand cubic meters of concrete. Cement and sand will be brought from the quarries in Cihanbeyli municipality (as described above).

1.3.3. Consumption of water, energy and other resources during construction

The construction of the Tuz Cargo Airport will temporarily consume about 120 m3 of water per day, especially for concrete preparation in the concrete mixing plant. Four deep wells will be drilled for this use within the proposed airport area. The high water consumption of the concrete mixing plant will last for a relatively short time, especially during paving of the runways and taxiways; during paving of particular service surfaces, their area will be covered by concrete continuously from the beginning till finishing the entire surface.

Water sources, including deep underground water wells, are limited in the area. That is why a water reservoir will be built in the proposed airport area where water reserve will be cumulated for concrete works. The reservoir will be later used for storing precipitation waters collected from paved surfaces – see chapter 1.4.5. Drilled wells will be used during the project operation as sources of potable water for the airport personnel and facilities for truck drivers.

The airport construction and operation will consume a lot of energy from public electrification network. A connection will be built between the closest electric high voltage line (220 kV) and the airport area where main transformer will be built.

During the construction, sources of fuel (diesel as well as petrol) for building machinery will be required. Fuel sources will be needed for trucks in the stage of operation as well. A petrol station will be built at the entrance to the airport area (close to Fevziye) to be used during the airport construction as well as later during the project operation. Fuel supply will be operated by tank trucks via public roads.

The average capacity of fuel tank of the aircrafts is up to 100,000 l of fuel (kerosene). Tuz Cargo Airport should have a daily storage of the fuel adequate for 5 days of full airborne traffic flow. The planned kerosene storage capacity at the airport is 150 mil litres (150,000 m3). Under normal circumstances aircrafts do not need to take full tank. They refuel for the nearest flight only.

Daily supply of kerosene during normal airborne traffic is expected about 5,000 m3 with maximum 20,000 m3 per day. As the capacity of the tank truck is about 30 m3, it is necessary to expect a normal daily frequency of about 100 tank trucks with an extreme maximum of about 200 tank trucks per day.

1.4. Data on outputs

1.4.1. Emissions during construction

The project implementation will produce significant amount of emissions of dust. Due to the volume of topsoil overburden on such a large area and extensive landscaping, it is impossible to restrict the work schedule to autumn and winter time with higher precipitation. Dust emissions would be disagreeable with inhabitants in the settled areas near the proposed airport location, but they would be negligible for the target habitats and target species of the proposed Natura 2000 sites. Species as well as habitats within steppes and arid areas should be adapted to natural dust and sandy storms.

Emissions of nitrogen oxides and other pollutants from the construction site produced by machinery during the implementation and by trucks and aircraft during the operation will not affect SPA and SCI area which is more than five kilometres away. Emissions produced by the transportation of the material for the airport construction (cement, steel) will affect the surroundings of public roads mainly far from the proposed SPA and SCI area.

The highest contribution to concentration of NO2 by machinery building the airport and its infrastructure will reach up to 1.6 µg/m3 in the air within the construction area.

Transportation of sand from the sandstone quarry will impact steppe habitats by emissions along the road between the quarry and Bozan. The possibly affected line where higher emissions of nitrates can be expected is about 8 km long.

Trucks bringing the sand from the sandstone quarry will produce the highest contribution to the average concentration of NO2.The emissions will reach up to 2.6 µg/m3 in the air along the roads within the construction site. This is the maximal concentration which will decrease with increasing distance from the road.

1.4.2. Emissions during operation

During landings and take-offs and the second source will be trucks operating within the logistic area of the airport and on the public roads outside the cargo airport. Machines operating within the logistic centre (fork-lift trucks and similar ones) will be mostly powered by electric engines.

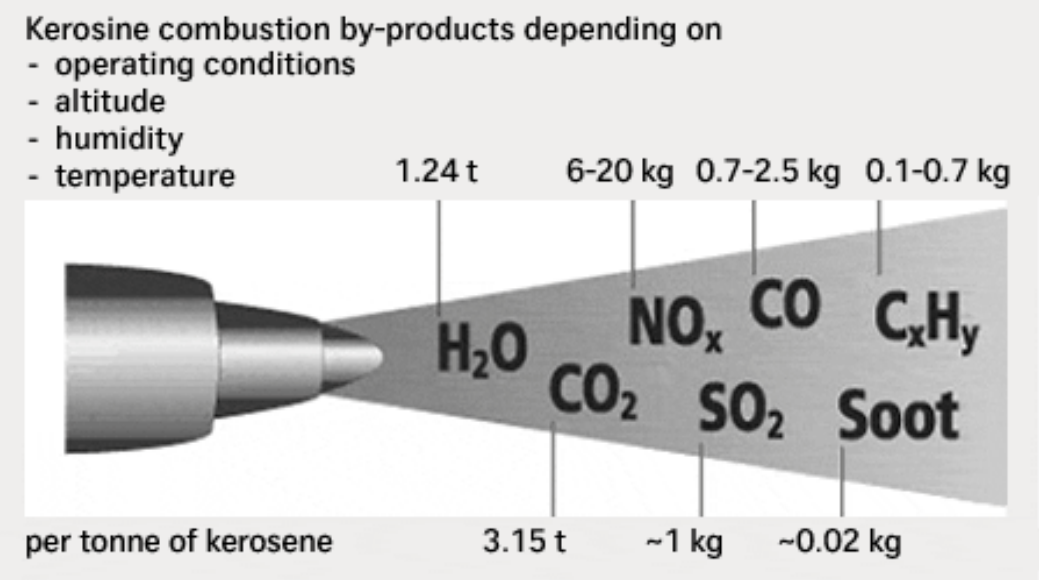
Emissions produced by aircrafts affecting local air quality near the airports according to the International Civil Aviation Organization (ICAO) are:

- Nitrogen oxides (NOx) – which include nitrogen oxide (NO) and nitrogen dioxide (NO2);
- Carbon monoxide (CO);
- Unburned hydrocarbons – which have almost been eliminated from the exhaust stream due to newer engine technologies;
- Sulphur oxides;
- Particular matter (PM) – which leaves the exhausts as carbon black soot;
- Volatile organic compounds (VOCS) – such as benzene and acrolein;
- Ozone (O3) – which is formed from the nitrogen oxides and volatile organic compounds emitted;
- Semi-volatile organic compounds (SVOCS);

- Metals;
- Odour;
- Noise;

Local air quality concerns focus on the effects created during the landing and take-off (LTO) cycle, as these emissions are released below the level of 915 metres, and releases from airport sources (such as airport traffic, ground service equipment, and de-icing). The illustration below (Fig. 8) shows current aircraft engine emissions.

Fig. 8. Model of emissions of an aircraft engine (https://www.metabunk.org/)



Emissions from an aircraft during its flight depend on:

- the type of aircraft (cf. weight, design, etc.);
- the fuel (e.g. nitrous and sulphur contents);
- the characteristics of the engine (e.g. technology, fuel efficiency according to load, etc.);
- the location of the operation (e.g. altitude) and the phase of the flight (LTO, cruise, etc.);
- the distance of the flight (cf. more fuel burned on long distance flights).

Tab. 1. Emission and fuel consumption factors used for the B737-400 type aircraft

(Morten, 2006)

B737 400		Standard flight distances (nm) [1nm = 1.852 km]						
Distance (km)								
	Climb/cruise/descent	231.5	463	926	1389	1852	2778	3704
Fuel (kg)								
	Flight total	1603.1	2268.0	3612.8	4960.3	6302.6	9187.7	12167.6
	LTO	825.4	825.4	825.4	825.4	825.4	825.4	825.4
	Taxi out	183.5	183.5	183.5	183.5	183.5	183.5	183.5
	Take off	86.0	86.0	86.0	86.0	86.0	86.0	86.0
	Climb out	225.0	225.0	225.0	225.0	225.0	225.0	225.0
	Climb/cruise/descent	777.7	1442.6	2787.4	4134.9	5477.2	8362.3	11342.2
	Approach landing	147.3	147.3	147.3	147.3	147.3	147.3	147.3
	Taxi in	183.5	183.5	183.5	183.5	183.5	183.5	183.5
NOx (kg)								
	Flight total	17.7	23.6	36.9	48.7	60.2	86.3	114.4
	LTO	8.3	8.3	8.3	8.3	8.3	8.3	8.3
	Taxi out	0.784	0.784	0.784	0.784	0.784	0.784	0.784
	Take off	1.591	1.591	1.591	1.591	1.591	1.591	1.591
	Climb out	3.855	3.855	3.855	3.855	3.855	3.855	3.855
	Climb/cruise/descent	9.462	15.392	28.635	40.425	51.952	78.047	106.169
	Approach landing	1.240	1.240	1.240	1.240	1.240	1.240	1.240
	Taxi in	0.784	0.784	0.784	0.784	0.784	0.784	0.784
HC (g)								
	Flight total	817.6	912.9	995.8	1065.2	1118.1	1240.4	1374.1
	LTO	666.8	666.8	666.8	666.8	666.8	666.8	666.8
	Taxi out	321.18	321.18	321.18	321.18	321.18	321.18	321.18
	Take off	3.09	3.09	3.09	3.09	3.09	3.09	3.09
	Climb out	10.58	10.58	10.58	10.58	10.58	10.58	10.58
	Climb/cruise/descent	150.78	246.13	329.05	398.47	451.33	573.67	707.37
	Approach landing	10.74	10.74	10.74	10.74	10.74	10.74	10.74
	Taxi in	321.18	321.18	321.18	321.18	321.18	321.18	321.18
CO (g)								
	Flight total	14252.5	15836.0	17525.5	19060.6	20369.3	23298.2	26426.3
	LTO	11830.9	11830.9	11830.9	11830.9	11830.9	11830.9	11830.9
	Taxi out	5525.45	5525.45	5525.45	5525.45	5525.45	5525.45	5525.45
	Take off	77.19	77.19	77.19	77.19	77.19	77.19	77.19
	Climb out	202.29	202.29	202.29	202.29	202.29	202.29	202.29
	Climb/cruise/descent	2421.54	4005.06	5694.59	7229.65	8538.39	11467.26	14595.41
	Approach landing	500.54	500.54	500.54	500.54	500.54	500.54	500.54
	Taxi in	5525.45	5525.45	5525.45	5525.45	5525.45	5525.45	5525.45

Tab. 2. Calculation of expected emissions from aircraft operation within landing and take-off (LTO) cycles

	1 x LTO (B737-400)	400 x LTO (B737-400)	1000 x LTO (B737-400)
NOx (kg)	8.3	3,320	8,300
HC (kg)	0.6668	266.720	666.800
CO (kg)	11.8309	4,732.360	11,830.9

1.4.3 Noise during construction

The project implementation will bring about several sources of noise. Heavy machines carrying away the topsoil and levelling a large area will produce noise.

The highest sound protection limit for the engines of category “N” with power higher than 250 kW which could be used for airport construction is up to 82 dB.

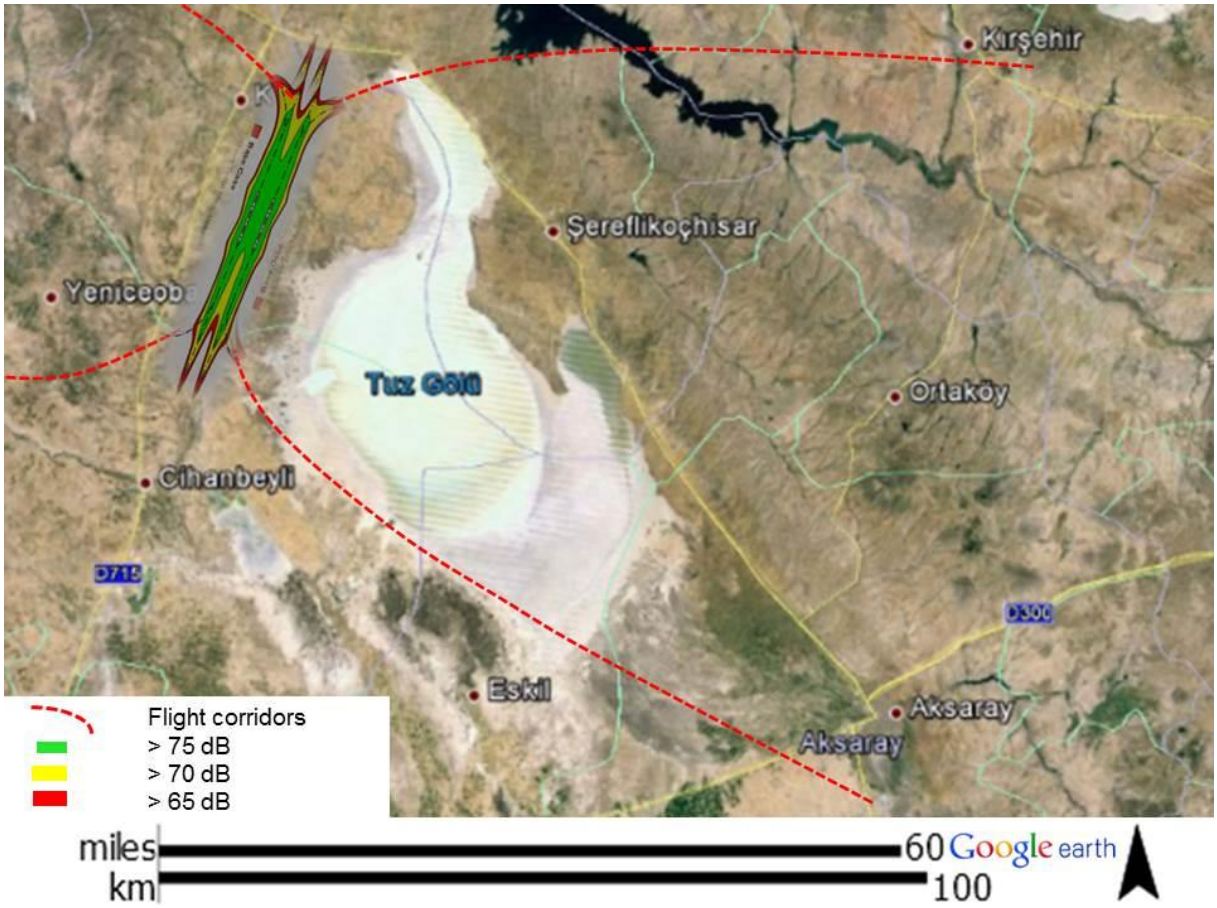
Noise reduction in open space is a relatively complicated process depending on wind speed and direction, air temperature and humidity, and vegetation. The value of noise reduction is mostly quoted between 20–22 dB per each 100 m of distance from the source. As the sound level for suburban areas is quoted between 40–50 dB, a significant decrease of noise up to 200 m from the construction site can be expected. It means that the proposed SPA and SCI will not be involved.

The closest site from the SPA where machines will produce noise during project implementation will be the sandstone quarry (see Fig. 6) which is situated 400 m far from the shore of Lake Tuz; its noise can be heard only on a short stretch of the lake shore at the level below 40 dB. Noise on the road from the sandstone quarry to the airport will reach up to 70 dB during the airport construction.

1.4.4. Noise during operation

Airports belong among the noisiest facilities. Models of noise influence of the airports are very complicated and obviously have more alternatives for different wind directions and corresponding landing and take-off corridors (see **Error! Reference source not found.**). The model used in this AA oes not involve the influence of wind. Levels of noise higher than 60 dB were incorporated in the model because 60 dB is a normal daily noise background in a farmland.

Fig. 9. Flight corridors and sources of noise during aircrafts landings and take-offs



1.4.5. Waste

A considerable part of the airport area will be covered by paved surfaces (about 800 ha). These paved surfaces will prevent soaking up of the precipitation. All such water will be directed into a reservoir. The water accumulated in the reservoir will be regularly checked and used for irrigation of greenery plots within the car parks.

Sewage water from the airport area (staff of about 1,500 persons) will be purified in a sewage treatment facility near the entrance to the area, close to the village of Fevziye, and its capacity will enable sewer hook-up from the village. The recipient for the purified waters will be a small creek entering Lake Tuz between the hamlets of Tuzyaka and Zincirlikuyu.

The sewage treatment facility will be built as one of the first facilities within the project and it will purify sewage water from the utility rooms and dining rooms of construction workers from the very beginning of construction works.

The cargo airport will produce only a small quantity of materials. There could be some production of wrapping material when some goods will be divided into more shipments (paper, plastics, wood). These materials will be separated and transported to already existing recycling facilities.

No other waste will be produced during cargo airport operation.

Fig. 10. Mouth of the channel – recipient for purified waters from airport area to Lake Tuz

1.4.6. Frequency of traffic during project implementation

The project implementation will require transportation of cement from the cement factory near Cihanbeyli and sand from the sandstone quarry near Bozan.

During the construction, at least 4,200 trucks with cement (on average 6 per day) and about 20,000 trucks with sand (on average 30 per day) will arrive at the site during two years. The frequency of this traffic will be regular. Placement of concrete on the runways will need more material in a short time (several weeks) as this process must be continuous. For these special works, a temporary storage for storing the necessary material will be prepared and situated near the concrete mixing plant on the location of future car parks.

1.4.7. Frequency of traffic during project operation

The expected frequency in normal operation is about 200 landings and 200 take-offs per day with a short-time rush frequency of the airport up to 500 landings and 500 take-offs per day, which is the highest capacity of the runways as well as the capacity of the logistic centre.

The frequency of truck movements will depend on the volume of transferred goods. The expected average frequency is 1,000 trucks per day with a possible top rush frequency of about 2,500 trucks per day.

2. Utilisation of available data (central as well as regional) about the site, and verification of the current status of the proposed SPA/SCI in the field

A field survey is a crucial part of each appropriate assessment. The aim of the field survey should be a) to confirm published data, if available (however, these data might be old and inaccurate); b) to gather the current data enabling to tailor the assessment to the real situation in the site(s).

Another aim of the field survey is deep understanding of relations in ecosystems within the area possibly involved by the assessed project. Basic data found in literature, on the web and in overview maps of such a large area are too general for a proper evaluation of a specific project at a specific site.

A detailed description of all sites affected by the project, an evaluation of quality and quantity of habitats, populations and functional interactions within the habitats are necessary for the justified decision on the significance of impacts of the project on target features.

2.1. Identification of affected sites within the proposed SPA/SCI

Lake Tuz and its surrounding area, as one of the largest salty lakes in the world and the biggest protected area in Turkey, is proposed as SPA as well as SCI following the EU Nature Directives (Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora and Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds – Habitats and Birds Directives).

The assessed project of Tuz Cargo Airport is situated outside the proposed SPA and SCI Lake Tuz. Inside the proposed SPA/SCI, there are two quarries of limestone (near the highway D715 between the towns of Kulu and Kirkişla) and a sandstone quarry (right on the shoreline of Lake Tuz near the hamlet of Bozan). Both these areas will be influenced by the project implementation because of trucks transporting cement and sand to the building site.

During the assessment, influences of the air traffic (noise above all) on the mosaic of temporary wetlands as well as permanent side lakes beside the main Lake Tuz were identified. All these plots are used by many target bird species of the proposed SPA.

2.2. Description of the affected sites, habitats and species within the proposed SPA/SCI and the character of impacts

Lake Tuz Environmental Protection Area (SEPA) declared on 14th September 2000 is by far the largest protected area in Turkey (7,414 km2). It covers a larger area than all the other SEPAs in Turkey combined.

Lake Tuz is mainly fed by underground water and represents one of the largest hypersaline lakes in the world. Being a site of tectonic origin, the area is located in a large closed basin called Konya basin. On average, the depth of Lake Tuz is less than 0.5 m. The lake is surrounded by four plateaus - Kızılırmak

(East), Obruk (South), Cihanbeyli (West), and Haymana (North). The area is poor in inflowing rivers due to its location in the part of the country which receives the least rainfall.

The surface area of the lake reaches up to 164,200 ha in spring. The altitude of the lake is 905 m. In summer, a dry period with excessive evaporation from the lake results in the formation of a salt layer about 30 cm thick. It is one of the saltiest lakes in the world as the density of water equals to salt ratio of 32.4 %. About 70 % of salt used in Turkey is produced from Lake Tuz.

Integral parts of Lake Tuz ecosystems are the mosaic of salt steppes and marches, temporary small lakes as well as smaller permanent lakes, like Düden Gölü Lake.

2.2.1. Identification of target bird species within the proposed SPA

Lake Tuz area provides unique environment for many bird species. The mosaic of habitats provides feeding grounds for various bird species all year long. That is why the lake and the surrounding steppe habitats can serve nesting, migrating as well as wintering birds.

The list of rare bird species (see Tab. 3) shows that this large reserve is settled not only by birds known within Europe and classified in Bird Directive Annexes but also by species living outside the European area which are not listed in Annex I of the latter. Among these birds, Greater Sandplover (Charadrius leschenaultii) or Steppe Eagle (Aquila nipalensis) can be named. Some other species considered rare in Turkey are common in Europe and, therefore, are not included in Annex I, e.g. Yellow-legged gull (Larus michahellis) or Common Shelduck (Tadorna tadorna).

Tab. 3. List of the most significant bird species listed by Birdlife Intl. within the Lake Tuz area (http://www.birdlife.org/datazone/)

Breeding Species	BD Annex	Population estimated
Caspian Tern (*Sterna caspia*)	I	3-5 pairs
Collared Pratincole (*Glareola pratincola*)	I	200 pairs
Common Crane (*Grus grus*)	I	15-20 pairs
Eastern Imperial Eagle (*Aquila heliaca*)	I	2 pairs
Great Bustard (*Otis tarda*)	I	83-110 ind.
Great White Pelican (*Pelecanus onocrotalus*)	I	2-3 pairs
Greater Flamingo (*Phoenicopterus roseus*)	I	14,000 pairs
Greater Sandplover (*Charadrius leschenaultii*)		100-120 pairs
Kentish plover (*Charadrius alexandrinus*)	I	400 pairs
Lesser Kestrel (*Falco naumanni*)	I	100 pairs
Little Bustard (*Tetrax tetrax*)	I	20 pairs
Montagu's Harrier (*Circus pygargus*)	I	40 pairs
Pallid Harrier (*Circus macrourus*)	I	1-2 pairs
Steppe Eagle (*Aquila nipalensis*)		1-2 pairs
Yellow-legged gull (*Larus michahellis*)		450-600 pairs

Wintering and passaging species	BD Annex	Population estimated
Common Crane (*Grus grus*)	I	4,000-8,000 ind.
Common Shelduck (*Tadorna tadorna*)		820-1,240 ind.
Common Teal (*Anas crecca*)		13,000-57,000 ind.
Eurasian Dotterel (*Eudromias morinellus*)	I	800-1,000 ind.
Greater White-fronted Goose (*Anser albifrons*)		6,618-57,000 ind.
Greylag Goose (*Anser anser*)		400-1,400 ind.
Gull-billed tern (*Sterna nilotica*)	I	200-300 ind.
Red-breasted Goose (*Branta ruficollis*)	I	118 ind.
Ruddy Shelduck (*Tadorna ferruginea*)	I	350-2,160 ind.

The list of species displayed in the table (Tab. 3) is not complete as it does not list especially songbirds. During the field mission in April 2015, other birds from Annex I of the Bird Directive were observed, such as Calandra Lark (Melanocorypha calandra), or bird species living outside the European area and not listed in that Annex, such as Black-headed Wagtail (Motacilla flava feldegg). Both these bird species were observed within the assessed area of the cargo airport project.

For the needs of this project, specific bird species should be defined as model target species within the proposed Lake Tuz SPA. Besides the above named species, the SPA should be protected as a habitat for migratory and wintering flocks of about one hundred thousand of waterfowl.

Some of the nesting bird species have their home-range almost completely outside Europe (Greater Sandplover and Steppe Eagle); these birds are not listed in Annex I of the Bird Directive.

2.2.2. Identification of target bird species within the proposed SPA

In the proposed SCI Lake Tuz, various types of habitats have been described already. Unfortunately, Turkey has not yet defined the list of habitat types from Anatolian biogeographical region for Annex I of Habitat Directive.

Steppe, salt steppe and arid habitats as well as habitats of salty lakes are quite different from habitats in southern and south-eastern Europe (1530 *Pannonic salt steppes and marches) or from coastal and other halophytic habitats. Unless the list of specific habitats of Turkey has been defined, it is impossible to identify target habitats within the Lake Tuz area.

Similarly to the possible target habitats of Lake Tuz, neither the target non-bird species have been defined for the area yet. Several animal species listed in Annex II were observed during the field mission in April 2015, such as European Ground Squirrel (Spermophilus citellus) (Fig. 11), Greek Tortoise (Testudo graeca ibera) (Fig. 13) and European Pond Turtle (Emys orbicularis) (Fig. 12).

All these animals were observed close to the roads planned for transportation of the limestone and sand for the cargo airport construction. Therefore, a high risk of killing these animals by trucks can be expected (see Fig. 14). However, due to the fact mentioned in paragraph 2.3.1 below, these species

have not been included among the target features of the SCI for the purpose of this pilot assessment and, therefore, impact in them has not been evaluated.

Fig. 11. European Ground Squirrel (*Spermophilus citellus*)

Fig. 12. A pair of European Pond Turtles (*Emys orbicularis*)

Fig. 13. Greek Tortoise (Testudo graeca ibera)

Fig. 14. Road between the sandstone quarry and the village of Bozan with steppe habitats including a medieval cemetery and ancient grave mound – a habitat of Greek tortoise

2.3. Affected target features within the proposed SPA/SCI and the character of impacts

2.3.1. Affected target features within the proposed SCI and the character of impacts

As mentioned above (see Chapter 2.2.2.), reference habitats and species have not yet been defined for Anatolian region of Turkey (Annex I and Annex II of Habitat Directive) and, therefore, the influence on habitats and species other than birds cannot be evaluated in this appropriate assessment.

2.3.2. Affected target features within the proposed SPA and the character of impacts

Lake Tuz area is an extremely diverse location with dense bird populations. Specific conditions of a salty lake are sufficient habitats not only for nesting birds but Lake Tuz is also a crucial area for migrating and wintering birds from eastern Europe as well as from western Asia. Not all the birds listed among target bird species would be influenced by the implementation and operation of the project (see Tab. 3).

Target bird species possibly affected by the project were recognized during the field survey of the site (see Tab. 4).

Tab. 4. List of target bird species likely to be affected by the assessed project

Species	Season	Population estimated
Eastern Imperial Eagle (*Aquila heliaca*)	breeding	2 breeding pairs
Greater Flamingo (*Phoenicopterus roseus*)	breeding	14,000 breeding pairs
Waterfowl species	wintering and migrating	more than 100,000 individuals

The complex of habitats within the area comprising the salty lake (including smaller side lakes), temporary marches, wetlands, periodical lakes and salty steppes and arable land provide specific food sources all year-round.

Never freezing salt waters provide feeding sources for breeding, migrating and wintering birds especially during autumn, winter and spring, when the salinity is lower thanks to precipitation and the benthos and plankton of these waters reach the highest biomass. During winter and spring wet period, rainwater fills temporary marches and lakes beside the main lake. These temporary wetlands are well known for their extremely high primary as well as secondary production, especially of crustaceans. These animals produce enormous numbers of eggs surviving over dry periods lasting sometimes one year or even several years. Development of these eggs after the wet period is extremely fast and in several days they can produce high biomass of energetically rich food for birds. A typical species of salty lakes is brine shrimp (*Artemia salina*) which represents a crucial food source for flamingos. However, there is a lot of species of plankton as well as benthos (crustaceans, worms, insects and others) with a similar reproduction strategy, feeding other bird species as well. Large ungulates play a significant role in this process. These animals which graze vegetation within the temporary pools and wetlands return key nutrients back to the soil by their excrements. An irreplaceable function of ungulates is trampling of the wet soil in winter releasing nutrients from the soil as well as eggs of

invertebrates to the water. Before human settlement this function had been fulfilled by wild natural species which were later replaced by herds of domestic animals. Here in Anatolia we can expect permanent long term land use of this kind for several thousand years and, therefore, relatively stabilised regime of secondary habitats.

These processes start at different times in the main Lake Tuz and in artificial smaller lakes in its neighbourhood providing the bird feeding progressively. None of these Lake Tuz functional segments is dispensable for waterfowl.

Winter and spring wet period provides feeding sources for herbivorous birds as well. As listed in the document published by the Birdlife International (see Tab. 3), about 100 thousand of herbivorous ducks and geese use Lake Tuz on their passage or for wintering. In late spring or summer, on the contrary, there is almost no vegetation which could serve feeding the waterfowl. During this summer period, small lakes in Lake Tuz neighbourhood provide the food for carnivorous birds feeding on animals living in salt water (mainly crustaceans).

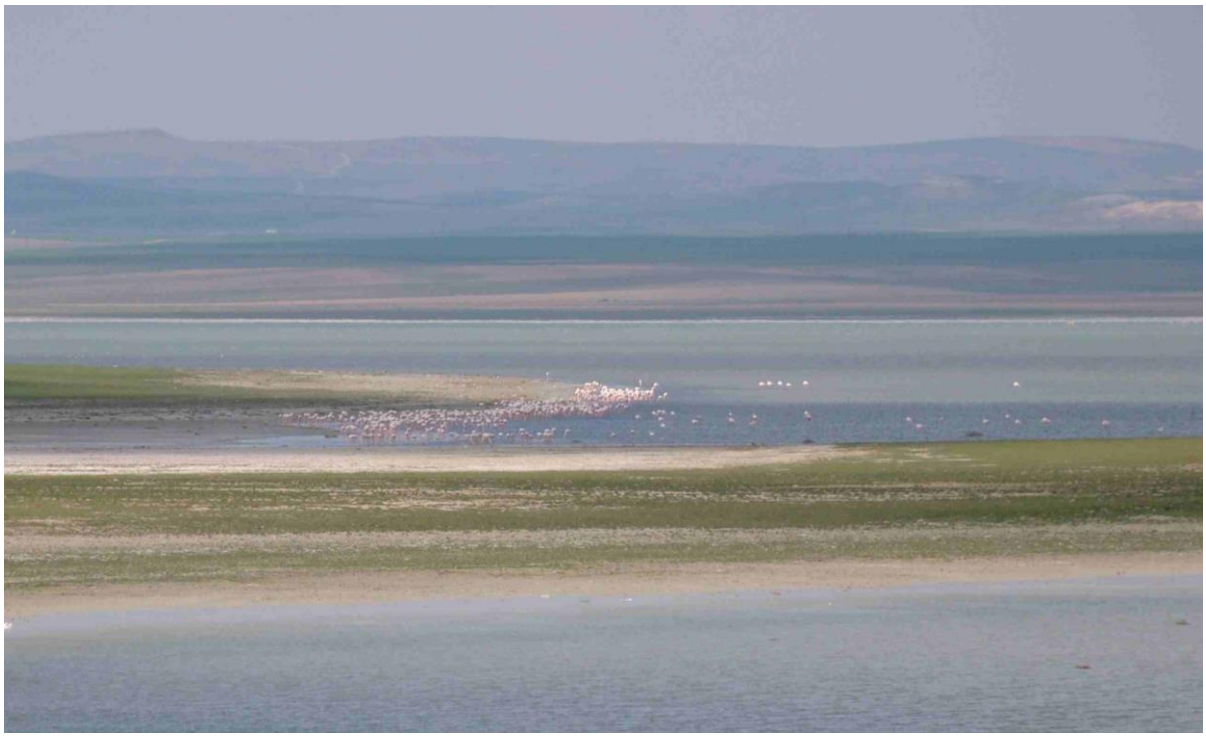
Flamingos primarily depend on crustaceans. Brine shrimp (*Artemia salina*) represents not only the source of energy for flamingos, but the pink colour of the latter is generated from red pigment concentrated in Brine shrimps from saline bacteria. Flamingos feed not only in the main Lake Tuz but they frequently use smaller temporary lakes in spring (see Fig. 15) as well as permanent lakes during the whole year.

Fig. 15. Greater Flamingos (*Phoenicopterus roseus*) feeding on Crustaceans on a small temporary lake near the village of Saglik in April 2015

A flock of about one thousand flamingos was observed during all three field visits to Lake Düden Gölu near the town of Kulu (see Fig. 16). This lake is right in an area directly affected by noise from the airport and flamingos would be permanently disturbed (see **Error! Reference source not found.**). herefore, it is highly likely that they would leave that area and that the overall flamingo population would be reduced.

As the population of Greater Flamingos within the whole Lake Tuz area is estimated on 14 thousand pairs, losing one thousand of birds means at least 4 % of that population. Other flamingos (approximately hundreds of birds) using small temporary wetlands close to the airport as feeding grounds would leave these patches due to noise disturbance. The total decrease of the Greater Flamingo population could reach about 5% or more within the whole area. Such decrease is always considered a significant impact (Lambrecht et Trautner 2007).

Fig. 16. Flock of Greater Flamingos (*Phoenicopterus roseus*) on Lake Düden Gölu in April 2015



Lake Tuz area is used by approximately 100 thousand of waterfowl during their migration and wintering. These birds use this area especially during the wet period of the year when there is enough food for ducks and geese on vegetation of steppes. These food sources are available from December to April.

In the time of ducks and geese passage, there is the winter rain period in central Anatolia and salty steppes and semiarid steppes produce green biomass usable by birds as well. Without grazing or burning out, recycling of nutrients between plants and soil does not occur and steppe plants accumulate nutrients from the soil to their stems. This process inhibits production of fresh green biomass necessary for birds during winter. As both the area and productivity of the steppes around Lake Tuz is not too big, we can observe that the arable land surrounding Lake Tuz provides food for herbivorous birds as well. Winter crops grow in the winter time as well as seeds left over from the last harvest. All the herbivorous waterfowl, migrating and wintering birds depend on traditional agricultural land use technology within the Lake Tuz area.

Thanks to the observations from the field visit in mid-April, it was possible to define target bird species which use these temporary food sources. April is an optimal time for these observations because it is the end of winter period when last wintering and migrating birds are still there and migrating birds are starting to breed.

During the first field visit in June 2014 and during another one in November 2014, only dry depressions were observed. In contrast with these first two visits, plenty of small lakes and wetlands, in plots completely dry during the rest of the year, were observed in April 2015. This finding helps to understand that these periodical wetlands beside the main Lake Tuz are as important as the main lake.

During the field survey at the end of April 2015, only a few remaining flocks of wintering birds were observed. Approximately hundreds of Ruddy Shelducks (*Tadorna ferruginea*) and Common Shelducks (*Tadorna tadorna*) were seen on small wetlands in the area to be influenced by noise from the planned airport (see Fig. 17).

Fig. 17. Common Shelduck (*Tadorna tadorna*) on a small wetland near Fevzie in April 2015

One pair of Eastern Imperial Eagles (*Aquila heliaca*) was observed during the field survey as well. These birds were close to the limestone quarry south of Cihanbeyli where the cement production is planned. These birds are top predators in the food chain in a steppe area and they need large territories. Any disturbance would limit the territory of eagles. A specific research focused purely on this species should be carried out for the quantitative calculation of its potential territory loss.

3. Assessment of the impact of project on the proposed SPA/SCI

3.1. Assessment of impacts on target features of the site

Lake Tuz is quite a large area with specific habitats providing irreplaceable conditions for many nesting, migrating and wintering bird species. It may seem that such a large area should provide enough space and food for all bird species found in here and a small loss of the area would be negligible for any species using this space. However, the reality is different.

Visits to the area in various parts of year (April, June, November) helped us understand the really complicated relationships between the weather during the four seasons, habitat production and feeding supplies during the whole year. Salty Lake Tuz itself cannot provide food for birds during warm and dry period of the year (from spring to early autumn) because the concentration of salt eliminates biological production within the lake.

Lake Tuz area is an absolutely unique area and a year-round useable complex of habitats for birds which has no parallel in Europe. Even though the dry and salty area may at the first glance seem unsuitable for waterfowl, in fact it is a very rich site.

The field visits to the area in June and November 2014 and April 2015 helped to understand essential changes of the habitats and ecological services provided by this large area during the year. In this cycle, both natural habitats as well as long-term farmland use within Lake Tuz surroundings which involves food sources of the waterfowl and other birds play an important role.

Results of this appropriate assessment are based on studying of the available data as well as the field survey of the complicated ecosystem relations described above.

The complex of pasture lands and other forms of agricultural landuse combined with relatively untouched wild steppe ecosystems on lake islands and wetlands provides unique sources of food especially for Greater Flamingos and for passaging and wintering waterfowl. Any deterioration like reduction of the area necessary for this food cycle influences these target features directly as they utilise all the space within the whole area.

Other target features of Lake Tuz area using temporary wetlands (like plovers or terns and other species depending on littoral ecosystems – those not used as target features for this pilot assessment) have smaller populations within the area and they can find other areas for feeding within the Lake Tuz marchlands.

Impact of the Tuz Cargo Airport on birds of prey has another character. The single pair of the eagles observed in the area likely to be affected by noise of the aircrafts would be impacted directly.

3.2. Assessment of possible cumulative effects

The area of the assessed project is mainly situated on arable land; raw materials for project implementation will be excavated inside the proposed SPA/SCI Lake Tuz. Land use within the area has a thousand-year-old tradition. We have no available quantified data about the intensity of land use in the past (number of inhabitants, structure and volume of crop and density of cattle within the area).

Recently, increasing intensity of crop production, supported by irrigation and fertilising, have been observed. However, these agricultural methods divert from the traditional ones. Channels for faster drainage of winter precipitation waters and irrigation systems have been built in the area in last few decades (see Fig. 19). Drainage of the area is named as one of the risks for birds by Birdlife International as well (http://www.birdlife.org/datazone/).

This progress could change the traditional land use within the area and above all the year-round food offer described in Chapter 2.3.2.

Within the area other large projects possibly cumulating with the assessed project of the cargo airport have not been found. There are plenty of small local projects, targeted especially at faster draining of local temporary wetlands. Losing the patches of drained wetlands together with the area affected by noise disturbing the birds by the assessed airport will accelerate deterioration of these bird species populations. However, quantification of these effects is impossible due to lack of any data.

The influence of salt extraction within the area has been assessed as a possible cumulative effect at first. However, the outcomes of discussions with salt quarries owners denied this threat. New technologies currently used for salt extraction after privatisation of the salt quarries are more effective than technologies used by former state companies. Present extraction of salt meets requirements on lesser influence on the salt lake than in the past. Trends in salt market are stable; extreme increase in salt needs in the world market and related growth of salt mining is not expected.

The embankment of the road across the main lake between the village of Bozan and the salt quarry within the municipality of Şereflikoçhisar may have a possible negative influence on Lake Tuz. This embankment was built in 1976 and currently is used only by those having a special permit. It transpired later that the embankment divided the lake into two parts where different processes of drying up and salt crystallization in spring and summer occur. Up to present it is unclear whether this influence has a negative effect on species and habitats. Therefore, it is impossible to assess it as a possible cumulative effect with the Tuz Cargo Airport project.

Fig. 18. Embankment of the road across Lake Tuz

Increasing agricultural intensity within the area, especially higher fertilizing rate, was ascertained as one of the negative effects on Lake Tuz ecosystems and species. However, implementation of the Tuz Cargo Airport will not cumulate with these influences.

A military air force target area is intended somewhere close to the Lake Tuz area as well. Information about this plan was provided by Mayor of Cihanbeyli Mr. Mehmet Ali Önal. Specific plans and the location of this project have not yet been defined. That is why it is impossible to assess its cumulative effects, too. If the project of military air force target area is implemented, than a special appropriate assessment should be carried out for that new project in which Tuz Cargo Airport would be taken into consideration as a source of possible cumulative effects in this area.

Fig. 19. One of the drainage channel outfalls to Lake Tuz near the hamlet of Saglik

3.3. Evaluation of data completeness for the assessment

Only partial data necessary for the assessment were obtained within the area. The area of Lake Tuz is too large to quantify all the data necessary for the assessment.

Field research for such a specific (and extensive) assessment requires about one hundred field research man-days for gaining trustworthy data concerning real influence of the assessed project on target species. Such field survey should involve autumn, winter as well as spring periods in order to gather data on birds which use the area proposed as SPA.

One of the specific issues of birds of the Lake Tuz area is a crucial changing of exploitability of habitats during the year cycle. During winter and spring period birds can use as feeding grounds not only the central salty lake. Plenty of feeding habitats are provided by short-time (periodical) flooded marches, too. In these sites, high biomass is produced by specific short-lifecycle populations of invertebrates as well as by shortly productive steppes, adapted to short wet winter periods. It is the time when there is plenty of food for herbivore waterfowl in the area as well as also dry habitats surrounding the lake provide biomass useable by these bird species. During winter, fields planted by winter crops would provide enough food for wintering birds as well.

During the spring period (March, April, and May) marshlands slowly retreat and dry salty steppes appear. At this time wintering birds abandon the area and mainly only nesting birds remain there.

A project with so large and long-term influence on several target bird species should be assessed in field through a year-round field survey. Specific methods should be planned for observations of various bird species crucial for proper evaluation of possible impacts of the assessed project.

4. Consultations

4.1. Consultation with regional experts and specialist(s) in given target features

At At the beginning of the project, basic issues of Lake Tuz conservation were consulted with national experts responsible for nature conservation within the Lake Tuz area and specialists from the Turkish Ministry of Environment & Urban Planning, Directorate General for Preservation of Natural Heritage and regional authorities: Mr. Mehmet Altuntas, Mrs. Suhdendan Aydemir, Mrs. Damla Baykal, Mrs. Safak Ozturk, Mr. Erdem Korkmaz, Mrs. Ozge Aktas, Mr. Erdal Eyupoglu, Mrs. Gözde Resber, Mrs. Deyra Karlislioglu, Mrs. Nihan Sumer, Mr. Umut Yasar Kelek, Mr. Guner Ergun, Mr. Umit Turhan, Mr. Ahmet Oguz, Mrs. Özlem Aksoy, Mr. Levent Keskin, Mr. Onur Andac Sever.

I would, above all, like to express my special thanks to Mrs Gözde Resber and Mrs. Özlem Aksoy for their help, contacts, information as well as translation before and during the field survey.

4.2. Consultation with regional authorities (risk of cumulative effects)

During AA preparation the mayors of Kulu municipality (Mr. Ahmet Yıldız) and Cihanbeyli municipality (Mr. Mehmet Ali Önal) were visited to get more information on present plans and projects within the municipalities with possible cumulative effects with the assessed project of Tuz Cargo Airport project.

During the field data collection phase, private owners of the biggest salt quarries within Lake Tuz near Hamzali (east shore of Lake Tuz) and near Yavsan Tuzlasi (Cihanbeyli municipality) were also visited. The main aim of these visits was to familiarize with the present technologies and trends in the extent of salt extraction from Lake Tuz and their impacts on Lake Tuz ecosystem.

4.3. Personal consultations with the proponent

The assessed project was manufactured by a project team for educational needs only. This is why this chapter of the document is not elaborated.

4.4. Unknown data

As described above, habitats and non-bird species have not been defined as target features within Lake Tuz yet. Target bird species have been defined according to literature data only. Exact recent data which would quantify the possibly affected target species are not available.

That is why the presented model appropriate assessment is a result of limited published as well as field data. If this appropriate assessment were real it would need to be completed with much better information and data collected during long-term field work within the area.

5. Recommended Mitigation measures

The results of the appropriate assessment proved significant negative effects of the implementation and operation of the Tuz Cargo Airport project. As the project was proposed in one alternative only, there is no opportunity to propose mitigation measures. Results of the appropriate assessment proved significant negative effects of the implementation and operation of the Eco-resort Kavadarci project. As the project was proposed in one alternative only, there is no opportunity to propose mitigation measures.

6. Conclusions

The appropriate assessment of the implementation and operation of the Tuz Cargo Airport is based on a few currently defined target features in the proposed SCI and SPA Lake Tuz and their quantification.

With respect to the currently proposed and quantified target features for the proposed SPA, this AA evaluated three species (or group of species) as being likely to be significantly affected by the project.

First, it would be Greater Flamingo (Phoenicopterus roseus). Its impacted population reaches about 5 % of the currently known population within the site. The impact would be permanent and irreversible.

Second, about 950 ha of the fields covered by concrete and about 3000 ha (including winter periodical wetlands and lakes and permanent Lake Düden Gölü near Kulu) heavily influenced by noise will represent the loss of about 4000 ha of potential winter food sources for passaging and wintering waterfowl birds, especially herbivorous species (ducks, geese) which cannot use the central salty lake as there is no useable vegetation. The loss of 4000 ha of habitats means about 10% of the area used by passaging and migrating birds with possible decrease of about 10% (10,000) of migrating birds.

Third, only two pairs of Eastern Imperial Eagle (Aquila heliaca) breed within all Lake Tuz area. One of these pairs was observed during the field survey in April 2015 in steppe habitats between Cihanbeyli and Lake Tuz to be in overlap with the flight corridor of the Tuz Cargo Airport where significant noise impact is expected. Loss of this one breeding pair from the Lake Tuz area would represent a 50 % decrease of the Eastern Imperial Eagle population.

6.1. Conclusions on the impact on site integrity

The appropriate assessment proves that the implementation and especially operation of the project of Tuz Cargo Airport will significantly adversely affect some target features of the proposed SPA Lake Tuz. That is why the ascertained impact of the project on these birds has been assessed as an adverse impact on site integrity.

No mitigation measures have been identified.

Therefore, the project must not be authorised.

7. References

- Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora;
- Directive 2009/147/EC of the European Parliament and of the council on the conservation of wild birds;
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