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Air Transport; Airport Planning and Probable Environmental Impacts; The Case of Gülyalı Airport

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Topic: Transport and Environment (Espoo Covention, Sec.3)

Abstract

We are charged, by the Ministry of Transport, with the preparation of master plans for new airport at "Gülyalı" between the cities of Giresun and Ordu, on the eastern Black Sea Coast of Turkey.

According to the Turkish "Environment Law" it is an obligatory stage to prepare a comprehensive EIA report after finalising the preliminary airport projects.

In this paper, it is intended to explain the objectives, site selection and planning criteria and the EIA report for the proposed "Gülyalı" domestic airport project.

Gülyalı Airport project planned and designed after extensive land suitability and location analysis survey, which covered quantitative analysis of wide surrounding geographical area, which has steep and broken topography at the land side. But draft topography is not suitable to the requirements of landing and take off criteria, therefore the possibility of designing the airport on an infilled land in the sea was seen the only alternative. After careful investigation in the field, it is agreed to plan the runway and the terminal on an infilled land. Sea side and land side facilities necessitate an area approximately 300 x 3000m in size, which will fulfil the requirements of ICAO criteria.

Five alternative proposals that fullfil the secured landing and take off were disigned and evaluated. The first alternative was the runway secured from the sea (from high waves) with a strip of 100m infilled land and 5 meter high breakwater, second alternative designed to protect infilled land from waves with a narrow sea canal and a waterbreak, third alternative aimed to protect the runway from waves similar as the second alternative but it allowed sea make an inlet between runway and the ground side, fourth alternative was the combination of the foregoing three alternatives. The fifth one is structurally different one; instead of infilling, the runway lifted over the sea by pile foundation (the platform over piles). Study of EIA was rather difficult process, since there were serious information shortages. The most economic and environmentally less harmful one is chosen.

Finally, a feasibility study has prepared and submitted to the Ministry of Transport.

Ordu and Giresun. The result of the survey showed that 20 pc and 11 pc of the total passengers (boarded, landed) of Trabzon and Samsun airports respectively were from Ordu and Giresun provinces.

By using the above figures passenger, flight and cargo predictions were made for master plan period (2000-2015). The predicition methods used were the expontential smoothed regression and exponential smooted time series (Statgraphics Statistical Package, 1986). The predicted values of passengers, flights, cargo and the peak values are given in Tables 1, 2, 3.

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2005	129 796	196 976	1 762	2 810	1 923	2 561
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* a and b are the parameters.

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Table 3. Peak Day and Peak Hour Passenger, Flight Volumes

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2.2. Site Selection

The suitable site selection needs to be analysed taking into account the following factors (Ashford, Wright, 1992):

- Operational capability: airspace considerations, obstructions, weather,
- Capacity potential: extend of available land, suitability for construction.
- Ground access: distance from demand for aviation services, road access, public transport.
- Development costs: terrain, land costs, land values.
- Environmental consequences: aircraft noise, impact on flora and fauna, existence of endangered species, air quality.
- Consistency with area-wide planning, impact on land use, effect on comprehensive land use and transportation plans.

2.2.2. Land Reclamation

Two main alternatives were questioned; land fill and consruct the airport on an eleveted platform on the sea. The former alternative was much more economical than the latter one.

Land reclamation will be done by filling rock material extracted from a quarry 5.5 km away from Gülyalı. A number of filling alternatives were considered. Two of them are:

- Protection of reclaimed land from the sea waves by a breakwater (Figure 4): 140 ha reclaimed land needed for this alternative. A strip of sea lies between the pier and filled area. This option has not been favored, because sea strips may cause odore and pollution, which may need dredging from time to time, due to lack of currents in those strips.
- Complete fill to gain required land area (Figure 5). This alternative gives opportunity to build airside and landside facilities which leaves approximately 30 ha land free for renting/leasing to generate profit for the airport authority. The comparisons of reclamation costs are given in Table 4.

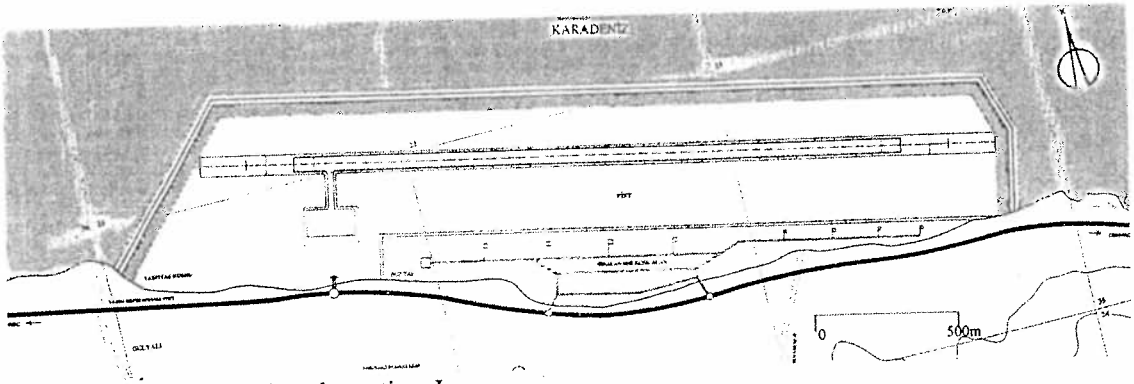

Figure 4. Land reclamation alternative- I

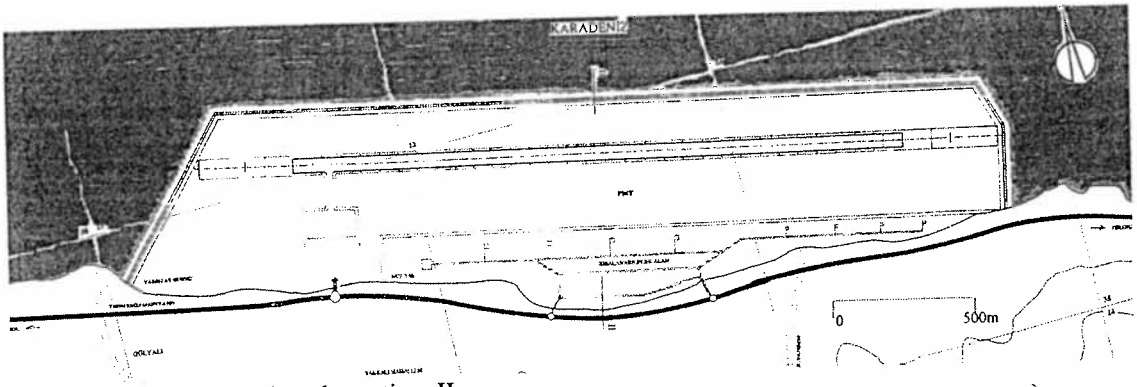

Figure 5. Land reclamation alternative- II

Table 4. Comparison of land reclamation alternatives

Alternatives	Cost (Billion USD)			
	fill	protection	total	construction duration
Fill protected with pier	25.500	6.000	31.000	36 months
Complete fill	25.000	5.388	30.388	32 months

2.3. Airport Facilities

The airport facilities included the runway, taxiway and apron at the air side, terminal building, services, utilities and parking area at the land side. Their broad characteristics are summarised in Table 5.

2.5. Environmental Impacts Assessment (EIA)

EIA was done in accordance with Turkish Environmental Impact Assessment Regulation, 1993[1]. The EIA Regulation process required serious technical evaluations and estimations, and bureaucratic procedures. The authors were responsible from undertaking only the former issues.

The regulation gives a standard format in detail on how EIA report should be prepared, of which impacts should be questioned. Accordingly, the project's environmental effects stemming from several sources were questioned mainly at two stages; construction and operating periods. EIA Regulation requires the following sections to be estimated and evaluated:

2.5.1. Site Preperation, Construction (impacts on physical and biologic environment, precaution to be taken)

The site designated was on sea, therefore on the site, excavation will not be done and explosives will not be used. However, the filling activity itself requires rocky infilling material, so quarrying will have some impact. Also, infilling inevitably will effect the sea environment; change on sea shore may impact both on hydro-dinamic equilibrium that may cause changes in sea base and biotic environment of the sea.

- **Infilling :** It is needed approximately 11 million qubicmeter rocky material that will be carried from a quarry 5.5 km away from the site. Quarry material declared suitable for infilling by the Regional Water Authoritiy. Its size is estimated as a mass of 250x400x90m that is equal to 15 billion ton of rocky material. For the extraction 15778 tons of explosive, 977 tons of diesel fuel and 111 tons of gelignite will be used. Necessary security measures will be required during transportation of explosives and diesel oil.
- **Explosion, wastes and the degree of influence on health**: Direct contact with explosives (introglycerin) may cause head ache and low blood pressure. CO, water steam, NO_x, CO_2, nitrogen, solid oxides and wastes may appear during explosion process. However, as long as the quarry is far from occupied lands, the impacts of quarry works on humans is estimated negligible. But process of transporting from quarry to the site may may cause negative effects on human and natural environment.
- **In fill materials, trucks, and machinery to be used during construction**: Approximately 10.8 million cubic meter of rocky material (151.3 million tons) will be exavated and carried from quarry to Gülyalı site. Materials will be carried by 20tons capacity vehicles that need to work 24 hours a day and all year long. 10-12 excavators and loaders, caterpiller tracks, cranes and tankers will be needed.
- In filling will cover an area of 500m x 3000m sea surface as shown above, in figure 4. The depth of sea at 500m away from the shore is, in average 8m. The height of infill estimated as 10m from the bottom (2m above from the sea level). The edge of infill will be protected from waves by a breakwater streaching deep in o the sea ground in the form of slanting at an angle of one third which will be done by using 15-20 tons of rocks.
- Some degree of nuisance (e.i. dust and noise) will occur from extracting, crushing, grinding, storing, piling and removing materials from the quarry.
- Deep hatching is not needed, but an enhencement should be made in the sea bottom to mitigate the force of waves before reaching the enhancement in front of the infill.
- Human wastes created by those working and living contruction site will be collected by Gülyalı Municipality.
- Biological environment in the filling site of the sea is rather poor; there are few fish species (whiting, horse mackerel, grey mullet, bonito, shad (Çelikkale, 1986)) that have marginal local value in the vicinity of the region according to the official records and the fisherman living in the area.

2.5.2. Airport Operation (impacts such as emissions, aircraft and traffic noises, pollutions from other sources)

- **Emissions**: During operation of the airport, emissions may be produced by the following sources; aircraft engines, vehicles and heating of buildings. All these sources expose CO, HC, NO_x, SO_x, Pb and soot. The amount of emission exposed differs by the fueld type used (Table 8).

[1] Since than the regulation was altered number of times, in 1997, 2002, 2003 and 2004.

- Enterpreneurs living in other parst of the country will expose willingness to come back to the region and make joint investments with native enterpreneurs.
- Outmigration from the region will slow down.

3. Conclusion

Since, within the limitations of a paper, the whole socio-economic and environmental impacts of the project cannot be mentioned, only the main items are considered here briefly.

Last few comments on the assessment process need to be made;
- The study was done under the severe information constraints. Information related to environmental resources were very scares, especially those specific to location and hinterland. In those cases experienced local people, civil servants and researchers (if there are) can be the only sources, though their reliability were questionable.
- To use a standard EIA format, which is practical for the authorities under the condition of short of expert personnel, was unnecessarily imposing burden- extra time and efforts, and also carries the risk of under emphasising the most important issues. However, the current regulation adopted the scoping.

Finally, EIA report concluded that the project economicly not feasible, environmentally carries some risks especially on flora and fauna, landscape values, atmosphere and soil due to construction activities. The essential components of environmental impacts are shown in Table 8, which was the part of standart format of the EIA Regulastion.

Table 8. The summary table of environmental impact assessment

Environment influenced	Preparation of site and construction[1]												Project operation[2]							
	a	b	c	d	e	f	g	h	i	j	k	l	a	b	c	d	e	f	g	h
Meteorology, climate	-1[3]	-1		-1				-3	-1	-1	-1									-3
Geologycal structure	-1	-3	-1		-3		-1			-1										
Surface water resources	-1	-1	-1	-2	-2		-1	-1	-1	-1										-1
Termal, geotermal water resources																				
Soil	-3			-3				-2	-2	-2	-2									-2
Plant cover	-3	-1		-3				-2		-2										-2
Agricultural land	-3	-1		-3				-2	-1	-1										
Forest areas				-2					-3	-2										
Area under protection																				
Landscape values		-3	-2	-2		-1	-1	-2	-3	-3	-1							-2	-1	
Flora, fauna	-3	-1	-1	-2				-2	-3	-3								-2	-2	
Lifestock, husbandary		-2			-2	-2	+2											-2	-2	
Minerals, fosil fuel res.																				
Public land	-1																			

1 Abreviations are:
- **a.** excavations
- **b.** construction of runway on pillars in sea
- **c.** prevention of run off and drainage
- **d.** dust spreading operations
- **e.** excavation and dredging under sea
- **f.** water use and discharge
- **g.** wastes and recycle
- **h.** noise and emissions
- **i.** woods to be cutted
- **j.** agricultural land to lost
- **k.** risky operation on humans
- **l.** other operations

2. abreviations are:
- **a.** raw materials
- **b.** hazardous, toxic materials, water use, discharge
- **c.** treatement of tap water
- **d.** fuels, burning systems
- **e.** solid wastes, recycling
- **f.** noise
- **g.** dust spreading operations
- **h.** other operations

3. Impacts that will occur from site preparation and contruction, management process on physical and biologic environment evaluated on a scale of 1 to 5. Pozitive impacts are shown (+), negative effects are shown (-); 1-2=less effective, 3= moderate, 4-5= most effective.

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Introduction

The Ministry of Transport has commissioned to the authors on behalf of Karadeniz Technical University for the Ordu-Gülyalı Airport Feasibitily Study.

From the social and physical point of view the Ministry intended politically that an airport may locate some where between Ordu and Giresun-two main cities of Black Sea Coast- namely at Gülyalı district (Figure 1). The airport will serve to an area of 90 km radius or 1.5 hour driving distance.

The questions asked to be answered were; to investigate where to build the airport and will it be feasible, will it incur environmental consequences.

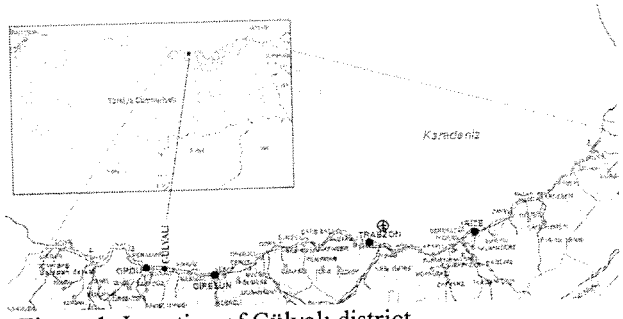

Figure 1. Location of Gülyalı district

1. Rational/Reasons Behind the Airport Project

- Many thousands of region's citizens, live in European Countries, keep ties with their relatives left behind in Turkey. They are and will be potential customer for air travel.
- The region ranks at the top of the net out-migrating regions for many years in the country. Also, the region's economy relies almost totally on hazel nut growing, processing, manufacturing and exporting. Severe requirements has been rising by public and the business environment to have an airport in the region.
- It is believed that an airport in the region will help to extend the marketing area of local products.
- The potential of soft tourism is very high in the region. An airport and the facilities that related to it will help to prosper tourism.
- Also, the airport and related facilities can make impacts on employment and income level, and will foster the social and economic well being of the region.

2. Airport Master Planning

A new airport master planning process includes the following steps of studies:
- Aviation demand forecasts,
- Determine scale and time phasing of facilities,
- Airport site selection,
- Preliminary project
- Economic considerations,
- Environmental prosedures and analysis,
- Airport plans and implementation

2.1. Air Travel Demand and Forecasting

Forecasting of future demand is a difficult and uncertain procedure. If forecasts are incorrect, an entire transportation mode either becomes deficient in its ability to provide for future traffic or sufferers from over investment (Ashford, Wrigth, 1992). The air transport data for an entirely new airport is much more difficult to produce. Inspite of abundance of forecasting models and methods, it is dificult to use them. In this project, an investigation was made by questionary survey for a week during in the peak season at Trabzon and Samsun airports, which are located in the neighbouring provinces, to distinguish passengers whose destination and origine

were Ordu and Giresun. The result of the survey showed that 20 pc and 11 pc of the total passengers (boarded, landed) of Trabzon and Samsun airports respectively were from Ordu and Giresun provinces.

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2.2. Site Selection

The suitable site selection need to be analysed taking into accounts the following factors (Ashford, Wright, 1992):

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- Development costs: terrain, land costs, land values.
- Environmental consequences: aircraft noise, impact on flora and fauna, existence of endangered species, air quality.
- Consistency with area-wide planning, impact on land use, effect on comprehensive land use and transportation plans.

2.2.1. Site Selection Criteria and the Land Required

Location of an airport will be influenced by the following criteria (Horonjeff, 1993):

- The type and the density of development in the surrounding area
- Atmospheric and meteorological conditions
- Accessibility of ground transport to the potential airport site
- Accessibility of land for expansion
- Presence of other airports and availability of air space in the area
- Surrounding obstructions:man made and naturel
- Economy of constructions
- Availability of utilities
- Proximity to aeronautical demand.

The Ordu-Gülyalı Airport will be 3D or 4D category by ICAO standards with the dimension of 1980 m x 45 m runway.

All the above criteria are checked and detailed analysis were made in the district Gülyalı in terms of availability of required amount of suitable land (65ha.-100 ha). But it was not found on land side in the whole district. Because topography in the area is very dynamic in which many hills are exist reaching up to 300-500 m. height from the sea level. More than 10 streams reach to the shore that make difficult to find suitable site for airport construction.

Consequently, it was decided the airport to be built on an area gained from the sea on the coast of Gülyalı township (Figure 2) (consideration are very similar to the site selection of Haneda Airport in Japan). Geological structure of sea side of Gülyalı district is suitable for construction. Under sea ground level varies between 5-9 m. The maximum sea wave height is 5.15 m, which occurs in 50 years period. According to the official records and the fisherman living in the area, there are few fish species of which value have been declared marginal in the vicinity of the region.

Site selection evaluation in terms of physical obstructions is shown in (Figure 3). The area obtained on the sea will extend approximately 500 m. from the main road to meet the requirements of landing and take-off criteria, namely flight cone. Also, the depth of the sea restricted the go further away than 500 m.

Figure 2. Site of airport- coastal area of Gülyalı

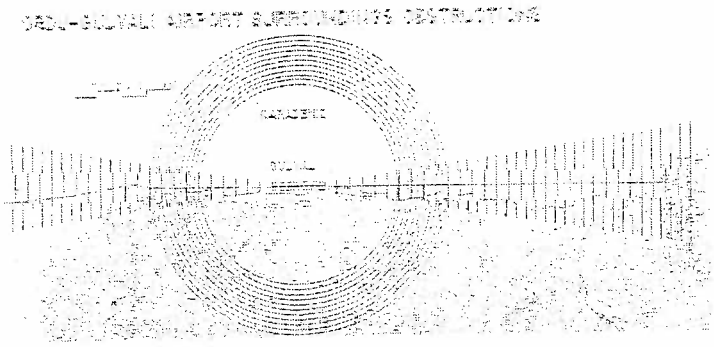

Figure 3. Gülyalı Airport flight cone (physical obstructions)

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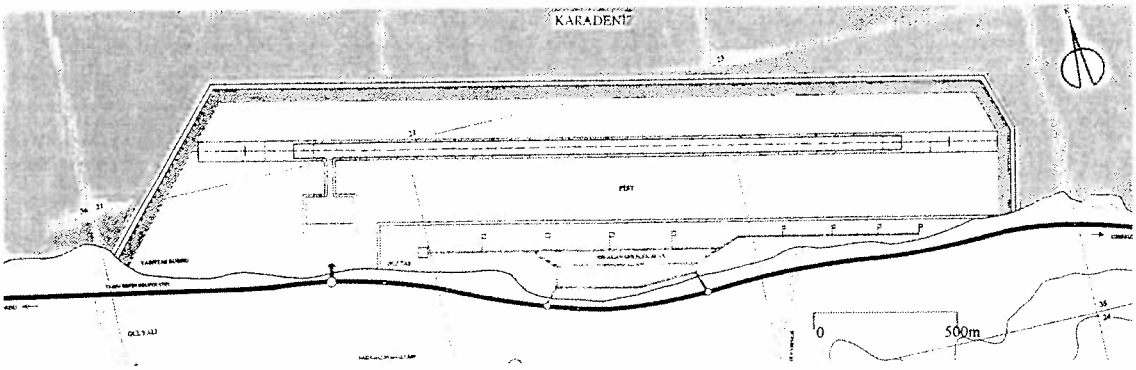

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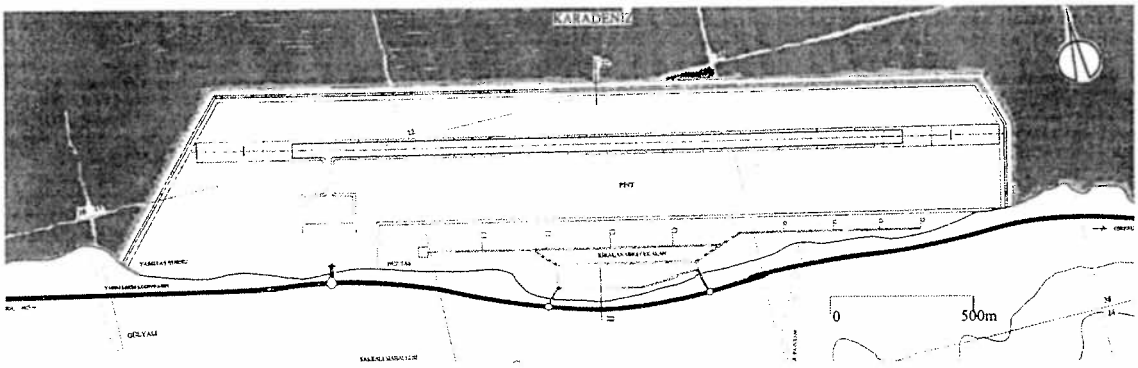

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2.3. Airport Facilities

The airport facilities included to runway, taxiway and apron at the air side, terminal building, services, utilities and parking area at the land side. Their broad characteristics are summarised in Table 5.

Table 5. The facilities covered at the airside and landside of airport

Location	At the first construction stage	Extention by 2015
Air side	A **runway**; its approach catagory is 3D or 4D* its dimensions is 1800 m x 45 m (including safety zones 1920 m x 60 m)	-
	A short **taxiway** (80 m x 9 m)	-
	An **apron**; designed initially to accomodate 4-5 aircraft,	Capacity can be reached to 9-15 aircraft.
Land side	A **terminal building** (2250 m^2)	Terminal area can be increaced to 3750 m^2
	Other services and utilities (maintenance offices, support areas, maintenance equipment storage facilities, tower, fueling, heating and sewage treatment plant)	-
	Access road to terminal and **parking area** (2400 m^2 parking area)	The parking area can be extended up to 4800 m^2

* They base on ICAO standarts (ICAO, 1985)

2.4. Economic and Financial Feasibility Assessment

Economic and financial feasibility analysis based on alternative 'fill protected with pier' explained above. As a generale rule, economically feasible alternative means that the airport plan will generate sufficient revenues to cover annual costs of capital investment and running costs (ei. administration, operation and maintenance).

Total financial investment cost will be 37.837 billion USD by the end of 2015 (Table 6). The land reclamation's share in the investment will be 81 pc. After 2005 the airport will make profit that covers only the operating costs of the airport. However, the 'net present value' of total gain by the end of master plan period (2015) indicates that the project's total lost will be 6.202 billion USD. It is clear that the project is not feasible interms of financial evaluation, though it may be feasible interms of economic evaluation.

Economic evaluations were done on 'Value Added Tax' (VAT) and Capital/Outcome Ratio criteria. The neither of them came to feasible (Table 7).

Table 6. Ordu-Gülyal Airport investment schedule Billion USD

Investment Items	Stage 1 (1997-2001)	Stage 2 (2002-2006)	Stage 3 (2007-2015)
A. Airside			
• Runway	4.118	-	
• Taxiway	0.045	-	
• Apron	0.440	-	0.236
B. Landside			
• Buildings (terminal+facilities)	0.498	0.151	-
• Roads, parking, others	0.512	0.009	0.009
C. Administrative, legal, engineering	0.737		
Total project cost	6.350	0.161	0.503
Land acquisition cost	30.860	-	-
Total investment cost	**37.210**	**0.161**	**0.503**

Table 7. The summary of economic evaluation of project

Criteria	Result of analysis
Value Added Tax	The estimated VAT generation's present value is -39 millon USD.
Capital/Outcome Ratio	Gülyalı Airport project will generate 75 jobs at the start. The cost of creating one job will be 82 million USD, which is very high comparing other sector in the economy.

2.5. Environmental Impacts Assessment (EIA)

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2.5.1. Site Preperation, Construction (impacts on physical and biologic environment, precaution to be taken)

The site designated was on sea, therefore on the site, excavation will not be done and explosives will not be used. However, the filling activity itself requires rocky infilling material, so quarrying will have some impact. Also, infilling inevitably will effect the sea environment; change on sea shore may impact both on hydro-dinamic equilibrium that may cause changes in sea base and biotic environment of the sea.

- **Infilling :** It is needed approximately 11 million qubicmeter rocky material that will be carried from a quarry 5.5 km away from the site. Quarry material declared suitable for infilling by the Regional Water Authoritiy. Its size is estimated as a mass of 250x400x90m that is equal to 15 billion ton of rocky material. For the extraction 15778 tons of explosive, 977 tons of diesel fuel and 111 tons of gelignite will be used. Necessary security measures will be required during transportation of explosives and diesel oil.
- **Explosion, wastes and the degree of influence on health**: Direct contact with explosives (introglycerin) may cause head ache and low blood pressure. CO, water steam, NO_x, CO_2, nitrogen, soid oxygen and wastes may appear during explosion process. However, as long as the quarry far from occupied lands, the impacts of quarry works on humans is estimated negligible. Although, during transportation of material from quarry to the site may cause negative effects on human and natural environment.
- **In fill materials, trucks, and machinery to be used during construction**: Approximately 10.8 million cubic meter of rocky material (151.3 million tons) will be exavated and carried from quarry to Gülyalı site. Materials will be carried by 20tons capacity vehicles that need to work 24 hours a day and all year long. 10-12 excavators and loaders, caterpiller tracks, cranes and tankers will needed.
- In filling will cover an area of 500m x 3000m sea surface as shown above, in figure 4. The depth of sea at 500m away from the shore is, in average 8m. The height of infill estimated as 10m from the bottom (2m above from the sea level). The edge of infill will be protected from waves by a breakwater streaching deep in to the sea ground in the form of slanting at an angle of one third which will be done by using 15-20 tons of rocks.
- Some degree of nuisance (e.i. dust and noise) will occure from extracting, crushing, ringing, storing, piling and removing materials from the quarry.
- Deep hatching is not needed, but an enhencement should be made in the sea bottom to mitigate the force of waves before reaching the enhancement in front of the infill.
- Human wastes created by those working and living contruction site will be collected by Gülyalı Municipality.
- Biological environment in the filling site of the sea is rather poor; there are few fish species (whiting, horse mackerel, grey mullet, bonito, shad (Çelikkale, 1986)) that have marginal local value in the vicinity of the region according to the official records and the fisherman living in the area.

2.5.2. Airport Operation (impacts such as emissions, aircraft and traffic noises, pollutions from other sources)

- **Emissions**: During operation of the airport emissions may be produced by the following sources; aircraft engines, vehicles and heating of buildings. All these sources expose CO, HC, NO_x, SO_x, Pb and soot. The amount of emission exposed differs by the fueld type used (Table 8).

[1] Since than the regulation was altered number of times, in 1997, 2002, 2003 and 2004.

Table 8. Some air pollutants by souce and operation period. (kg/day)

Source	Year	CO	HC	NO_x	SO_x	Pb	Soot
Vehicles	2000	2.400	0.320	0.240	0.009	0.0030	0.009
	2005	5.400	0.675	0.540	0.014	0.0054	0.014
	2010	7.800	0.800	0.700	0.016	0.0070	0.016
	2015	9.800	0.880	0.800	0.020	0.0090	0.020
Aircraft*	2000	1.494	1.181	0.180	-	-	-
	2005	1.992	1.575	0.240	-	-	-
	2010	2.656	2.100	0.320	-	-	-
	2015	3.154	2.494	0.380	-	-	-
Heating	2000	0.110	0.026	0.439	3.110	-	
	2005	0.226	0.043	0.802	6.392	-	
	2010	0.233	0.054	0.931	6.596	-	
	2015	0.272	0.064	1.272	7.718	-	

* The aircraft emission rate varies with aircraft type, the engine type used and the average operating time in each operation (Ashford, Wright, 1992).

• **Noise**: Aircarft and vechiles are the major source of noise.

a) Aircraft noise; the noise level can be predicted by "noise exposure level" (NEF) and "noise and number index" (NNI). Both methods were used to estimate the noise levels. Assuming that RJ-100 aircrafts will be in operation and its noise level is 90dBA, calculations are made by using the following formulas.

$NEF = EPNL+(10 \log N/K)-C$ (EPNL = effective noise level)

$NEF_j = EPNdB_1+\log Nj-88.0$

$NNI = \acute{L}+15 \log_{10}N-80$

$$\acute{L} = 10\log_{10}1/N \sum_{i}^{N} 10^{L/10}$$

$$TNEL=10\log \sum_{i}^{N} (\text{antilog } ENPL(n)/10)+10$$

The estimated noise levels were for NEF = 19.4 EPNdB and for NNI= 19.5 EPNdB. Because both values are less than 30 NNI, there will be no need to take any precaution for noise protection.

b) Vehicle noise; noise created by different vehicles around and inside the airport estimated that the noise level will range between 40.6 dBA in 2000 and 44.0 dBA in 2015.

Joint noise level of aircrafts and vehicles carrying passenger to/from the airport will exceed the aircrafts effect on esidences facing to the carriageway.

c) Population exposed to noise; culculated by the formula $Pw = \Sigma_i P_i W_i$ (Horonjeff, McTelvy, 1983). About 1250 people living in the vicinity will be effected from the noise. However, the level of discomfort will be rather low due to the sources of noise will be active in day time.

• **Waste**: Approximately 46 tons of hosehold wastes (paper, glass, wrapping wastes, etc.) will be produced. These will be collected by Gülyalı Municipality. There will be also 55 m^3/day waste water treated by package sewage treatment plant, then discharged to the sea. Surface water will be treated separatly.

2.6. Nonmeasurable benefits

There will be number of expected socio-economic consequences of the airport project, which are difficult to be measured. Some of them are;

- Regional accessibility will increase,
- Regional development level will be positively affected,
- Employment in the region will increase
- Internal and international relations will develop
- The cities of Ordu and Giresun will take part in Black Sea Economic Organization
- Moral expectations of public in the region will be meet.
- Local and regional social infra structure will be strenghten.

• Enterpreneurs living in other parst of the country will expose willingness to come back to the region and make joint investments with native enterpreneurs.
• Outmigration from the region will slow down.

3. Conclusion

Since, within the limitations of a paper, the whole socio-economic and environmental impacts of the project cannot be mentioned, only the main items are considered here briefly.

Last few comments on the assessment process need to be made;
• The study was done under the severe information constraints. Information related to environmental resources were very scares, especially those specific to location and hinterland. In those cases experienced local people, civil servants and researchers (if there are) can be the only sources, though their reliability were questionable.
• To use a standard EIA format, which is practical for the authorities under the condition of short of expert personnel, was unnecessarily imposing burden- extra time and efforts, and also carries the risk of under emphasising the most important issues. However, the current regulation adopted the scoping.

Finally, EIA report concluded that the project economicly not feasible, environmentally carries some risks especially on flora and fauna, landscape values, atmosphere and soil due to construction activities. The essential components of environmental impacts are shown in Table 8, which was the part of standart format of the EIA Regulastion.

Table 8. The summary table of environmental impact assessment

Environment influenced	Preparation of site and construction[1]												Project operation[2]							
	a	b	c	d	e	f	g	h	i	j	k	l	a	b	c	d	e	f	g	h
Meteorology, climate	-1[3]	-1		-1				-3	-1	-1	-1									-3
Geologycal structure	-1	-3	-1		-3		-1			-1										
Surface water resources	-1	-1	-1	-2	-2		-1	-1	-1	-1										-1
Termal, geotermal water resources																				
Soil	-3			-3				-2	-2	-2	-2									-2
Plant cover	-3	-1		-3				-2		-2										-2
Agricultural land	-3	-1		-3				-2	-1	-1										
Forest areas				-2					-3	-2										
Area under protection																				
Landscape values		-3	-2	-2		-1	-1	-2	-3	-3	-1							-2	-1	
Flora, fauna	-3	-1	-1	-2				-2	-3	-3								-2	-2	
Lifestock, husbandary		-2			-2	-2	-2											-2	-2	
Minerals, fosil fuel res.																				
Public land	-2																			

1 Abreviations are:
- **a.** excavations
- **b.** construction of runway on pillars in sea
- **c.** prevention of run off and drainage
- **d.** dust spreading operations
- **e.** excavation and dredging under sea
- **f.** water use and discharge
- **g.** wastes and recycle
- **h.** noise and emissions
- **i.** woods to be cutted
- **j.** agricultural land to lost
- **k.** risky operation on humans
- **l.** other operations

2. abreviations are:
- **a.** raw materials
- **b.** hazardous, toxic materials, water use, discharge
- **c.** treatement of tap water
- **d.** fuels, burning systems
- **e.** solid wastes, recycling
- **f.** noise
- **g.** dust spreading operations
- **h.** other operations

3. İmpacts that will occure from site preparation and contruction, management process on physical and biologic environment evaluated on a scale of 1 to 5. Pozitive impacts are shown (+), negative effects are shown (-); 1-2=less effective, 3= moderate, 4-5= most effective.

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