MUNICIPALITY OF TIRANA

Bashkia e Tiranës

Tirana Outer Ring Road

Environmental and Social Impact Assessment Study

February 2009

Bernard Engineers | Brenner Engineers

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1 DESCRIPTION OF THE PROJECT

1.1 PROJECT HISTORY

Tirana Outer Ring Road (TORR) is a major component of the 1989 urban master plan for Tirana, which is still current. This master plan establishes proposals for the construction of inner, middle and outer ring roads. In the last two decades, these roads have been only partly built. Parts of the Middle Ring Road, in a total length of 3.3 km, have been and have been reconstructed under a previous EBRD loan. In 2004, the City approached the EBRD with a request to finance the construction of part of the so-called outer ring road between Kavaja Road and Elbasan Road, two of the main radials leading out of the city centre, for a distance assessed at that time of 5.2 km. In 2004-05, the municipality commissioned a local civil engineering firm to prepare design drawings of the works and supporting documents. This segment of the Outer Ring Road will be a continuation of the 2.2 km segment that was opened in 1999 between the Durres Road (the third main radial of the network) and the Kavaja Road. In 2007 the initial TORR design was reviewed by independent engineer John Snell at the request of the EBRD. In September 2008, the Bernard Group was contracted by the City, with EBRD support, to carry out a traffic study and model, a full ESIA and furthermore to assist local planners to improve the road design.

1.2 PROJECT JUSTIFICATION

The construction of the TORR fulfills the implementation of a key segment of a larger ring road for the City of Tirana, which has been under implementation since the 1990s. The complete ring road around Tirana's main urban area is planned for completion by 2020 This particular section of the TORR will also serve an important urban development function by improving mobility for travel from the northern Tirana to the south and vice versa by avoiding the congested downtown. The new road segment will also improve local access to an important adjacent park and recreation area at Tirana Lake, as well as the Zoological Park. Finally; through inclusion of new public transport routes on the TORR, and an expected reduction in congestion levels currently prevalent in the city centre (as shown technically by the independent transport model developed by the project designers), the new road will act to support the next stage of implementation of the sustainable transport strategy under development.

The Project includes a loan to the City of Tirana, with possible co-fiinancing from the Republic of Albania ("RoA"), for the construction of an arterial road in the amount of up to EUR 25 million to link two main radial roads in the city network, calling for construction of around 3 km of a 4 or 6-lane urban distributor in an intensely developed urban corridor and a 4-lane section of approximately 5 km on the periphery of the city. While this is designated as the 'Tirana Outer Ring Road', the new road will actually serve primarily local traffic, acting as a key connection between the established north-western side of the city centre and the growing southern neighbourhoods and into the community of Sauk.

1.3 BASIS FOR ROAD DESIGN

In effect the road design is based on the traffic studies. The number of lanes, the layout of service lanes and the kind and location of intersections especially are derived from the traffic study. The parameters of the cross section and the longitudinal sections are based on international good road design practice.

The traffic study has been approved by the Municipality of Tirana, therefore the road is based on those parameters.

The following figures show the main results of the traffic study (figure 1) and the resulting size of intersections between the TORR and local roads (figure 2).

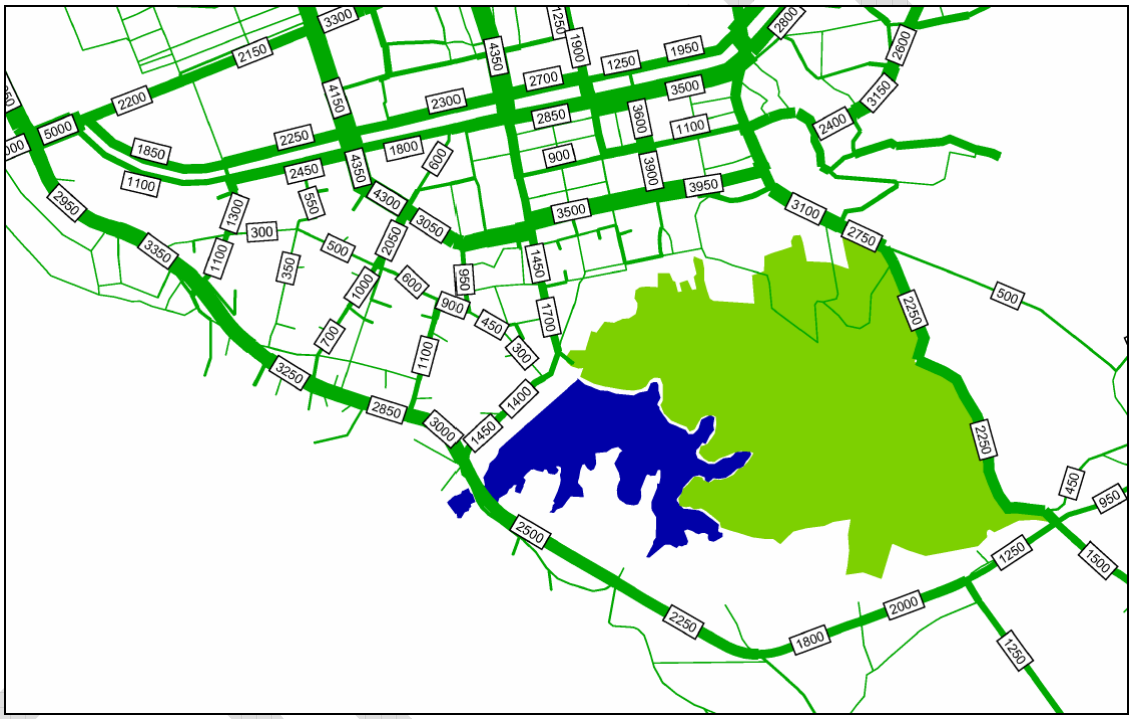


Figure 1: Proposed Traffic Volume for 2021 (peak hour in the morning)

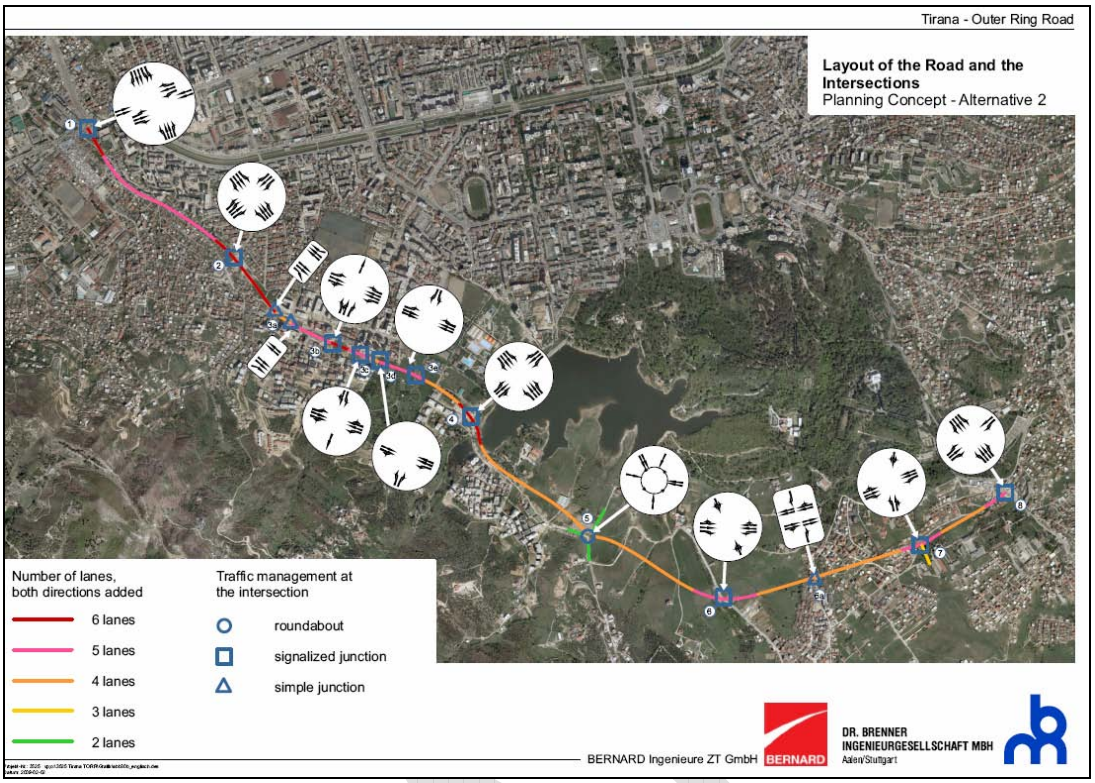


Figure 2: Dimension of lanes at the intersections

1.4 DESCRIPTION OF THE ALIGNMENT

1.4.1 Horizontal alignment

From Kavaja Road to the lake (km 0,000+ 2, 275)

At the beginning the TORR is designed as at-grade intersection with traffic lights. The Konferenca e Peze/ Rruga e Kavajes is built as an underpass under the TORR. All lanes are adjusted to the existing situation on the northern/ southern and western end.

Figure 3: Intersection 1 – TORR/ Kavajes Road

On the northern side a service road is designated in which the public bus-line is led. In this part of the TORR two lanes in each directory are planned according to the cross section 1.

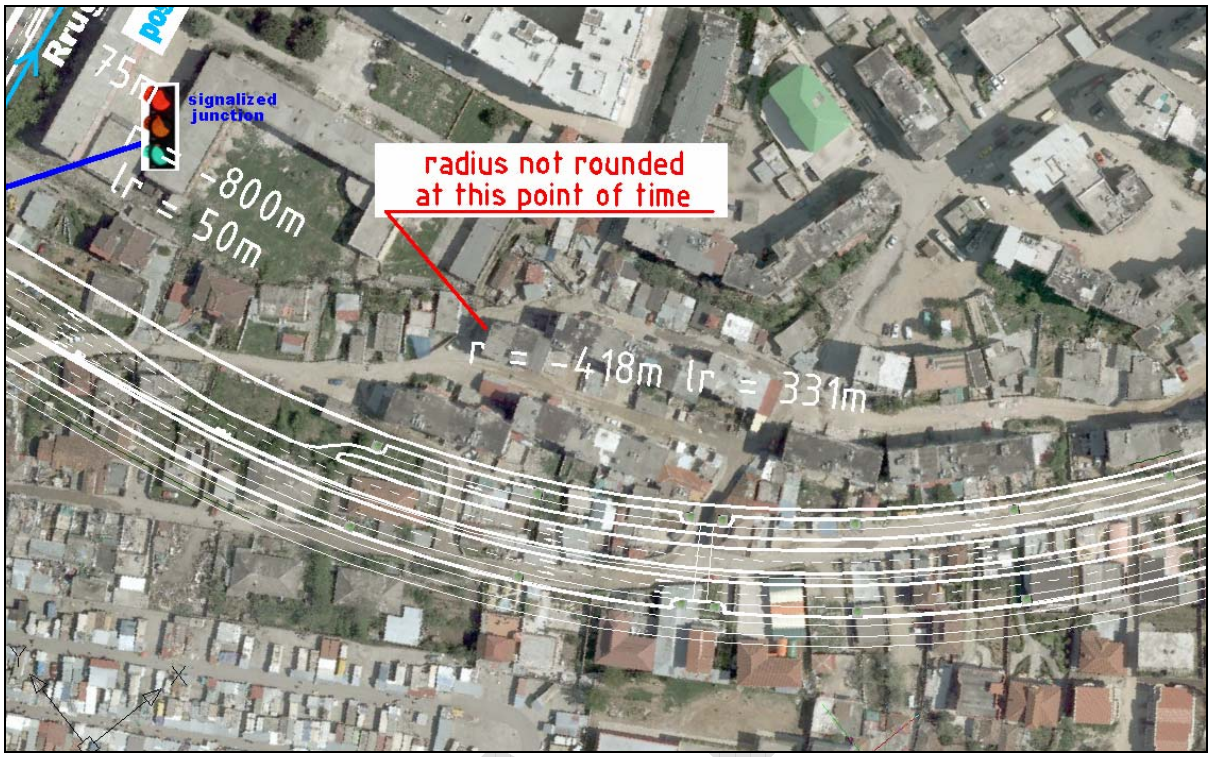


Figure 4: Intersection 1 – TORR (km 0,5 – 0,955)

The intersection 3 is splitted in 3a to 3e to connect secondary roads. Except intersection 3a all are signalized. The generated space between the roads can be used as parking areas. The secondary road increases the quality of the terminating traffic, e.g. by offering parking lots

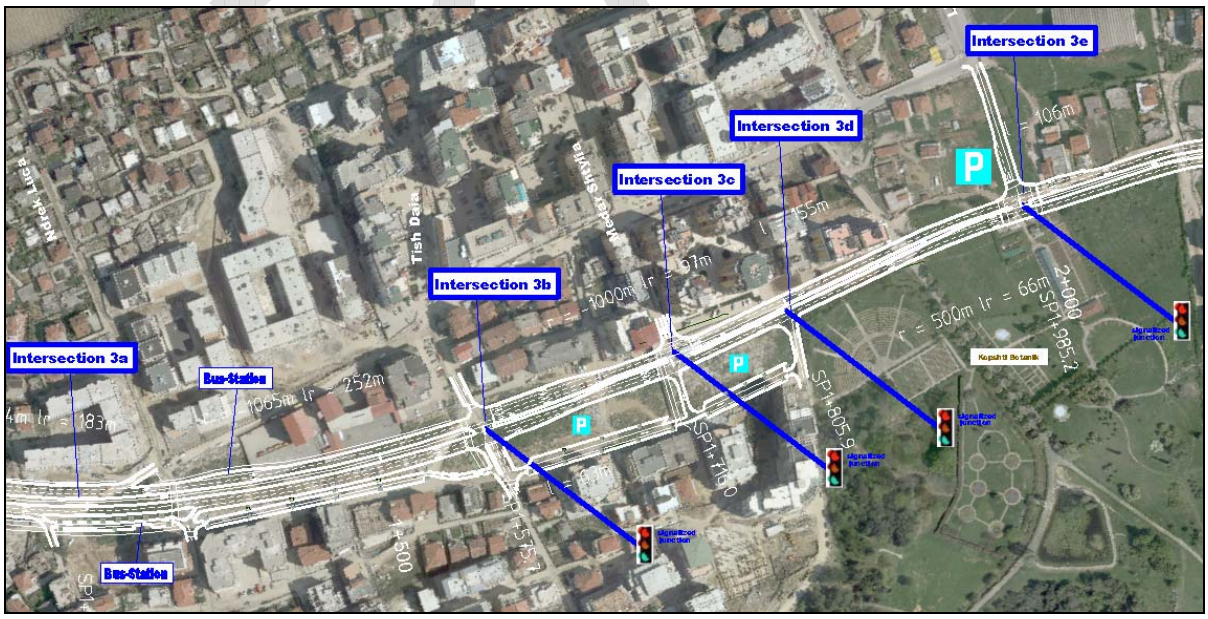


Figure 5: Intersections 3a-3e – TORR (km 1,291 – 1,985)

At the crossing of the botanic garden, the width of the TORR has to be minimized. The median is minimized in this area.

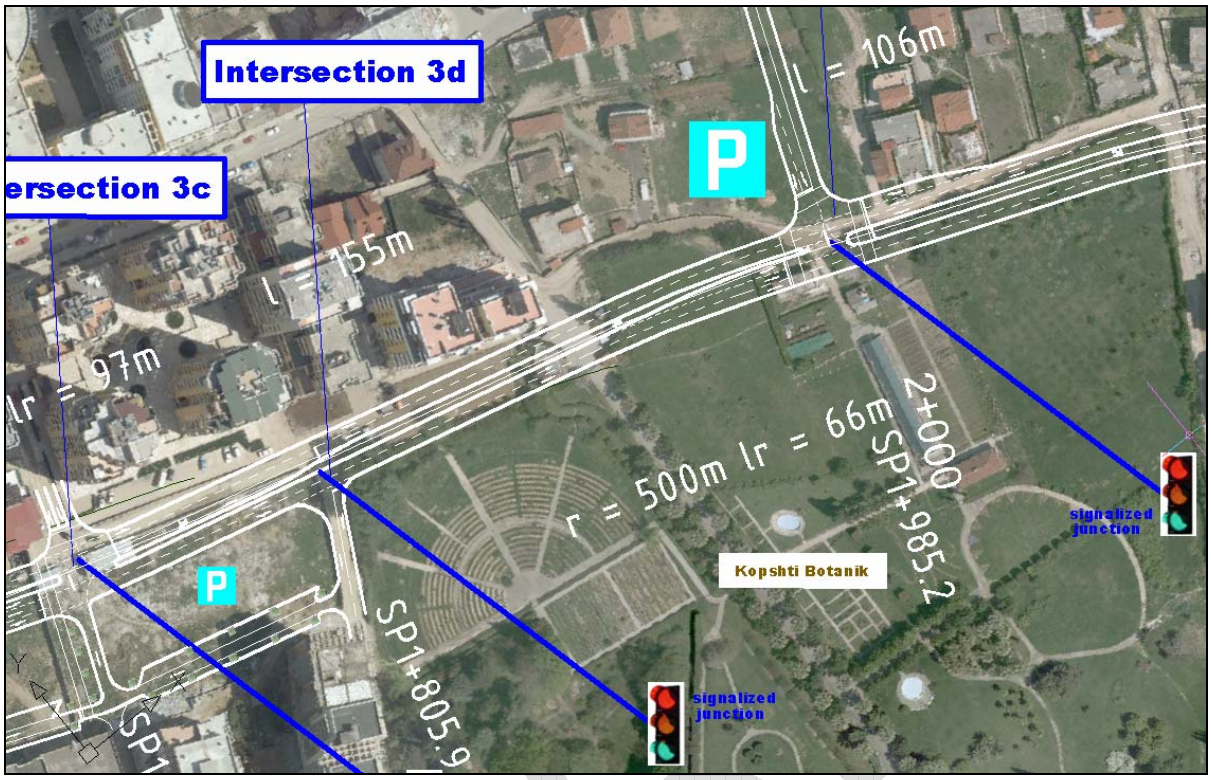


Figure 6: Crossing the Botanic garden (km 1,805-1,985)

At intersection 4 the Dora D´Istria and the exisiting secondary road in direction to Sauk are connected. The junction is signalized and the rest of the remaining areas can be used as parking lots for visitors to the lake, the zoo and the shopping area.

Figure 7: Intersection 4 (km 2,275)

From the Lake to Sauk

From the lake to intersection 5 the TORR is led parallel on the northern side to an existing road with 2 lanes in each directions. The diameter of the roundabout is 60 m outside as there are 5 roads to connect. The roundabout is dimensioned with two lanes and can be constructed as Turbo Rotonde as well. This would provide a better leading of the vehicles within the roundabout. Bridges in this area can be seen in the chapter longitudinal section.

Figure 8: Intersection 5 (km 1,141)

Onto km 3 the alignment is swinging to northeast with an arc of about 1200 m. Near km 4,255 the cemetery of Sauk has to be passed. With the planned alignment no touching of the cemetery is necessary.

Figure 9: Passing Sauk cemetery at km 4,3

The road continues according to the demand of the traffic study. Due to a high longitudinal gradient (8 %) in this part the lanes are separated with a median to avoid that vehicles change the lanes at passing actions.

At last the TORR is connected with the Elbasan Road. All lanes are joined to existing with the Elbasan project is not part of the TORR and will be realized at a later point of time.

Figure 10: Connection Torr/ Elbasan Road

1.4.2 Longitudinal section

Till km 3,889 moderate longitudinal slopes are used. From km 3,889 to the end the maximum slope is planned with 8 % which is reduced at the Elbasan Road to 2,5 %.

1.5 PROJECT DEVELOPMENT AND SCHEDULE FOR IMPLEMENTATION

Complete authorization of the project will be finished by the the time it has been approved by the EBRD and the municipality of Tirana. This approval also includes recognition of public statements concerning the project.

The municipality of Tirana plans to build the road and to realize the integrated measures starting September 2009.

1.6 ENVIRONMENTAL, SOCIAL, HEALTH AND SAFETY MANAGEMENT

Environmental and social issues were considered mainly in the phase of optimizing the alignment in order to reduce affected valuable areas (e.g. botanical garden) and houses. Furthermore a certain span for the bridge was integrated in the road design in order to prevent a barrier effect on sensitive species (e.g. otter) and to preserve moist areas.

Impacts on buildings were avoided by changing slightly the alignment. This specifically avoided impacts on a seven storey residential structure and on a college.

To reduce the effects of disconnection between both sides of the road, connections for pedestrians have to be made and equipped with traffic lights. Separated pathways for cyclists and pedestrians enhance safety and will reduce conflicts between road users. The pedestrian planning concept is shown in the figures below.

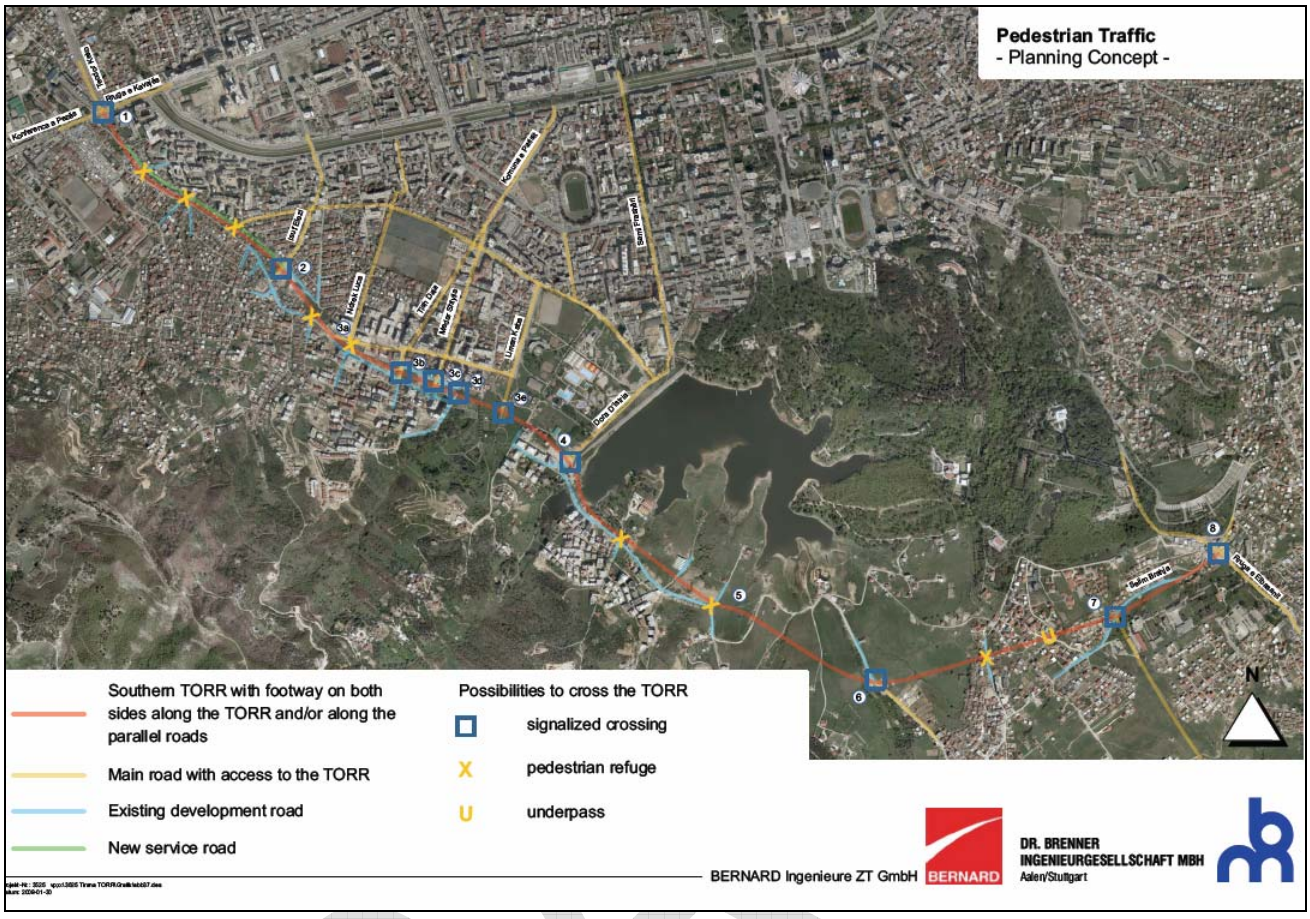


Figure 11: PedestrianTraffic – Planning Concept

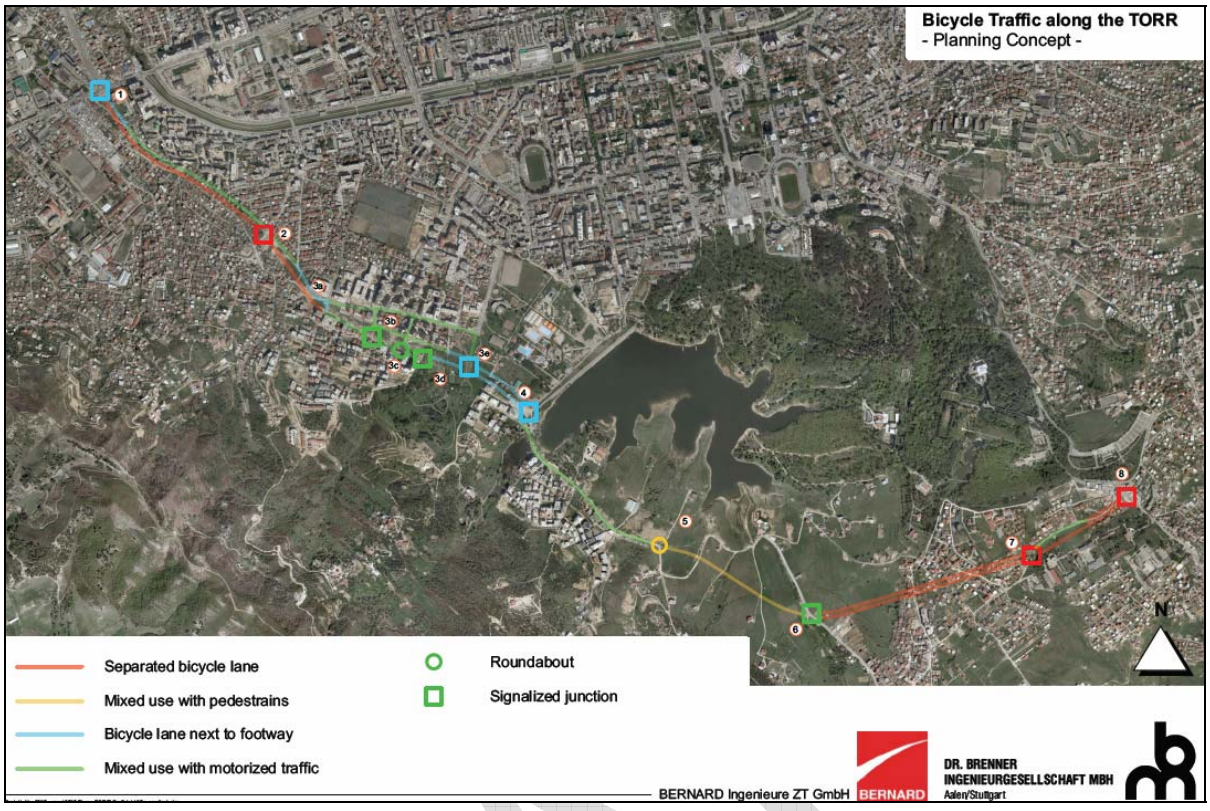


Figure 12: Bicycle Traffic – Planning Concept

In the following figures some typical cross sections are shown.

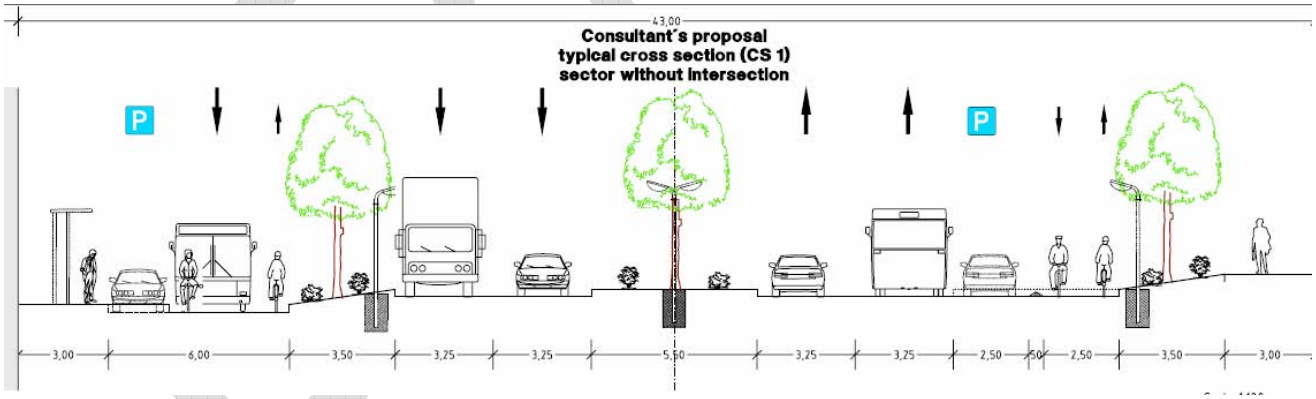


Figure 13: Typical cross section for the western part of the TORR

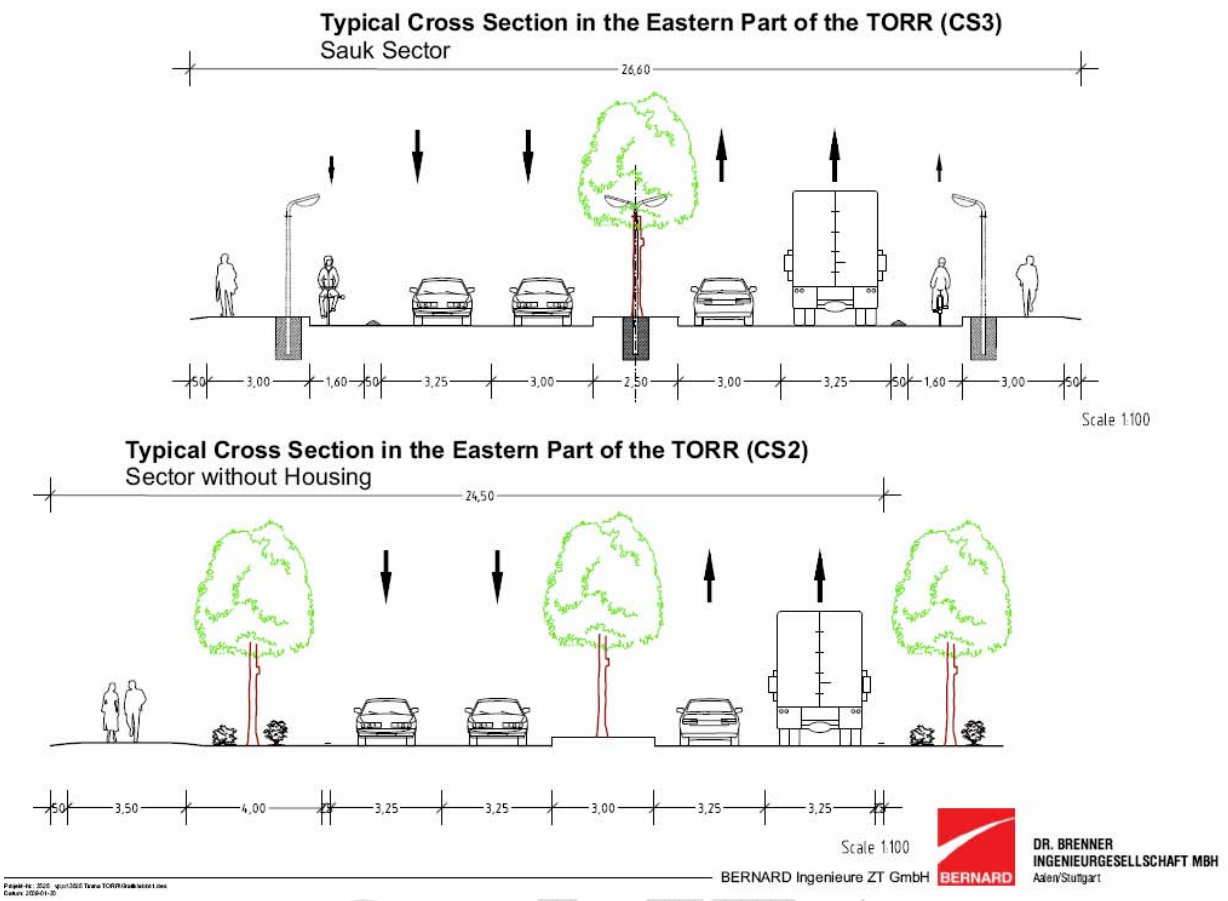


Figure 14: Typical cross section for the eastern part of the TORR

1.7 PROJECT RESOURCES

The total land take for the Project is about 25 hectares, distributed as follows:

km	km	width	Area
0	21	70	1470 m²
21	340	54	17226 m²
340	561	58	12818 m²
561	982	60	25260 m²
982	1184	64	12928 m²
1184	1542	56	20048 m²
1542	1713	68	11628 m²
1713	1920	40	8280 m²
1920	2365	24	10680 m²
2365	2769	32	12928 m²
2769	3217	48	21504 m²
3217	4039	70	57540 m²
4039	4520	23,5	11304 m²
4520	5055	50	26750 m²
	summation		250364 m²

Figure 15: Estimation of land take

This is an approximation at this point in time. Therefore some changes are possible.

Dewatering Concept

In the first part till about km 0,0+00 till km 2,9+00 the stormwater will be collected in pipes (with Oil Water Separators) and can be led into the existing canal at km 0,0+00 and km 0,5+50 in the existing canal, as the exisiting canal is not of high quality by now. As compared to the current situation, where no run-off is retained or treated, the TORR will positively influence the water quality of the Lana river.

FIgure 16: Dewatering concept – km 0,0+00 – 2,9+00

From km 2,9+00 till km 3,9+00 parallel to the alignment on the northern side sedimentation tanks can be situated.

In cuts, rainwater is collected by ditches cavities or drainage pipes parallel to the axis. On special points sedimentation tanks (dug in natural soil) and geotextiles are used. These tanks function as a natural filter and therefore ensure the quality of the subsoil water. Because of these project details the quality of the lake is not influenced and above all the natural water flow is not inhibited in terms of quantity and quality.

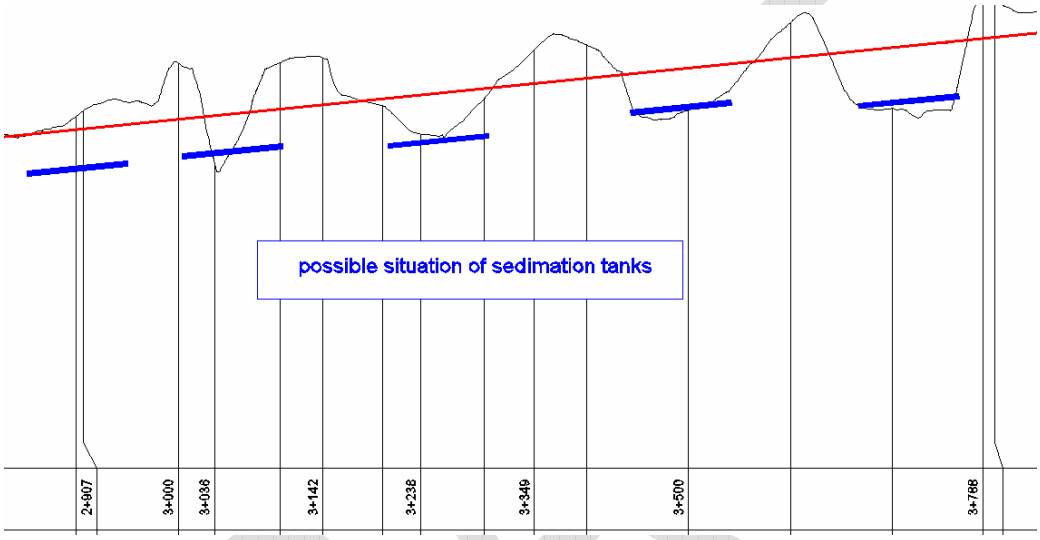


Figure 17: Dewatering concept – km 2,9+00 – 5,2+50

Waste is generated only in the construction phase and will be depolluted on regular landfills.

Noise emissions are generated by up to 27000 vehicles per day within the year 2020 (daily amount of estimation by traffic study by Brenner Engineers). Possible effects are described in the impact assesment.

Due to the geology of the area **vibrations** are not expected to affect humans and settlements. The vibrations will not spread out significantly further than 20 m.

In forecasting the emissions of **air pollutants** PM 10 and NO2/NOx are the most important ones.

1.8 OUTLINE OF THE MAIN ALTERNATIVES

'Do nothing' alternative

While in 1990 the Tirana population was 300,000 (per unofficial estimates) it has now grown to about 1 million. The number of cars has brown by an even greater level. Official estimates are of about 200 cars per 1,000 inhabitants. Because of insufficient traffic infrastructure, traffic simply collapses in the morning peak hours. Therefore the development of road infrastructure and transport services is essential and the "do-nothing alternative" is not viable.

Alternative solutions to transport problem

The Environment Centre for Administration and Technology produced a draft report in September 2007 entitled "Integrated strategy for sustainable traffic development in Tirana". The work was conducted with the support of the EU Life Programme and the Federal Ministry for Environment, Protection of Nature and Reactor Security, Germany. This draft report sets out very clearly the consequences of two main alternatives to the year 2021: a 'road traffic-oriented strategy' (Strategy A) and a 'public transport-oriented strategy' (Strategy B).

The authors concluded that a key requirement to solve traffic problems is the development of a core road, independently from the chosen strategy.

Alternative alignments

Other options include:

- crossing the park
- following the existing corridor along the zoo and turn north, then in the direction of Sauk.

The corridor for the TORR has been fixed for more than 20 years. The whole urban development of the region focused on the given corridor. Crossing the park with a road would affect the life of ten thousand people in Tirana. The park is very important for recreation for the people, the production of fresh and cold air and for wildlife. The park is a relatively quiet area and also one of the few places where families can let their children play in a safe environment. Therefore crossing the park with a new road is not feasible. Also the given corridor is without any alternative from the point of view of optimizing the given traffic in the new settlements.

Design alternatives

Alternative designs to the current TORR were considered by both the Municipality and its advisors. Various design scenarios were tested against the transport model developed specifically for the TORR, including optimizing the physical integration of the new road into the existing street network for both motorists and pedestrians, the number of lanes along the length of the TORR, locational decisions for signalized junctions and various lane configurations, including through-lanes versus local service lanes. The final design adapted by the Municipality's design engineers reflects the optimal

dimensioning of the new road. Possible alignment alternatives in Sauk were considered during the first inception report. However, after careful study of the impacts on expropriation of planned social institutions in the alternative area;the original road alignment was maintained. Finally, the final design was modified to minimize physical impacts on particularly sensitive sites and structures, such as the Botanical Gardens and residential buildings.

2 THE PROJECT AREA – BOUNDARIES AND DESCRIPTION

2.1 BOUNDARIES OF THE PROJECT AREA

The boundaries of the project area includes:

- the project area for the description of environmental impacts
- the host area / the area for potential relocation

The **project area** is defined so as to cover all the considerable environmental impacts which may be caused by the project. Under consideration are the project's outreach and range of factors of impact, the impact paths concerning the local circumstances and the conservation resources on the one hand and the functional coherence of the conservation resources with regard to later measures of compensatory measures on the other hand.

The project area for the description of the environmental impact contains 500 m on both sides of the new route. The impacts caused by the planned route should be compensated by the park. Therefore the extended project area contains the whole park area and the lake. It is relevant for all assets (flora, fauna, landscape and visual resources / recreation, climatic conditions, ground water, surface water, ground conditions, cultural heritage). The river Lana in the north of the extended project area is also a part of the project area for the surface water.

Due to the fact that there is not only an EIA to prepare, but also an SIA, the second project area contains the **area for the potential relocation**. On the one hand this is the area of Usina tractor, on the other hand also of Sharra.

2.2 DESCRIPTION OF THE PROJECT AREA

2.2.1 Project area for the assessment of environmental impacts

The project area for Tirana outer ring road mainly consists of settled areas. The western part comprises densely populated urban areas of Tirana; the eastern part comprises settled areas of Sauk. South of the lake, which belongs to the Great Park (Parku i Madh), new settlement areas are being developed at the moment. Within the populated areas, there are some open spaces which mainly contain sports areas and fallow lands.

The large coherent open spaces outside the urban regions of the project area comprise the Great Park (Parku i Madh) south of the centre of Tirana and the open spaces south of the park area. The park consists of woodland and an artificial lake; the open spaces are primarily greenland. On the southern edge of the project area, in the transition from the plains to the adjacent mountains, there is woodland.

West of the lake, there are open spaces of the botanical garden and the zoo. The open space areas south of the park are structured by additional elements like hedges, shrubs and small copses.

Small streams running towards the lake shape the project area. In summertime, those streams are partly dry. Furthermore, the Lana River, which has a natural bed until the Kavaja Road and from there on is canalized, is situated to the north of the project area. In the project area's eastern part, there are wide distance view ranges of Sauk, which is situated on a westwardly exposed hillside, towards the park and the city of Tirana. Further view ranges are from the southern shore, over the lake towards the wooded park and vice versa from the northern shore towards new settlement areas in the south and the wooded mountains. There are further view ranges from the dam of the lake in all directions (park, Sauk, new settlement area south of the lake, adjacent wooded mountains and western districts of Tirana).

2.2.2 Host area – area for potential relocation

The realization of the Tirana outer ring road might cause the demolition of houses. EBRD requires physically displaced people to be resettled.

The municipality of Tirana is considering two sites as suitable for the relocation of displaced people:

- Kombinati Tekstil
- Usina Tractor

The figure below gives an overview of the location of both sites.

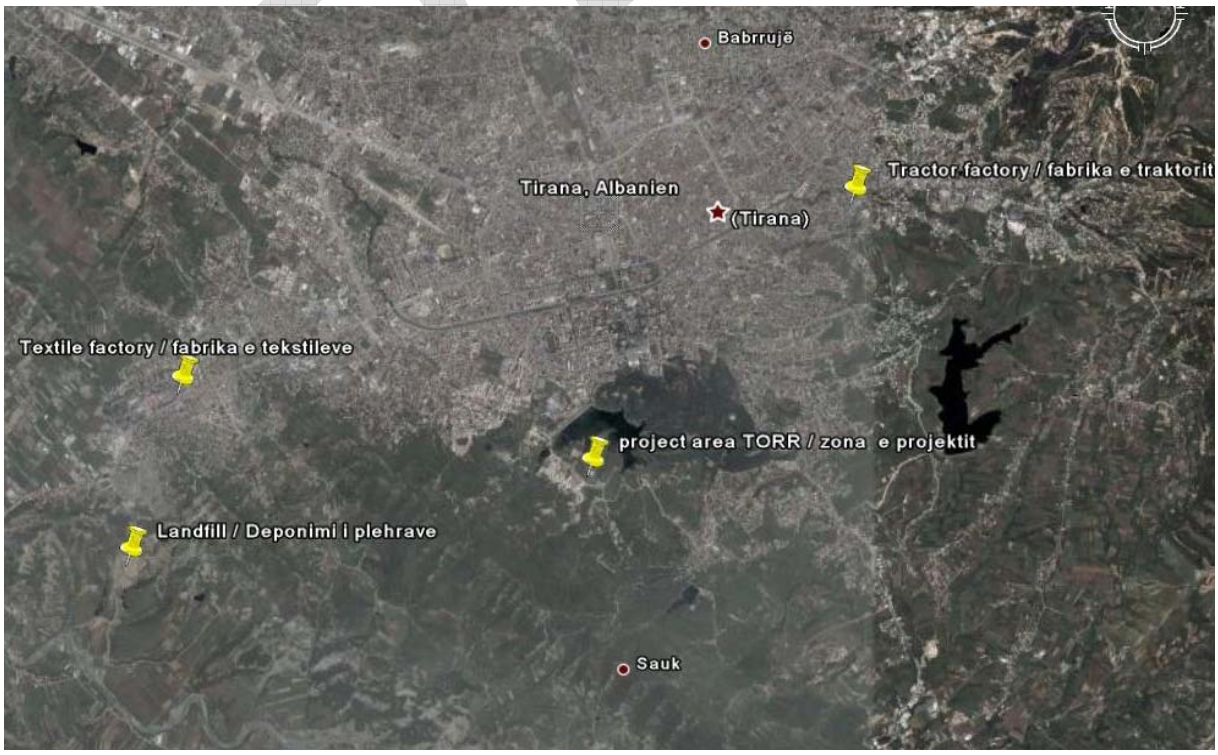


Figure 18: Overview of Kombinati Tekstil and Usina Tractor

One small area of approximately 2.5 hectares within the old “Kombinati Tekstil” could be used for resettlement of people according to the municipality. This area covers some open land right next to the ruins of the old textile factory. It is about 5 km west of the city center. The production of textiles was stopped about 20 years ago.

The other area used is to be the “Usina Tractor.” This site is east of Tirana about 3 km away from the city center. The municipality of Tirana is already in the process of demolishing the industrial ruins.

3 ENVIRONMENTAL AND SOCIAL BASELINE

The assets of ecology and biotic resources, surface water and landscape visual resources / recreation are assessed by ordinal numbers with a range of 1 - 5 classes (low priority to very high priority). The other assets are assessed functionally.

3.1 CLIMATIC CONDITIONS

The corresponding map is 04_1_climate.pdf.

3.1.1 Material references

- Topographical map of the city of Tirana
- Aerial photos
- Own baseline and site reviews.

3.1.2 Methodology of baseline and assessment

The methodology of baseline relates to the analysis of existing data and the technical assessment of potential effects on climatic conditions. The potential effects on humans (e.g. increase of humidity) and on agricultural use are mainly in the focus of the assessment. Therefore it is important to differentiate between an area with high pollution and an area with reduced pollution.

Areas with high pollution normally contain a high percentage of business and industry, settlements, and traffic, so-called "sealed" areas. They constitute "hyperthermic areas" or "heat-islands".

Areas with reduced pollution (fresh air and cold air producing areas) are characterized by a high percentage of open spaces and woodland and therefor "unsealed" ground. Due to the high percentage of vegetation, they have a low medium temperature and cool down fast during the evening and nighttime. This means they act as compensatory areas in regard to climatic and air hygienic issues, especially if they have a functional coherence with areas with high pollution and air can be exchanged between the areas.

For the development of cool air streams, agricultural and greenland areas, as well as wetlands are particularly favourable. The development of fresh air proceeds mainly from larger woodlands and copses.

In the course of baseline and assessment, the Tirana climate is described generally. After that, the existent areas with high pollution and areas with reduced pollution and their functional coherences are described.The assessment is done verbally argumentative.

3.1.3 Description and assessment of the climate conditions in the project area

Description of the local climate conditions in Tirana

Tirana is situated in the center of Albania, partly in the central mountainous region and partly in the western region. It has hilly to mountainous terrain; the average altitude is 521 m above sea level.

Tirana has a mild climate in the western part, which gets harsh in the east, near the mountains. The annual average temperature of Tirana is 15° C. In January the average temperature is 6.8° C while in July it is 23.5° C. The lowest temperature of Tirana is -9.9° C while the highest goes up to 41.3° C. The average annual rainfall is 1,247 mm. Prevailing winds come from the northwest and southeast of Tirana. During the summer you can feel the freshening breeze of the sea. (Municipality of Tirana; 2008)

Description of the areas with high and reduced pollution in the project area

In the project area, the densely populated areas of the city of Tirana are areas with high pollution. The grounds are sealed almost completely. Air hygienic encumbrances occur as a result of pollution by traffic and heating. In the summer, those areas heat up very much.

All open spaces and wooded areas in the project area are areas with reduced pollution. Steep hillsides without woods exist in the project area's southeast (Sauk) and south. The existing slope leads to relevant streaming of cool air in the northern and western direction (direction of the lake and the southwestern urban area of Tirana). Cold air streams are inhibited by scattered buildings on the hillside. In the lake area and the adjacent open spaces, there is a slight slope, so that there is less streaming of cool air. The lively relief due to lots of smaller landfills adds to the effect, so that the stream is less strong. The lake's dam also adds to that effect. Beside the dam, cold air may concentrate. The linking road between Tirana and Sauk, which had been expanded at the time of baseline, is also situated on a dam and inhibits the air streaming from the southern hillsides. South of the road, in the low grounds, cool air concentrations may also form.

Due to the relief and the woodland between the open spaces and the city, there is no stream of cool air in the direction of the northern parts of the city of Tirana from the project area. The large lake nevertheless acts as a climatic compensator for the urban climate of Tirana.

Assessment of the climate conditions in the project area

Summarizing, the large and coherent open spaces and woodlands south of Tirana work as sources of cold air and fresh air. They provide important climatic compensation for the polluted urban areas.

None of the areas in agricultural use at the present time is endangered by frost.

3.2 GEOMORPHOLOGY AND GEOLOGY

The corresponding map is 04_2_geomorphology.pdf.

3.2.1 Material references

- Harta Gjeologo – Inxhinierike, M 1:25.000 (Municipality of Tirana)
- Tirana GIS (Seismic-shapefile)
- Lake park research report (Municipality of Tirana, 2008)

3.2.2 Methodology of baseline and assessment

The methodology basically extends to the analysis of existing data. The situation is described qualitatively. No assessment is necessary.

3.2.3 Description of geomorphology and geology in the project area

Relief and Geomorphology

The area of the Tirana artifical lake represents an erosion valley surrounded by the hilly chain that extends from the sanatorium to the University of Tirana to the dam of this lake. The other chain reaches from the lakes' left-hand side to Sauk to the textile plant. The fronts of these two chains are interrupted by several torrents which end up in the lake's valley. They give the valley the shape of a closed bowl from the southern part, which opens in the northern part and nowadays is closed by the construction of the existing dam. (municipality of Tirana 2008: park lake report)

Geological construction

Tirana artificial lake area is part of the synclinal structure of Tirana field and is situated at its western side. The synclinal structure rises over the flat field forming the above-mentioned hills and chain hills.

The sediment of this field consists of sand, clay argyle and alevrolites. On this structure the latest sediments of quaternary represented by diluvial – proluviale sediments are deposited, which according to the studies of 1958 vary from 2 m to 20 m in thickness. These sediments consist of plastic grey to yellow suargyle of different weights, which contain moisture and are averagely compressed. (according to: Municipality of Tirana 2008)

The „seismic"-shapefile of the city of Tirana shows that the main part of the investigation area is situated in an area where earthquakes with a magnitude of 7 on the Richter scale can occur. In the northern part of the investigation area this value can extend to 7.5, whereas in the area of Sauk it reaches up to 6.5. Considering the classification of earthquake magnitude according to the Richter scale, those values lie in the upper half. This means the possible effects of an earthquake range from strong (destructive in areas up to about 70 km) to major (serious damage over larger areas). The

country is situated in a pressure zone between the African Plate which pushes north and the Eurasian Plate. The Anatolian Plate and the Apulian Plate are wedged in between.

3.3 SURFACE AND GROUND WATER HYDROLOGY AND QUALITY

3.3.1 Surface water

The corresponding maps are 04_3_1_surface_state.pdf and 04_3_1_surface_assesment.pdf.

3.3.1.1 Material references

- Field inspection in October 2008
- Mr Rada, former head of the department for water supply and waste water treatment in the municipality of Tirana (interviewed in October 2008)
- Tirana GIS (natural boundries, orthophotos)
- Cadastre of the research area
- Urbaplan

3.3.1.2 Methodology of baseline and assesment

Parameters for characterizing bodies of water describe the conditon of the riverbed, the river flow, the riverine vegetation, the depth, the water course and the water quality. Data availability on bodies of water in Tirana is poor. That's why the parameters for describing the ecological state of rivers are restricted to hydromorphopological quality elements that can be collected in the field. During field work data was collected about river flow, water course, riverine vegetation and the condition of the riverbed. Riverine vegetation is the only biological quality element that can be collected in an easy and simple way and therefore it was also documentated during field work.

Lakes are also described by parameters that can be easily collected during on-site inspection. Visibility depth, limit of submersed vegetation, nutrient load and the margin are ecological factors that allow conclusions to be drawn. They can be used for describing the trophic level.

Moreover we figured out some data about the water quality of the bodies of water in Tirana from the report made by urbaplan (Swizerland, 2008). We obtained more detailed information about the water regime of the rivers in Tirana and the water conditions of the lake in the park from Mr. Rada. He used to be the head of the department for water supply and waste water treatment in the municipality of Tirana.

The effency of bodies of water and the living conditions in and along waters are mostly affected by water quality, flow – off, ecological structure (eg. riverine vegetation, water course) and morphology of the river bed. Based on the EU water directive the water bodies are classified in four groups. Each class is defined by special parameters which describe the ecological state of the body of water. Water quality and the structure of the waters are closely related to each other.

The lowest quality of rivers (poor and bad) is combined into one class in the EU water directive. For describing waters in this study a five scaled rating matrix will be used because more detailed statements can be made. Totally artificial and modified water are classified as bad (Table 4.3-1 and Table 4.3-2)

Tab. 3.3-1: Definitions for the high, good, moderate and poor or bad status of rivers

Status	High	Good	Moderate	Poor	Bad
Shore dynamics	Shore dynamics are not restricted, bank stabilization only apears sporadically on undercut river bank or where bank erosion exists	Shore dynamics are restricted in places, stream bank is consistent over short distance (local stabilization)	Systematically modified water bodies, shore line is almost continously stabilized	Shore line is totally influenced by humans, bank overall stabilized	Waterbody is totally piped or bottom is compact, canalized water body
Bed dynamics	Bed dynamics are not restricted, bed stabilization only apears sporadically (eg. Ground still)	Bed dynamics are partly restricted; activities for bed stabilization appear continuously (eg. Ground still), between buildings naked substrat appears that allows unrestricted bed dynamics	Bed dynamics are restricted by local stabilization (eg. Bed paving, water management structure), in between there is naked substrat	Bed dynamics are toally restricted, bed is over all modified by humans, artificial bed substrat (eg. changes in particle size)	Waterbody is totally piped or bottom is compact, canalized wate body
Water course	Water course is natural and unrestricted	Water course is nearly natural	Water course is obviously modified but not constantly influenced	Water course is straightened	Waterbody is totally piped or bottom is compact, canalized water body
Particle size distribution	Particle size is mostly natural	Particle size is fractionally modified (eg. less silting forced by humans, barriers for sediment storage)	Grain size distribution is considerably modified (eg. wraping colmation, silting forced by humans), foreign matter frequently appears	Extensive modification of bottom (e.g. paving of bed)	Overall bed modification eg. by paving the bottom
Structure of the streambed	Streambed structure is natural, no reduction of riverine structures forced by humans	Natural variablility of streambed exists	Streambed structure is modified, reduction of riverine structures forced by humans	Streambed is mostly modified by humans, natural sections exist rarely	Streambed over all modified by humans, no natural riverine structure
Margin	Margin on both sides composed of natural flora	Stripped margin on both sides or expanded tree population on one side	Stripped margin with little cover of shading	Margin is fragmented, less shading	No natural Margin

Tab. 3.3-2: Definitions for the high, good, moderate, poor or bad status of lakes

Status	High	Good	Moderate	Poor	Bad
Visibility depth	High visibility depth (5 to 10m, max. 15 – 20m), little algae growth	Average visibility depth (1 to 2m, max. 5 – 10m), moderate algae growth, algal bloom appears temporarily	Less visibility (less then 1m, max. 2 – 3m), high algae growth, algae bloom appears	Poor visibility (few centimetres), massive algae growth	Bad visibility, compact algae occurence
Limit of submersed vegetation	12 to 30m	5 to 10m	Less than 2m	Less than 1m	Few centimeters
Nutrient load	little	moderate	high	heavy	artifical
Trophic level	oligotrophic	mesotrophic	eutrophic	polytrophic	hypertrophic
Margin	Well develoded margin composed of natural flora, high shore dynamic	Stripped margin, natural or semi-natural vegetation	Stripped margin with little cover of shading, flora influenced by humans	Margin is fragmented, less shading, flora influenced by humans	No natural margin

3.3.1.3 Description and assessment of surface water in the project area

Description of surface water in the project area

The project area shows a moderate variety of different types of waterbodies. The most important and dominating waters are the lake in the park and the Lana River to the northwest of the project. Both have a great water carrying capacity. Therefore they have an important impact on the water regime of the region.

Most of the waterbodies are fed by streams that come from the upper valley. In passing the urban area the water is contaminated with nutrients and heavy metals. This water loaded with pollutants flows into the lake. That is why nutrient concentration is unnaturally high in the lake.

Inadequate solid waste collection and disposal is another important cause of environmental pollution in the Tirana region. Waste collection does not yet serve the entire inhabited area and needs to be expanded. Incomplete market servicing, incorrect dumping by commercial enterprises and the very rapid growth of the residential population all contribute to inadequate solid waste management.The absence of sewage treatment is a serious problem that leads to high levels of pollution of the Lana River. Due to the fact that waste water is being discharged into that river, the water quality is expected to be very contaminated. Following the natural river flow down to the Mediterranean Sea, waste water is being discharged into the river also at other points. The results of surface water quality monitoring show the Lana River to be in a very bad condition. Nutrient concentration and oxygen depletion is very high. The stream bed is paved. The Lana River provides inhostable living conditions.

Small water sources that drain into the lakes lie in the northeast of the project area. Most of them are temporarily water-bearing.

Fragments of alluvial forests occur to the south of the lake in the middle of the project area. They are well structured and semi-natural. One unnatural alluvial forest stocks in Sauk. Two ditches exist within the project area. One of them is located in Sauk and has a simple structure. It is permanently water-bearing. The other ditch is longer and its shore is well structured. The ditch is temporarily water-bearing.

There are also small lakes to the southeast of the zoo. They are semi-natural and in good condition.

Assessment of surface water in the project area

Waterbodies are multifunctional systems and therefore most important for the environment. They act as transport systems for animals, plants and nutrients. If artificial barriers occur along the river courses the river flow is restricted and corridor function is limited. Therefore the project must provide barrier-free river flow. No water emplacement or deposit should be made. Moreover the river system should not be divided. The alignment of Tirana does not affect the stream network of the project area by fragmentation or barrier building. Rivers and lakes are major retention reservoirs and contribute to the environment. Pollution of water must be avoided. The waste water flow during the rainy period may influence water quality.

Water bodies have a positive effect on the microclimate of the region. Humid regions are a buffer zone with regulatory effects. They must be conserved in their recent expansion. The alignment avoids impeding water bodies.The **Lana River** north of Kavaja Road has a high ecological potential. It has well developed riverine vegetation that acts as a retention area for animals as well as for nutrients, but unfortunately is polluted at the moment by illegal dumps . On the other hand the Lana River south of Kavaja Road is totally modified. The canalized water body shows a high flow–off and no retention reservoirs. That is why it is dewatering the region. Moreover non-treated waste water drains into the canal. The nutrient balance is high. This part of the Lana River is considered a river with a moderate status. Due to the fact that waste water is being discharged into that river the water quality is expected to be very contaminated. Following its natural river flow down to the Mediterranean Sea, waste water is being discharged into the river also at other points on the way.

The **lake** in the park is highly influenced by humans but overall in a moderate ecological state. The affluent and the effluent are artificial. According to data from the municipality of Tirana the lake is an abandoned site. Shores of the lake are semi-natural with few stabilization and most of all swards.

The **lakes** to the east of the Tirana zoo are in a good ecological state. They are not openly accessed areas. As isolated systems they have not been polluted by humans. The shore vegetation is semi-natural and acts as a spawning ground for amphibians and fish.

There are **two small river courses** to the south–east of the park lake. They are discharged into the lake. Their ecological state can be classified as high. The riverine vegetation is well developed and semi-natural. The river course as well as the river bed is natural and unrestricted. Moreover they have an important function as corridors for the project area that connect the back-country with the urban

area. Actually the rivers within the project, apart from the Lana canal show less river flow. The river flow fluctuates depending on the input of rain.

Besides the rivers and lakes there are two more biotopes that are mainly influenced by water. Well developed fragments stock in the south of the park lake. They may act as retention zones in case of flooding. In Sauk the **alluvial fragment** is highly influenced by humans because it is located in a well-developed urban area. The second type is **ditch**. One of them is located south of the project area. It has a various ecological structure. As a semi-natural and humid biotope it has an important function for amphibians and birds. Moreover it has an impact on the microclimate of the region. The other ditch is located in Sauk in the south-east of the project area. The morphology is highly modified by humans but it has an important function for invertebrates, fish, amphibians and birds in this area.

Canals have been built during the construction of mulit-storey buildings. As decribed in the chapter "Groundwater" these canals collect water from the houses and lead it as sewage to the lake. The TORR crosses one open canal in the project area. Due to the fact that the canal is artificial and contains waste water, the water quality is classified as poor.

3.3.2 Ground water

The corresponding map is 04_3_2_groundwater.pdf.

3.3.2.1 Material references

- Field inspection in October and December 2008
- Interviews with experts
- Tirana GIS (natural boundries, orthophotos)
- Harta hidrogjeologijke (hydrological map)

Methodology of baseline and assessment

The methodology is based on the analysis of existing data (e.g. hydrological maps), on-site visit and interviews with experts. Two interviews were held: one with Mr. Rada who used to be head of the department of water supply and waste water management of the municipality of Tirana (Mr. Rada, October 2008) and another one with Mr. Drishti, a local road designer from Tirana (Mr. Drishti, D+C Partners November 2008).

The present situation was assessed qualitatively. The groundwater is described under the perspective of its use for human beings. Therefore the description is focused upon whether the project area contains important groundwater resources and if they are vulernable to contamination.

3.3.2.2 Description and assessment of groundwater in the project area

Wells

Wells for drinking water supply do not exist in the project area.

Hydrogeological present state and significance for water supply

Groundwater

The hydrological map classifies the project area as consisting mainly of consolidated rocks. Therefore the capacity to store or to transport penetrating water as groundwater is – in comparison to unconsolidated rock (or loose rocks) very low. The available supply of groundwater is very low and amounts to Q 0.1-0.3 l(sec) which is considered almost as an aquiclude.

The significance of the area for groundwater is therefore very low. The hydrological map assesses the available groundwater and therefore its significance as very low.

The lake itself is not groundwater fed. It is an artificial lake, whose water table is managed by pumps.

Subsoil water – artificial surface water

Subsoil water is mainly water that penetrates the soil and flows laterally following the slope. Therefore it can not be separated from surface water.

From the description of Mr. Drishti (November 2008) and from field visits, the subsoil water is expected to be highly contaminated in certain areas.

After 1990, after the end of communism, the construction sector also boomed in Tirana. At this time a lot of multi-storey buildings were built. However, no attention was paid to treating waste water then. In the area of Selita (north of the project area) waste water was connected to some open canals without a thorough integration with the municipality's canalization. This water flows in open canals, mixes with rainwater, penetrates the soil and finally reaches the subsoil groundwater. In addition, the leaching out of contaminants from debris of some illegal construction sites was expected also to pollute the subsoil groundwater.

In the area of Sauk that is close to the lake, waste water and rainwater mix and flow right into the lake. Therefore the lake is expected to be polluted. In other parts of the project area, rainwater flows laterally into the lake. Close to the lake is a water collector. The waste water and the rainwater is pumped and discharged from the water collector into the river Lana.

3.4 LANDSCAPE AND VISUAL RESOURCES, RECREATION

The corresponding map is 04_4_landscape_vision.pdf.

3.4.1 Material references

The following material references are known to expert planners and are being used:

- Aerial photographs of the city of Tirana
- Topographic maps scaled 1:10,000, dated December 18, 2004
- Site inspection (recreation, amenities, ecology) (October 2008)
- Proposed network (municipality of Tirana)
- Park lake research report (municipality Tirana, Berlage Institute) (February 2008)
- Interviews in the park
- Tirana GIS (shapefiles: sport, recreational areas)

Baseline description relies on site inspections, analyzing existing data and interviews.

3.4.1.1 Landscape and visual resources

The present report features the protected good "landscape" consisting of the following components: On the one hand, natural scenery, which can be perceived visually, olfactorily and auditively by the people. On the other hand, suitable natural or landscaped areas for recreational purposes. Both aspects influence that natural scenery is a main aspect of the suitability of an area for recreational purposes. (NOHL 2001)

The qualitative description of the **criteria individuality, diversity and beauty** are based on §1 subparagraph 1 of the German Federal Nature Conservation Act. The paragraph describes the requirements in nature and landscapes which are to be protected sustainably for recreational purposes.

The qualitative description serves as a basis for the assessment of the importance and sensitivity of the different units of natural scenery. The scale of values is divided in four levels and ranges from very high to low.

A landscape's sensitivity towards visual, acoustic and olfactory interference depends on a wide variety of factors. Forest areas and woodlands, for instance, may constitute less sensitive areas visually compared to open country, as an impact is visible only in its direct vicinity due to the dense stock of trees. (Of course, exceptions may occur, e.g. viewpoints which are situated above a forest area or a route which is situated on the hillside.) On the other hand, forest areas are highly sensitive towards loss of space.

In contrast, additional elements in open country may take a back seat or come to the fore, depending on relief dynamic and the number and arrangement of vegetation structures blocking the sight.

(compare ADAM, NOHL, VALENTIN 1986). The fewer structuring and enlivening grove structures there are, the lower is their sensitivity towards structural losses, yet the higher their sensitivity towards modifications of the surface structure.

The sensitivity of a landscape towards noise and odors depends on the sensual perception of the recreation seeker. Basically, a road which is not visible is experienced as less noisy than a road which can be seen over a long distance.

Sensitivity is largely determined by the following factors:

- reshaping by fragmentation (linear structural change)
- change in surface shape
- superimposing onto structure principles and order patterns of scenery components
- disturbance of long-distance view ranges

Based on the survey, for each spatial unit, individuality, diversity and beauty are evaluated (compare JESSEL 2003). The scale of values is divided in four levels. The overall assessment (landscape quality) of a spatial unit is based on the individual assessments of the quality attributes - individuality, diversity and beauty.

Tab. 3.4-1: Indicators for the assessement of landscape scenery quality

Indicators	**assessment of landscape scenery quality (=sensitivity)**			
	very high	**high**	**medium**	**low**
Diversity: landscape with typical elements which are valuable for the scenery (forest, woods, riparian copses, bodies of water, tree-lined roads, historically grown richly structured settlement edged with gardens and orchards)	high density of typical elements with a positive effect in the complete spatial unit, high diversity in shapes, patterns and colours, enlivening contrasts and contour effects, richly structured settlement edges with gardens and orchards	typical structures or elements with a positive effect exist in the complete spatial unit, existing intense land use or buildings compensated to a large extent by existing structure elements or integrated very well richly structured settlement edges with gardens and orchards older settlement edges with old trees and copses	typical structures or elements with a postive effect exist merely locally considerable influence of intense types of use high number of artificial buildings dating from more recent times	uniform agricultural landscape poorly structured grassland recent plantings of copses that are untypical to the site dominant contrasts due to harsh settlement edges structure elements which primarily constitute disturbance factors (e.g. travelways, business parks)

Indicators	**assessment of landscape scenery quality (=sensitivity)**			
	very high	**high**	**medium**	**low**

Individuality: dominant or guide structures, relief, benchmarks, contrasts in colour and topography distinctiveness historico-cultural significance historically grown forms of land use	high percentage of typical or natural guide structures undisturbed relief no or very low losses of individuality due to the change of land use which is typical for the spatial unit high grade of harmony irregular, traditional settlement structures with high level of integration into the spatial unit	high percentage of typical elements and patterns changes in typical forms of land use and artificial buildings exist, but their dimensions are adapted to the spatial unit no major impact on the overall figure	typical or natural guide structures reduced or disturbed considerable amount of dominant artificial structures which cause negative effects considerable loss of individuality due to extended changes of typical forms of land use or high amount of more recent settlements	high amount of large technical and artificial structures or of dominant guide structures which cause negative effects due to various, spread-out forms of land use (e.g. agriculture, settlements, commercial areas) standardized landscape with high losses of individuality due to complete change of typical forms of land use landscape spoilt by development
Global assessment (including beauty) Beauty is the perception of the landscape as a whole	**verbal-argumentative summary of the indicator's assessment (low, medium, high, very high)**			

View ranges as a partial criterion of diversity are recorded and described under that aspect.

The assessment of settlement edges is made verbal-argumentatively and enters into the assessment of landscape scenery quality, as those edges mark the transition between settlement areas and the open countryside. They therefore characterize natural scenery.

The legal designation of protected objects or protected areas is recorded for information.

3.4.1.2 Recreation

For this criterion, landscape-related forms of recreational use are of special interest, as they need features of the landscape in determined quality and peculiarity. In this context, preloads like existent impacts due to noise or air pollutants need to be considered and may have influence on the assessment. Against the background of increasing noise pollution, low noise spaces are an increasingly scarce resource. Based on the stock-taking for the recreational areas the following criteria will be evaluated: recreational facilities, attractivity of the landscape, quietness in the reference area and accessibility of the recreational area.

The criterion recreation comprises the partial criterion "stationary recreational facilities" as these facilities are common to the study area and characterise it.

Due to the strong use for recreational purposes in the study area and due to the particular importance of open spaces for recreation, the recreational infrastructure of the landscape units and their relevance for recreational use enters into the assessment and will be described in the according spatial unit. Recreational areas therefore are identical with the spatial units.

The scale of values for the assessment is divided in four levels. The overall relevance (= recreational quality) of a spatial unit is based on the evaluation of the criteria: experience quality, recreational infrastructure and quietness.

The following table summarizes the criteria:

Tab. 3.4-2: Indicators for the assessement of the recreational quality

Indicators	Assessment of the recreational quality (=sensitivity)			
	very high	**high**	**medium**	**low**
Experience quality: quality of the natural scenery	experience quality requires supra-regional importance (weekend recreation)	experience quality requires regional importance (daily recreation	experience quality requires local importance (short time recreation)	no or hardly any importance due to very little experience quality
Recreational infrastructure: landscape-related recreation (lines of movement, provided route network) stationary recreation (leisure facilities, stops for refreshments, bathing ponds, etc)	the designated infrastructural facilities require supra-regional importance (weekend recreation)	the designated infrastructural facilities require regional importance (daily recreation, regional cross-linkage of routes)	the designated infrastructural facilities require local importance (short time recreation, related to dwellings and settlements)	no facilities, at least of local relevance
Quietness in the reference area (daytime)	largely undisturbed rest area	minor disturbances due to noise	medium disturbances due to noise	significant disturbances due to noise
Global assessment	**verbal-argumentative summary of the indicator's assessment (low, medium, high, very high)**			

The criterion 'accessibility' is considered in the description of suitability for recreational purposes.

Participatory Appraisal – Census

In order to integrate local knowledge and the wishes of the people from Tirana who use the park for recreation, an interview was conducted in the park in December 2008. With this information, possible measures for compensation of the impacts ensure efforts to meet the needs of the people of Tirana. Therefore a questionnaire was created with some standardized answers and some open answers:

1. What do you use the park for?
2. What do you like in the park?
3. What don't you like in the park?
4. How often do you go to the park?
   - every day
   - once a week
   - more than once a week
   - rarely
5. When do you go to the park?
   - morning
   - noon
   - evening

3.4.2 Description and assessment of landscape resources

3.4.2.1 Functional description of the landscape, visual and recreational resources in the project area

Following **units of natural scenery** are defined:

1. **Park south of the Tirana city centre**
   - 1A Wooded part of the Great Park
   - 1B Lake as a part of the Great Park
2. **"Cemetery of the Nation's Heroes" (Varreza e Dëshmorëve)**
3. **Open Spaces south of the park area**
   - 3A Botanical garden, zoo and adjacent open spaces
   - 3B Greenlands west of Sauk
   - 3C Greenlands within Sauk

The following table summarizes the importance and sensitivity of the units of natural scenery. The complete description is part of the annex 2.

Tab. 3.4-3: Description and evaluation of the project area's units of natural scenery

Number of the unit of natural scenery	Description of the unit of natural scenery	Importance / Sensitivity
1A	**Park south of the Tirana city centre:** **Wooded part of the Great Park** Natural scenery: Unit number 1 comprises the Great Park (Parku i Madh) at the southern edge of Tirana. It consists of two parts, which each have a distinct appearance (wooded area = unit 1A, lake = unit 1B). Park lake is a man-made green area. During the early 60s the location was simply a bare hill. It forms the transition of the densely developed urban parts of Tirana to the natural landscapes south of Tirana. As a consequence of the park character (which in the western part of the unit results from the shape and the equipment with infrastructure) and the prior incumbrances, the unit is rated of **medium** individuality, diversity and beauty. Suitability for recreation Because of its high (supra-regional) importance for recreation, **very high significance** is alloted to this unit. Together with the units 1B, 3A and 3B, it forms a large coherent open space with high potential for recreation. Overall assessment / Potential: Despite its medium quality concerning the landscape scenery, overall a very **high importance** is alloted to the unit due to its supra-regional importance for recreation. Beyond that, the unit is highly sensitive as related to the project due to its value for recreational purposes and due to the sensitivity of the relief; the appointed route would cause a section of the hillside to be seen from the route despite its situation in the woods. Obviously, maintenance and development of the park stagnate at the moment, which means increasing deterioration. Basically, the park has high potential for reactivation and revaluation, which should be exploited on account of the park's high importance for recreation and to stop futher deterioration. A new park design should acknowledge both ecological and recreational aspects.	**very high / high**
1B	**Park south of the Tirana city centre:** **Lake as a part of the Great Park** Natural scenery: Due to high prior incumbrances to the unit a **medium** grade of individuality, diversity and beauty is allotted. Suitability for recreation:	**high / high**

Number of the unit of natural scenery	Description of the unit of natural scenery	Importance / Sensitivity
	As the unit also has special importance for recreation and is therefore used intensely (good accessibility to the lake, promenade around the lake), overall **high importance** for recreation is alloted to it. Together with the units 1A. 3A and 3B, it forms a large coherent open space with high potential for recreation. Overall assessment / Potential*:* Considering the medium quality of natural scenery and high importance for recreation, overall a **high importance** is alloted to the unit. Furthermore, it has a high sensitivity towards the project due to visibility of the unit and its high importance for recreation. *Unit 1B has, like unit 1A, high potential for reactivation and revaluation. One should try to combine ecological and recreational aspects.*	
2	**Cemetery of the Nation's Heroes (Varreza e Dëshmorëve)** Natural scenery: Concerning natural scenery, as a result of prior incumbrances, only a **low** grade of individuality, diversity and beauty can be alloted to it. Recreation: The area is not suitable for landscape-related recreation and therfore recreation is not a primary target for this area. There is no recreational infrastructure. Nevertheless, the cemetery is an area for retreat and quiet within densely populated Tirana – also because of its seclusiveness due to being bounded by a fence. Therefore, a **medium** grade of suitability for recreation is alloted to the unit. Overall assessment In spite of the low quality of natural scenery, a **medium importance** is alloted to the unit. This results from the medium importance for recreation. As there are very few recreational areas, the criterion is estimated higher. The unit has a **medium sensitivity** as it is rather poorly visible.	**mittel / mittel**
3A	**Open spaces south of the park area:** **Botanical gardens, zoo and adjacent open spaces** Natural scenery: Due to the park character (artificial landscape) and the prior incumbrances, a **medium grade** of character, diversity and beauty is alloted to the unit. Recreation: The unit has a **high importance** for recreation. Together with unit 1A, 1B and 3B, this forms a larger coherent open space with high potential for recreation. Overall assessment / Potential: In spite of medium importance for natural scenery, and due to its high importance for recreation, a **high importance** is allotted to the unit. The high importance mainly results from the fact that the area is an important excursion destination with supra-regional importance. Due to its visibility, the unit has **high sensitivity**. *Due to its high importance for recreation, any impact in these areas should be avoided, especially in the zoo and the botanical gardens. In fact, all possible efforts should be made to expand the areas and get a larger space for recreation. The potential exists due to available adjacent areas.*	**high / high**
3B	**Open spaces south of the park area:** **Greenlands west of Sauk** Natural scenery: Due to major anthropogenic incumbrances, a **medium grade** of individuality, diversity and beauty is alloted to the unit. Recreation: From a recreational view, the unit is important in-so-far as it forms a green belt between the densely populated area of Tirana in the north and the new settlement areas in the south. For the southern settlement areas, it constitutes a link to the park. Recreational value therefore is evaluated as **high.** Together with units 1A, 1B and 3A, it forms a larger coherent open space with high potential for recreation. Overall assessment / *Potential:* Due to the medium importance for natural scenery and the high importance for recreational purposes, overall the unit is evaluated as **highly important**.This evaluation is underlined by the fact that the open spaces constitute the few areas which are near to the city and form a green belt within the settlement areas.	**hoch / hoch**

Number of the unit of natural scenery	Description of the unit of natural scenery	Importance / Sensitivity
	Furthermore, there is a **high sensitivity** due to visibility and relief. *The uncontrolled growth of settlements towards the park (especially the lake shore and the adjacent open spaces), leads to a growing demand for land at the expense of the green belt south of the city of Tirana. It seems necessary to develop a concept to protect the open spaces. Recreation seekers and local residents especially could use them as a link to the park. The potential for upgrading is high due to the vicinity of the city and multiple possibilitiies to shape the area.*	
3C	**Open spaces south of the park area:** **Greenlands within Sauk** Natural scenery: Due to the intense use: **low** individuality, diversity and beauty. Recreation: Due to its inferior role for recreation and vicinity to the southern open spaces and mountains, the recreational function is evaluated as **low**. Overall assessment: Due to the low relevance for natural scenery and the low relevance for recreational purposes, the unit is evaluated with **low** relevancy. Beyond that, there is **medium** sensitivity due to visibility and relief.	**low / medium**

3.4.2.2 Participatory related description and assessment recreational resources in the project area

On December15th Mrs. Rada and Mr. Wefelnberg (both: Bernard Ing.) conducted an inspection of the park site in Tirana. They interviewed 20 people to find out what they used the park for and what they think about it. The results showed that people of all ages use the park for recreation and some for sports; they like the fresh air and quiet. Most of them complained about the bad condition of the paths and wished them to be improved. Moreover they wished for more seating accommodation, lavatories to be built, lake water to be purified and the park illuminated.

Expert opinions on the condition of the park correspond with the results of the interviews. The park has a big potential for realization of improvement measures.

3.5 ECOLOGY AND BIOTIC RESOURCES

3.5.1 Fauna

The corresponding maps are 04_5_fauna_state.pdf and 04_5_fauna_assesment.pdf.

3.5.1.1 Material references

The main source of information on the occurrence of species was qualified interviews with experts on specific animal species. Available literature on local and general scale has been sighted. Many questions could be clarified in an interview with Prof. Dr. Ferdinant Begu, director of Tirana Natural History Museum on the occurrence of animal species in the area. The main focus was on vertebrate species: mammals, birds, reptiles and amphibians. Information on the distribution of nearly all animal species in Albania is covered by the Atlas of the Regional Environmental Center for Central and Eastern Europe (REC, 1997ed.). Information on the European level of the distribution of bats (Dietz, Helversen, Nill, 2007), mammals in general (McDonald 2001), birds (Tucker & Heath, 1994, Limbrunner, Richarz & Singer, 2007, Mebs & Scherzinger 2000), reptiles (Gruber 1989) and amphibians (Nöllert & Nöllert1992). Additional information on the distribution of invertebrates are from Askew (1988), Baytas (2007) and Higgins & Riley (1977)

In addition to this research new field investigations have been undertaken aiming to confirm local habitat potentials for the selected lead species. Due to the seasonal situation the habitat and occurrence of some species could also be confirmed, eg. olive warbler.

3.5.1.2 Methodology baseline and assessment

The methodological approach includes structural estimation of habitat potentials for lead animal species and personal field visits to prove the occurrence of species. These key species represent the main ecological levels of the species communities, food webs, spatial distribution patterns and vulnerability. In this regional lead species conception, the following taxa are included: mammals, birds, reptiles, amphibia, butterflies and grasshoppers. Criteria for the selection are national or internatonal protection – e.g. presence in a European directive like birds directive or habitats directive – as well as ecological parameters. So the set of species is representative to cover the variability of the fauna. The specific urban ecological situation with site fragmentation, human activities and habitat changes is considered.

The results are

- a list of important regional lead animal species
- a description and valuation of main faunistic structures in the total investigation area
- an actual distribution pattern of the lead animal species in the investigation area
- important migration corridors for animals in the investigation area
- an estimation of expected impacts by the project on the animal community

- a general conception of balancing measures

Functional areas

Habitats and corridors are the main zoological structures in the investigation area. The essential habitat patterns of each species are shown above and valuated in five levels. Criteria are the habitat potential and the connectivity for the selected lead species. The ecological quality of animal habitats is valuated in the following five levels and shown in 04_5_fauna_state.pdf.

1 strongly reduced habitat quality and/or very high fragmentation of habitat structures

2 basic habitat quality and/or high fragmentation of habitat structures

3 reduced, but still existing habitat quality and/or medium fragmentation of habitat structures

4 medium habitat quality and/or moderate fragmentation of habitat structures

5 high habitat quality and/or low fragmentation of habitat structures

3.5.1.3 Description and assessment of fauna in the project area

The project area shows a high variety of animal habitats. Not only the lake and the park, but also the agricultural land and the settlements are important animal habitats. For example several bat species use houses as partial habitat elements and several birds and lizards also live in gardens. In the table lead species have been selected to prove the biodiversity of the project area and to measure the impact of the road on different levels of the animal species community.

The legal status in the table below refers to the EU-legislative: EC-FFHD…Fauna-Flora-Habitats-Directive, Annexes II and IV, EC-BPD…Birds Protection Directive Annex I

Tab. 3.5-1: Animals in the project area

Species group	Scientific name	Legal status	Remarks
Mammals	Meles meles	-	The badger is characteristic for the forest and open areas - key habitats in remote areas of the park and in the south of the project area. Like other mammals, they use streams as corridors for migration and exchange of metapopulations.
	Lutra lutra	EC-FFHD II/IV	The common otter inhabits the lake area and small tributaries from the south and east. The habitat structure is best in the Salix forests, which offer hiding places as well as protected paths to the lake.
	Mustela putorius	-	As a characteristic species of the wetlands, the polecat depends on rich populations of amphibians.
	Plecotus auritus	EC-FFHD IV	Long-eared bat species are characteristic both for forests and cultural landscapes. Habitats can be in houses as well as in trees. Green corridors into the urban centers are of high relevance as guiding structures for bats.
	Nyctalus noctula	EC-FFHD IV	The noctule bat inhabits mainly forest ecosystems. So the habitat quality of the lake park is very attractive for bats. The open water surface and surrounding wetlands with ample insects guarantee a good food base.

Species group	Scientific name	Legal status	Remarks
	Suncus etruscus	-	The Etruscan shrew is the smallest mammal of Europe and inhabits open cultural land, pastures and the banks of small streams, so its habitat is restricted to the south of the area.
	Micromys minutus	-	This rodent is a typical species with extended reeds. In the project area only the reeds south of the lake fulfil the basic habitat criteria for the harvest mouse.
Birds	Tachybaptus ruficollis	-	A wintering group of more than 40 individual little grebes was mapped on the lake and the habitat structure shows also quality for several breeding pairs.
	Anthus pratensis	-	The meadow pipit is typical for open grassland with pastures and small structures. Upcoming density of settlements restricts the area of this bird species.
	Acrocephalus palustris	-	The marsh warbler can be found in small reeds along streams as well as along lakes and rivers. Suitable habitats are around the lake and along the tributaries.
	Hippolais olivetorum	EC-BPD I	The olive warbler is bound to reeds and single shrubs along streams in cultivated land. So the project area is actually still high, but of decreasing habitat quality. Actual habitats are in the east of the lake.
	Sylvia nisoria	EC-BPD I	The habitat potential for the barred warbler is in pastures where they use small forests and shrubs.
	Troglodytes troglodytes	-	Parts of the forests with undergrowth are the habitat of the wren. These structures exist in several parts of the park and in the south of the lake. The wren also inhabits gardens, but mainly in the winter.
Reptilia	Emys orbicularis	EC-FFHD II/IV	The swamp turtle is rather common and inhabits the banks of the lake with basic structures and wintering habitats. The richness of submerse macrophytes like Myriophyllum and Ceratophyllum in the eastern part of the lake is a valuable habitat structure for the turtles.
	Mauremys caspica	EC-FFHD II/IV	The Mauric swamp turtle is reported to still be in the lake area, but to be rare. The habitats are in the east and south of the lake and along some small sections of the streams.
	Testudo hermanni boettgeri	EC-FFHD II/IV	The spurtailed Mediterranean land-tortoise is one of the most characteristic animals of the Mediterranean area. The population is very dispersed and decreasing due to changes in land use and traffic increase which lead to massive fragmentation of habitats. The pastures and suburban settlements are still a suitable habitat for the tortoise.
	Natrix tesselata	EC-FFHD IV	The diced snake is a strongly water adapted snake and occurs along the lake. The population seems to be vital. The habitat consists of sunny sites along the banks and wintering sites that can be some hundred meters away. Direct persecution and disturbance by people present dangers for the diced snake.
	Lacerta trilineata	EC-FFHD IV	The three lined emerald lizard finds habitats around the park and agricultural land. The best habitat structure is in the extensive grasslands in the south east of the park.
	Lacerta viridis	EC-FFHD IV	The habitat necessities of the emerald lizard are rather comparable to the closely related three lined emerald lizard. These big lizards need rich populations of grasshoppers to survive. Experiments show that one individual alone needs around 1000 m² of extensive grassland.
	Podarcis taurica	EC-FFHD IV	The smaller Tauric lizard finds suitable habitat structures in dry and open places of the project area.
Amphibia	Rana lessonae	EC-FFHD IV	The lake shows a rich frog population, but the species could not be verified. The common small water frog seems to occur; also the Greek frog can be expected.
	Hyla arborea	EC-FFHD IV	The tree toad needs warm wetlands with vertical structures like reeds or shrubs close to the bank. The tree toad also breeds in small wetlands and settlements. So the habitat

Species group	Scientific name	Legal status	Remarks
			potential is quite promising and a vital population can be expected.
	Triturus cristatus	EC-FFHD II/IV	Ponds and lakes with richness in submersed macrophytes are the habitat of the great crested newt. The lake shows a good potential for this species. The wintering habitats of the great crested newt are close to the summer habitat, so the Salix and Quercus forests with enough undergrowth seem suitable. Sometimes newts also winter in the water.
	Bufo viridis	EC-FFHD IV	The green toad is a typical steppic species and shows a reduced connection to water habitats. It breeds in open, often very small waterbodies with little or no vegetation. Shallow banks of the lake as well as small puddles along the streams or the retention areas are typical habitats. The adults have a wide range of more than two kilometres, so fragmentation of the habitat endangers the populations.
Butterflies	Lycaena phlaeas	-	Up to now only few butterflies could be verified in the area. The dry grasslands show a high potential. The small copper is one of these characteristic species; several specialized blues can be expected.
	Colias crocea	-	Another typical butterfly species in rich grasslands is the yellow. This species has a wide area and the adults can be found in many different places.
Grasshoppers	Aiolopus thalassinus	-	The beach grasshopper is a rather rare grasshopper species with a high ability to fly. This is an adaptation to wide bare banks of open rivers and lakes. The habitat situation is quite optimal for the beach grasshopper at the lake.
	Stenobothrus lineatus	-	The heath grasshopper lives in dry grasslands and along the edges of the forests. Best habitats are in the south of the park and around the garden areas.

1. Corridors

There are three relevant corridors for migrating animals within the planning area. They all connect the open agricultural landscape to the lake. These connections are of great importance especially for small and medium mammals, reptiles and amphibians to change between breeding and wintering habitats and to exchange between local metapopulations. In urbanized areas especially for small and medium mammals, reptiles and amphibians, zootop fragmentation is a relevant factor for nature protection.

Corridor I: south of the lake there are remaining highly natural wetlands. For the European and Mauric swamp turtle, diced snake, otter, polecat and green toad this area shows the best habitat quality in the area. For a sustaining population the site itself is too small, and a fragmentation might lead to longterm extinction of the population. The highest risk is with the spurtailed Mediterranean tortoise (Testudo hermanni boettgeri), a species that shows a dramatic decline in the whole Balkan peninsula due to loss and isolation of habitats.

Corridor II: Between dumping areas and groups of buildings a small rudimentary tributary of the lake still exists. South of the local road there is a connection to another migration corridor.

Corridor III: This migration route follows another small stream from southeast and connects between the suburgan garden areas and farmland to the lake. In this part of the lake again important habitats for the above- mentioned species occur.

The assignment of the corridors follows also the strategy of the municipality to preserve this open land in the project area.

The municipilaltiy of Tirana intends to tear down some illegal buildings within our project area and in addition preserve important ecological zones in the south (Mrs. Kushi, municipality of Tirana, 16.12.2008, personal interview). The functionally assigned corridors end up in those areas in the south. Therefore technical proposals coincide with the concepts of the municipality.

2. Main faunistic structures in the project area (5)

To specify main habitats apart from the corridors, the following decribed habitats are essential for wildlife species.

A: Urban areas with low habitat potential

B: River corridor with reduced habitat potential

C: Lake park area with wetlands and migration corridors to surrounding agricultural areas with high habitat potential

D: Suburban area with moderate to medium habitat potential

E: Agricultural areas with high habitat potential

F: Urban park area with medium habitat potential

This classification responds to the selected lead animal species of common and regional interest. 04_5_fauna_state.pdf and 04_5_fauna_assesment.pdf shows the distribution of fauna structures and estimates the occurrence of lead animal species in the area. The most important areas of faunistic interest are described below.

Areas of main faunistic interest

The lake park area, with wetlands, forests and migration corridors to surrounding agricultural areas with high habitat potential is the most important habitat complex in the investigation area. Habitat potential and diversity are high. There are also still existing corridors like those described above.

For the animal communities there are two main ecological services in the project area. On one hand the habitats with higher naturalness are important for the biodiversity. These prior habitats are:

- Forest areas, especially oak forests in the lake park. Lead species are bats like the noctule bat and birds. The habitat situation in these forests is very different. The diversity includes open sites with park trees, dense forests rich in shrubs and herbs and specific situations related to the topography. So wrens like dense shrubs and characteristic forest birds like woodpeckers need old trees.

Figure 19: Forest areas

- Dry grasslands around the park and the suburban areas have their communities of insects, especially grasshoppers and butterflies. Typical for this habitat pattern are species like the heath grasshopper and different coppers. These species are usually restricted to small sites with low mobility, but sometimes high densities of population. The habitat complex with surrounding woodland and high herbal vegetation benefits different local lizard species, especially emerald lizards. These need a high insect density. Usually one individual emerald lizard needs the productivity of some thousand square meters of heath.

Figure 20: Dry grasslands around the park and suburban areas

- The lake and the wetlands around the lake, as breeding place and wintering habitat for water birds, various amphibians and insect species. The changing water levels cause wide banks with poor vegetation. These sites are the habitat of the beach grasshopper and highly attractive for water birds. They find food in the mud. Some ecological deficits are the lack of reeds due to the artificial character of the lake. These structures would bring safe breeding places for ducks, divers, herons and several warbler species, safe hunting areas for the otter and the polecat. Reeds are also important hiding places for the swamp turtles.

Figure 21: Lake and the wetlands around the lake, as breeding place and wintering habitat for water birds, various amphibians and insect species

- Small tributaries of the lake with their reeds, semi-aquatic grasslands and small relictuous Salix-forests. These are of high importance for swamp turtles, diced snake and the olive warbler. The impact on these small streams is rather high. They are affected by waste deposition and pollution from the nearby settlements. For amphibians with their sensible skin these effects are dangerous. Also the aquatic organisms, mainly invertebrates are heavily affected. In a next step also the fish of the lake are to be expected to have increased microbial pollution. Therefore there is a strong need to improve this area.

  The habitat potential still is high, but there is urgent need for measures to save and restore these remaining rests of small wetlands with their high biodiversity. The olive warbler is a protected species of Annex I of the birds directive and it is remarkable to find this species in the fauna of an European capital.

Figure 22: Small tributaries of the lake with their reeds, semi-aquatic grasslands and small relictuous Salix-forests

- The agricultural land to the south of the lake. These areas are not only habitats themselves, but also of high importance as corridors for migrating animals with a wider range like the green toad or the spur tailed Mediterranean tortoise. Extensive land use and the pattern of single trees and shrubs is a habitat not only for endangered species, but also with a high recreational potential to experience nature in an urban environment.

Figure 23: The agricultural land to the south of the lake

Figure 24: House gardens in the south of the lake

The zootope complex with highest (5) valuation for the animal community includes the park, the lake and the surrounding wetlands, pastures and migration corridors to the south.The installation of a protected area should be taken into consideration to reach a good status of conservation, consequent landscape management with core and buffer zones to develop both nature protection and recreation potential of the site.

3. Environmental Protection Zone

Environmental protection zones (Municipality Tirana, January 2009) affilitate with the corridors south of the project area. Therefore the suggestions of Bernard Engineers to preserve the above-mentioned areas by integrating mitigation measures (e.g. building of bridges) coincide with the perceptions of the municipality of Tirana.

3.5.2 Flora

The corresponding maps are 04_5_flora_state.pdf and 04_5_flora_assesment.pdf

3.5.2.1 Material references

- Field inspection in October 2008
- Tirana GIS (natural bounderies, buildings, orthophotos)
- Cadastre of the research area
- Libri i kuq i flores shqiptare, Tirana 2007, Haziz Marku (Red data book of plants)

3.5.2.2 Methodology baseline and assesment

Ecosystems provide multiple benefits to humans. Habitat biodiversity is the basis to ensure ecosystem services. In general it is difficult to quantify biodiversity precisely. The methodological approach taken

in this study is based on the CORINE (Coordinated Information on the European Environment) Land Cover programm promoted by the EU. CORINE tries to classify Europe into different land types regarding use of land. There are 43 different habitat types. Terminology of habitat types is mainly taken from the CORINE program in this study. For getting more detailed information of the project area the given classification has been enlarged. Field insepection was made at the beginning of October 2008. During side inspection plants were collected as random records.

The biotopes are valuated in five levels. Criteria are naturalness and habitat potential:

Tab. 3.5-2: Definitions for the high, good, moderate, poor or bad status of biotopes

indicator	state				
	high	good	moderate	poor	bad
naturalness and habitat potential	less influenced naturalness of the biotope and/or high habitat quality	influenced naturalness of biotope and/or medium habitat quality	areas with influenced biotope characteristics and/or reduced, but still existing habitat quality	areas with influenced biotope characteristics and/or reduced, but still existing habitat quality	highly altered areas with basic habitat quality

3.5.2.3 Description and assessment of flora in the project area

Description of flora in the project area

Following the CORINE Land Cover classification there are various vegetation types. The project area is mainly characterized by urban structures. About two-thirds are mapped as habitats with human buildings. Most of it is sealed or paved area in the eastern part of the region. Furthermore Sauk is mapped as discontinuous urban fabric. Within the urban area there are several places for recreation (e.g. sport fields, botanic gardens and other commercial units). There are two roads within the park, flanked by trees on both sides. Woodland mainly occurs within the park area. These structures are very important for air quality and air regeneration of Tirana.

The most frequented area is the park in Tirana. Besides its social importance the park area contains a mix of planted species like Acer negundo, Aesculus hippocastanum, Catalpa bignonioides, Gleditsia triacanthos, Magnolia grandiflora, Populus Canadensis, Robinia pseudacacia and Sophora japonica, but also extended forests with natural vegetation. In these dry and warm sites Quercus robur dominates, and Acer campestre, Carpinus betulus, Quercus suber and Quercus petraea occur. In the lowest stratum Ruscus aculeatus is characteristic, further Crocus sp. and Dactylis glomerata. The open areas show typical grassland species like Centaurea jacea and Odontites vulgaris.

The park is used in many different ways by humans (e.g fishing). Shores are mostly composed of different grassland types. The changing water levels of the lake show large submersed macrophyte clones. Due to the high nutrient level Myriophyllum spicatum and Ceratophyllum sp. dominate. In the deep areas other submersed macrophyte species can be expected. Moreover the lake has an important impact on the microclimate of the region. The lakes to the east of the zoo also take place in climate regulation.

Most of the habitats with a high ecological potential, besides the Lana river to the west of the region, are located in the center of the project area. The Lana river is one of the most important donor biotops and retention reservoirs in the urban fabric of this part of Tirana. Furthermore it is a corridor and transport medium for animals, plants and nutrients. All other biotopes with less influenced naturalness and/or high habitat quality are also humid ones.

Around the lake there are extended areas with characteristic species of semiaquatic vegetation types. In the northeast and south there are small relictuous willow forests with Salix fragilis, accompanied by Prunus spinosa and Rosa sp. Only few sites show little influence from grazing. These places are the most important spots from a biodiversity point of view within the whole project area, with species like Bolboschoenus maritimus, Cyperus fuscus, Cyperus longus, Epilobium sp., Gnaphalium uliginosum, Juncus effuses, Lycopus europaeus, Mentha aquatica, Scirpus sylvaticus, Typha angustifolia and Xanthium albinum ssp. riparium. The phytocoenosis includes central European as well as Mediterranean plant species. In the rather dry bank areas Centaurium erythraea, Xanthium albinum ssp. Riparium, Pennisetum alopecuroides, Verbascum blattaria and Lycopus europaeus occur.

There are several small streams in the southern part of the catchment of the lake. These are mainly with reduced natural vegetation like Salix or reed and lead through agricultural areas and new settlements. Some of these places are heavily polluted by waste deposition and dumping. East of the lake there is a small ditch with Equisetum telmateia, Typha angustifolia and Urtica dioica that is already partially filled up with garbage. These places are of elementary importance for the local water household for temporal retention and semi aquatic habitats.

Dumping sites occur along the road in the south of the lake. In the deposition sites species like Cichorium intybus, Rubus sp., Verbascum sp., Solanum nigrum and Dipsacus fullonum can be found.

All areas with influenced biotope characteristics and/or reduced, but still existing habitat quality, besides the Lana canal and the botanical gardens, are located in the west part of the project area. Most of them, like grassland, arable land, pasture and cemeteries are managed by humans. They have less biodiversity but overall an important contribution to social living. Waste land and brownfields with no special local condition also have a moderate ecological potential.

Fruit farming sporadically occurs within the project areas. Such structures are located in the southeast and are very important for birds (eg. food source, nesting site).

Assessment of flora in the project area

The local loss of essential habitats can disrupt ecosystem services (e.g. food, air quality) for a long time. Changes in habitat structure can also lead to negative impacts on ecosystem processes (eg. nutrient cycling). The alignment of Tirana's outer ring mainly avoids destruction of biotopes with high ecological potential. Most of the alignment goes through urban areas and follows the path of an existing road in non-forested land. Fragments of riverine forests and other biotopes that are fed by water may be affected by discharge from the road during rainy periods. This could be prevented by conduits that flow into the canal system.

Changes in land use and distribution of landscape patches influence climate. Grassland, arable land and humid non-forest land benefit the production of cold air. Such biotopes are located in the center of the project area. Forests, shrubs and other types of woodland are important for air regeneration and air quality. The alignment only takes some forest area in the south of the project area.

Two fruit farming places in the southeast of the project area are affected by loss of their habitat area and structure. These kinds of biotopes are rare in the region and therefore are very important for the project area.

Fragmentation of biotopes is also one of the main impacts that occur during building of band elements. Botanical gardens in the center of the project area are one of the main elements to protect endangered species. This section should be given special attention concerning nature conservation.

The park within its different habitat types has an important contribution to the biodiversity of the whole region and should at least be conserved in its current state. Furthermore measures should be implemented to improve the ecological structure and ecological potential of the park. The alleys in the park act as stepping stone biotopes that connect biotopes to each other and are considered to have an important ecological function. Aesculus hippocastanum are considered as critically endangered species according to the Red data book of plants. But overall this species is quite common in the project area of Tirana because it is cultivated as trees in alleys and parks. Quercus robur are also mentioned as critically endangered species. These species have a retention reservoir within the park area. It stocks near the inflows and outflows of the lake. These semi-humid and humid forests are very important for biodiversity and have a positive impact on climate.

Salix fragilis is one of the covering species in the fragments of riverine forests in the south of the project area. Considering the Red data book this species is endangered. Most of the alignment lies in the urban part of the area. These parts are considered as regions with poor or bad ecological conditions. Urban areas are biotopes with less ecological potential.

Dumping sites that occur to the south of the road are considered places with poor ecologoical potential. These areas have influenced biotope characteristics and/or reduced, but still existing habitat quality.

3.6 AIR QUALITY

The corresponding map is 04_6_air_quality.pdf.

3.6.1 Material references

- Measured data on air pollutants at the 7 gauging stations owned by the municipality of Tirana
- Digital terrain model (DTM)
- Orthorectified aerial photographs
- Technical data on the alignment such as longitudinal gradient, number of lanes, the design speed and average daily traffic was calculated
- Shape-files regarding buildings and residential and business areas along the proposed alignment provided by the GIS of the municpality of Tirana
- Site inspection and field work (mapping)

3.6.2 Methodology baseline and assesment

The air quality of the project area is described by assessing the measured data gathered (Data from the municipality of Tirana) through the gauging stations for air pollutants and climatic conditions such as wind velocity. The initial levels of air pollution are assessed by comparison with legal regulations such as Albanian law and thresholds defined by the WHO or the EU.

3.6.3 Description and assesment of air quality in the project area

In general the prevailing winds come from the northwest and southeast sides of Tirana. This freshening sea breeze can be observed especially during the summer period. (municipality of Tirana 2008). Due to lack of more specific and local data regarding various wind patterns within the city of Tirana these prevailing winds will be used to assess air quality and possible ways of propagation of air pollutants through the project area.

The following figure illustrates the project area and the location of the gauging stations for air pollutants in Tirana. Data on air pollutants taken from the gauging stations most representative and close to the project area will be used to assess the situation regarding air quality. Two more criteria of choosing the most appropriate gauging station are the development of future road networks and residential development in or close to the project area.

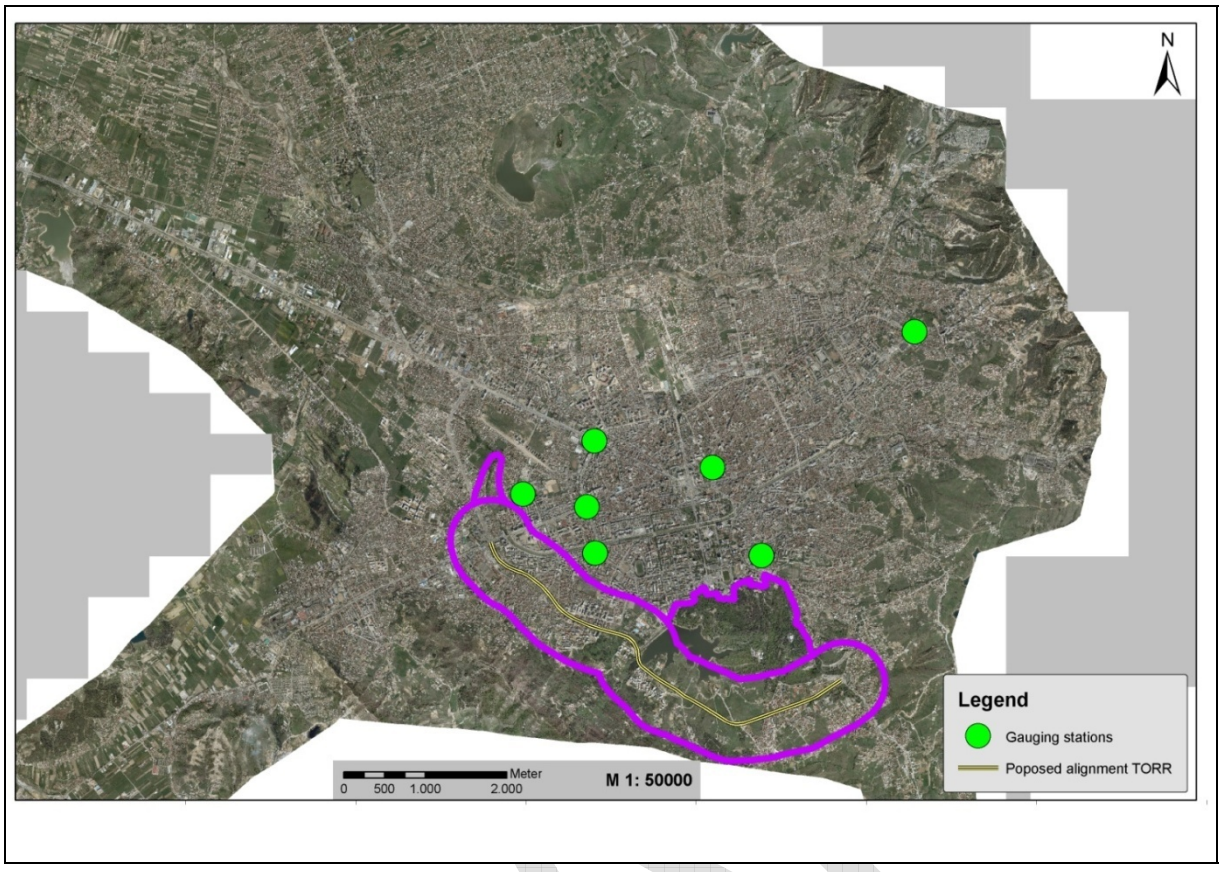


Figure 25: Project area and the location of the gauging stations for air pollutants in Tirana

Due to a lack of measured data on daily average values or hourly average values, the assessment focuses on an examination of annual yearly average values for PM 10 as an air pollution indicator.

To describe the existing situation the project area has been devided in two areas.

Section 1 – Road Kavaja to intersection 6

Measured data from Gauging station 4 (north east of Kavaja road), located at the Crossing 21 – Dhjetori, were taken to determine the initial level of pollution for the first section of the alignment. The measured average yearly PM10 value for this gauging station is 354 µg/m3 (Monitoring results on the urban air quality, Tirana, 2007).

Section 2 –Intersection 6 to Road Elbasan

Measured data from Gauging station 5 (northeast of the Park), located at the Directory of Hygiene and Epidemiology, were taken to determine the initial level of pollution for the second section of the alignment. The measured average yearly PM10 value for this gauging station is 96 µg/m3 (Monitoring results on the urban air quality, Tirana, 2007).

The thresholds for PM 10 (and NO2 as a typical indicator just for information) are shown in the table below (for example IG-L Austrian Law, EU-directive 1999/30/EG; WHO recommendations, 2006):

Tab. 3.6-1: Air pollution standards for human health

	Annual yearly average [µg/m3]			
Air pollutant	**Albanian standard**	**European standard**	**Austrian standard**	**WHO recommendation**
PM_{10}	70	40[1]	40	20
NO_2	60	40	30	/

1) It is going to be 20 µg/m3 (valid from 1.1.2010)

Comparing the EU standards and the Albanian standards with the present state the air quality exceeds standards for human health.

3.7 NOISE, VIBRATION AND FURTHER POLLUTANTS

3.7.1 Material references

- Field inspection in October and December 2008
- Traffic study Brenner Engineers
- Urban regulatory plan
- Geological map (Harta gjeologo inxhinierike)

3.7.2 Methodology of baseline and assessment

The methodology is based on the analysis of existing data (e.g. hydrological maps), site visit and expert interviews. The present situation is qualitatively assessed.

3.7.3 Descripiton and assessment of noise, vibration and other previous impacts in the project area

Noise

The calculated noise level are based on the assumption that emission equals to immission. This assumption has to be made, because the existing settlements are very close to the planned alignment of the TORR.

The noise level differentiates in the project area. Some areas have a high previous impact (for example along the expected intersection with the TORR and the Elbasan road in the east and the Kavaja road in the west).

The Kavaja road for example generated in 2008 a traffic volume of 29.000 motorvehicles/24 hours. The noise level for the emissions of this road therefore is

LmE(d) = 70.4 dB(A)

LmE(n) = 63.1 dB(A)

LmE (d): noise equivalent pegel daily

LmE (n): noise equivalent pegel night (22:00 – 6:00)

In this part of the project area the WHO standards on noise (45 dB(A) at night and 55 dB(A) per day are exceeded.

Following the Kavaja road for about the first 500 m south in the direction of the Zoo the noise level decreases. The following table shows the decrease. The noise level for the emissions of the road was calculated by the traffic volume nowadays in this corridor of the foreseen TORR. In this section it reaches 2500 motorvehicles per day. The noise emission for the year 2008 is therefore:

scenario 2008	motorvehicles/24 hours	maximum speed	down grade	LmE(d)	LmE(n)
	m-v/24h	km/h	%	dB(A)	dB(A)
	2500	50	12	63.0	55.7

Also in this area the standards for human health are exceeded.

Following the alignment of the TORR in the direction of Sauk, the area has no previous impact in terms of noise (because there is almost no traffic volume and no noise of industrial production)

A significant fall off in life quality due to a high previous noise impact just arises at the planned intersection with the Elbasan road. In this area the traffic volume in 2008 reaches 17.500 vehicules per day. Therefore standards for human health are exceeded.

Vibration

Existing vibration is not an important previous impact, because the traffic density is very low in the vicinity of the TORR. Therefore neither any discomfort for people nor any damages on houses are expected to occur at the present state.

Other previous impacts

An important existing impact affects the uncontrolled run-off of waste water with potential hazards for people. As already described in the chapter *ground water* within the busy time of constructing houses, people forgot to connect the waste water to the canalization system properly. Furthermore the leaching out of contaminants from construction debris pollutes the subsoil water and finally the lake. Therefore the fish caught by the anglers are supposed to be contaminated. At the same time the contamination of fish endangers precious wild life species like the otter that still exists in the project area. Also the quality of the river Lana is very polluted, because the stream serves as canal for untreated waste water.

3.8 GROUND CONDITIONS

The corresponding map is 04_8_ground_conditions.pdf.

3.8.1 Material references

- Site inspection (recreation, amenities, ecology) (October 2008)
- Tirana GIS (shapes: agriculture, brown fields)
- Harta Gjeologo - Inxhinierike

3.8.2 Methodology of baseline and assessment

Soil is the basis of life and a living environment for humans, animals, plants and microorganisms. It regulates the cycles of water and nutrients and can buffer and filter pollutants. Therefore it has a multitude of functions. Analysis and description of soil is based on the geological map, the existing data of Tirana GIS and site inspections. Four categories are described:

- paved ground
- anthropogenically shaped soil (in the region of landfills)
- agricultural soil
- close-to-nature-soil

The evaluation is made verbally argumentative.

3.8.3 Description and assessment of ground conditions in the project area

Description of ground conditions

Paved ground is ground in urban areas and under paved roads. Mainly it is found in the urban areas of Tirana and Sauk. Smaller areas of paved ground can be found in the entire project area as single houses and small roads.

Anthropogenically shaped soil means soil which is covered by landfills. This exists in the open space areas south of the lake and reach up to the road around the lake. The landfills consist mainly of construction waste. They cover the natural soil horizons and interfere with the soil's functions (reduced fertility, alterated living environment for fauna and flora, concentration of pollutants). Furthermore, the landfills constitute potentially polluted areas.

Agricultural soil can be found within the project area south of the lake, south of the road surrounding the lake. It is used exclusively as greenland, so that the natural array of soil horizons is preserved and the soil can fulfill its natural functions. In the "agricultural" shape-file from the Tirana geographical information system (GIS), these open spaces are marked as "cultivated area", which indicates their suitability as agricultural areas.

Natural soils can be found in the area of the park, and, precisely, in the less used areas, e.g. the park's eastern part. There is almost natural vegetation, which implies the existence of natural and intact soil horizons.

Assessment of ground conditions

Paved ground has completely lost its soil functions; this soil has no importance whatsoever for the ecological balance.

Anthropogenically shaped soil has a certain importance for the ecological balance, as it fulfills certain functions, however in a reduced way.

Agricultural soil has a special significance for the natural balance, as it is fertile and almost completely fulfills the functions mentioned above.

Close-to-nature-soil in the park's wooded areas is highly important for the natural balance.

3.9 SOCIO-ECONOMIC AND CULTURAL ISSUES

3.9.1 Material references

The main sources for this topic were site visits, the analysis of existing plans (e.g. Farka's regulatory plan) and interviews. Furthermore information from the GIS Tirana was used for the study. Also a main source of information was the data from the resettlement action plan. This plan was developed by the municipality of Tirana in order to fulfill the social requirements for the Tirana outer ring road.

Traffic counts are part of the traffic study. The main information was gathered from the resettlement action plan (municipality Tirana, January 13th 2009)

3.9.2 Methodology of baseline and assessment

The methodology for the baseline is based on structured field interviews (municipality of Tirana), the analysis of existing data and field work. The numbers of people that are directly affected were counted by means of a census (municipality of Tirana, January 2009). The affected houses and the properties were identified during the expropriation process. At the time these numbers were compared with the available GIS data and with our own field work to include the houses.

To have an idea of the population potentially affected not just by the loss of houses but also due to noise, the number of people in the vicinity (100 m) along the road was roughly estimated. The focus was on those buildings with more than 4 storeys. The Bernard Engineers assumed that 4 people were living in one apartment.

3.9.3 Description and assessment of socio-economic and cultural values in the project area

The following chapter describes the present situation within the corridor and dimensions of the Tirana outer ring road. The information given is based mainly on the resettlement action plan (municipality Tirana January 13th 2008)

3.9.3.1 Land ownership patterns and tenure arrangements

Within the project area an expropriation plan was developed under the authority of the municipality following the national requirements.

The properties are categorized in 5 cadastral zones. These are the cadastral zones 8240, 8260, 8270 (considered as urban territory) and the cadastral zones 3292 and 3266 (considered as rural territory).

It is noted that the cadastral zones 3292, 3266, classified as rural territory, lie within the yellow line of Tirana city and these areas are have buildings on them.

TORR Requirements

Tab. 3.9-1: Area for the TORR (Municipality of Tirana, January 13th 2009)

Cadastral Zone	Private Property	Public Property	Unidentified Property
	Surface (m^2)	Surface (m^2)	Surface (m^2)
824,082,608,270	53,424		1,100
3,292 (rural territory)	60,332		
3,266 (rural territory)	28,933	31.95	5,850

The data in the table above might to be updated again after the finalization of the road design.

As confirmed by the real estate registry office, the data on the cadastral areas 8240, 8260 and 8270 (urban land) was obtained from the parcel registry as these areas are not in the registry system. For cadastral zone 3266 (rural land) the data was obtained by property certificates because the area is registered.

Potentially affected estates

Tab. 3.9-2: Number of potentially affected estates

Cadastral Zone	Private Property (estates)	Public Property (estates)	Unidentified Property (estates)
824,082,608,270	124	19	5
3,292 (rural territory)	25	8	
3,266 (rural territory)	67	9	7,000

Property structure

As confirmed by the real estate registry office and by evaluating the area, of the 206 objects affected by the project, 78 are registered in the mortgage preliminary registry, 128 are not registered – lawsuits for construction without permits are pending.

Also in the cadastral area 3292, four structures of public property and 2 abandoned objects are being evaluated.

Tab. 3.9-3: Status of the potentially affected objects within the cadastral areas

Object	Cadastral Area	Cadastral Area	Cadastral Area
	8240,8260,8270 (urban)	**3292 (rural)**	**3266 (rural)**
Registered	77	1	
Without Property Ownership	90	13	36
Abandoned	2		
Public Objects	4		

Remarkably almost all owners of unregistered buildings have applied to legalize their property.

3.9.3.2 Types of structures, utilities and services

Number of structures

Until now, the municipality of Tirana has identified 206 objects to be potentially affected by the construction of the Tirana outer ring road. Of this number, 170 objects are under administrative jurisdiction of the municipality unit No. 5 and 36 objects are under administrative jurisdiction municipality unit No.2.

The majority of the structures to be potentially demolished (78.12%) are part of the common road section of component 1, starting from Kavaja Road to the zoo (length = 2.2 km); the remaining buildings (21.88%) are part common road section of component 2, from the zoo to the existing Elbasan Road (length = 3.0 km).

In both components, structures are mainly residential (77.61%), lived in by the owners.

Some others (approximately 12.69%) are commercial structures that are used by the owners for business. Some owners live far from their buildings. Only 9.7% of the structures are used for other services. Most of these commercial structures are registered with the exception of the kiosks.

Status of the structures

Of the structures mentioned above, only 20.9% are legal and registered at the mortgage office. The others are either illegal or not registered (77.61% of them do not know the status of their structures). From the total amount, 1.49% of the structures are in the process of being legalized.

The majority of them (74%), mainly residential buildings, have a fence or wall around the property. Usually the enclosure is made of wood, (bushes 7%) or a wire fence, (material 93%).

Material of the structures

The structures are mainly solid buildings (96%) with some kiosks (4%). The walls are mainly brick or stone. Mainly roofs are covered in roof tiles or concrete tiles. Floors are mainly concrete with majolica slabs. Wood is used only in 12% of the cases.

Age and value of the structures

The majority of the commercial structures are new, built within the last 5 to 10 years. The average value of the structures has been calculated as approximately US$ 350/m^2. Most residential structures have also been built in the last 10 years. Commercial structures are used mainly as shops, then workshops and three warehouses.

3.9.3.3 Business – Economic activities

The main businesses along the TORR are kiosks and retailers. On the census, some people declared being a farmer.

3.9.3.4 Residential areas

Existing homes and number of potentially affected families

From the starting point of the TORR at Kavaja Road to the botanical gardens there are residential buildings beside the planned route. The first section is a mixed use zone (residential and other). Besides ordinary houses, there are some huts used as a dwelling. These huts have been built within the corridor of the TORR.

The following section is characterized mainly by small homes (the area south of the TORR belongs to Farka). From km 2+300 to km 3+000 there are multi-storey apartment buildings. In the following section, to the junction with the Elabasan road, there are mainly villas (max. 2 storey houses) as individual units.

Housing Plans

The housing plans are based on the regulatory plan of Tirana (December 2008). Parts of the project area border on the municipality of Farka. There the regulatory plan does not coincide (in certain areas) with Tirana concerning the perception of future urban planning. During an interview with decision-makers of the municipality of Tirana (e.g. Mrs. Kushi, December 16th 2008), the arrangement was made that Tirana's concept is more likely to be put into practice than the one from Farka. Additionally the municipality of Tirana calculated the number of people living in the project area in the year 2020.

Bernard Engineers accept those numbers not only for predicting the potential impact on people, but also for the traffic model.

The first section is foreseen as a mixed zone. The major changes in the urban development concern an area northwest of the lake, next to the corridor of the TORR: The municipality plans to develop this area (next to the fun fair). It is considered as a scale development (mid to high density) with offices, trade and hotels. The total area encompasses 330,000 m^2.

The major differences regarding future urban development between Farka and the city of Tirana concern the area between km 3+400 to 4+100. The municipality of Tirana wants to preserve this open area as an environmental protection zone whereas Farka plans detached individual units for housing. In an interview with the municipality of Tirana (Mrs. Kushi, December16th 2008) this area is definitely foreseen for recreation and nature conservation. Additionally, the municipality plans to relocate the illegal settlements not only from the corridor of the TORR avoiding urban sprawl and fragmentation. The municipality of Tirana plans use the area from km 4+050 to km 4+300 for new low rise development. If corridors for important wildlife species are to be preserved for the future (see chapter fauna) –construction in this area should be reconsidered.

Number of inhabitants and demographic trends

In general the city of Tirana has grown very rapidly since 1989. Approximately 300,000 people used to live in Tirana and the estimated population now is 1,000,000. Therefore, solving the challenges of traffic is an important economic and social issue.

Potentially affected houses

Out of the total amount of 206 objects that could be demolished, 181 are classified as buildings. Only 78 buildings have been erected legally whereas the rest have been built illegally. Of the families living in those residential areas, 78 are potentially affected. Additionally, 120 Sinti and Roma living in improvised housing are affected.

Residents potentially affected by noise

To asses the number of people affected by noise, the demographic trends also have to be considered. The expected number of people in the year 2020 served as basis for the forecast of the potential impact of noise and air pollution.

The municipality of Tirana (Department of Urban Planning, Mrs. Kushi, December 16th) estimates the number of people in residential areas with 7 floor buildings at about 700 per hectare. In districts with villas (semi-detached or detached individual units; at most 3 storeys high and sometime an additional one) the population density is about to reach 400 people per hectare. The estimated average number of people per apartment is four.

In the future the highest population density is going to be in the area of km 2+200 – km 2+450. Already now it has reached its peak in some areas southwest of the lake (2+600 – 3+400). A couple of thousand people are going to live in the area along the planned TORR in the year 2020.

3.9.3.5 Social services and community cultures

The only remarkable social service close to the corridor of the TORR is a school. A sports center has been built inside the corridor. The loss of this area is unavoidable.

3.9.3.6 Travel patterns

The area can be reached by bus. Separated roads for cycling and pedestrians do not exist.

3.9.3.7 Direct social situation

Ethnic composition

The only ethnic groups to be considered are the Sinti and Roma. They have improvised housing along the planned route of the TORR.

Perception of the project

The response to the expropriation was positive. None of the people asked had a negative perception concerning the issue of the TORR.

Health status

Thirteen families have members who suffer health problems. Nine out of them have general health problems and 4 are disabled.

Nationality

All the people living in this area are Albanian although there are Roma who also belong to a linguistic minority living in Albania. Characteristically, these people move continuously within Tirana, but also within Albania, changing location and settlement, based on their seasonal work.

Vulnerability

A total of 22 potentially vulnerable persons were identified out of a total of 262 individuals surveyed. Their distribution is as follows:

- Physical handicap: 8
- Mental handicap: 0
- Chronic disease: 8
- Entire household unemployed or without regular income: 5
- Other: 1

Nature and extent of poverty

As mentioned above there are about 120 Roma who live in the area where the Tirana ring road will be built. They live in very poor conditions: no hygienic facilities, very poor economic situation and no access to drinking water.

Primary sources of income are salaries (66% of households) and pensions (18% of households). The vast majority of households has only one source of income, with only 30% declaring that they have a secondary source. Agricultural production is mentioned as a secondary source of income for only 9% of households, which confirms the relatively marginal place occupied by agriculture in the economics of the area. However, 82% of households self-produce part of their food needs.

Food is identified by the majority of households (86%) as their first source of expenditures. Seventy percent identify utilities as their second source of expenditures. Eighty-nine percent of households indicate that they experience occasional hardship.

Literacy and Languages spoken and written

The educational status of households interviewed is very diverse and varies from non-educated persons (such as Roma community) to very educated ones. Fourteen percent of the persons interviewed appear to be illiterate.

3.10 LAND ACQUISITION AND RESETTLEMENT

3.10.1 Material references

The main sources for this topic were site visits, the analysis of existing plans (e.g. Farka's regulatory plan) and interviews. Furthermore information from the GIS Tirana was used for the study. Also a main source of information was the data from the resettlement action plan. This plan was developed by the municipality of Tirana in order to fulfill the social requirements for the Tirana outer ring road.

Traffic counts are part of the traffic study. The main information was gathered from the resettlement action plan (municipality Tirana, January 13th 2009)

3.10.2 Methodology of baseline and assessment

The methodology for the baseline is based on structured field interviews (municipality of Tirana), the analysis of existing data and field work. The numbers of people that are directly affected were counted by means of a census (municipality of Tirana, January 2009). The affected houses and the properties were identified during the expropriation process. At the time these numbers were compared with the available GIS data and with our own field work to include the houses.

To have an idea of the population potentially affected not just by the loss of houses but also due to noise, the number of people in the vicinity (100 m) along the road was roughly estimated. The focus was on those buildings with more than 4 storeys. The Bernard Engineers assumed that 4 people were living in one apartment.

3.10.3 Description and assement of land acquisition and resettlement in the project area

3.10.3.1 Project area of the TORR

The municipality of Tirana has an entitlement matrix that describes the potential compensation modus (RAP municipality of Tirana 2008).

The municipality owns the area of the abandoned tractor factory where people can be resettled.

The municipality of Tirana offers financial compensation mainly for those whose rights have been infringed upon or whose properties will be affected. Except for the tractor factory the municipality of Tirana does not own other areas.

3.10.3.2 Host area for the relocation

Potential host areas were visited by Bernard Engineers and staff members of the municipality of Tirana on the 15th and 16th of December 2008.

Old textile factory

The municipality of Tirana proposed this site for housing. The area is about 2.5 hectares. It is approximately 5 km away from the city center.

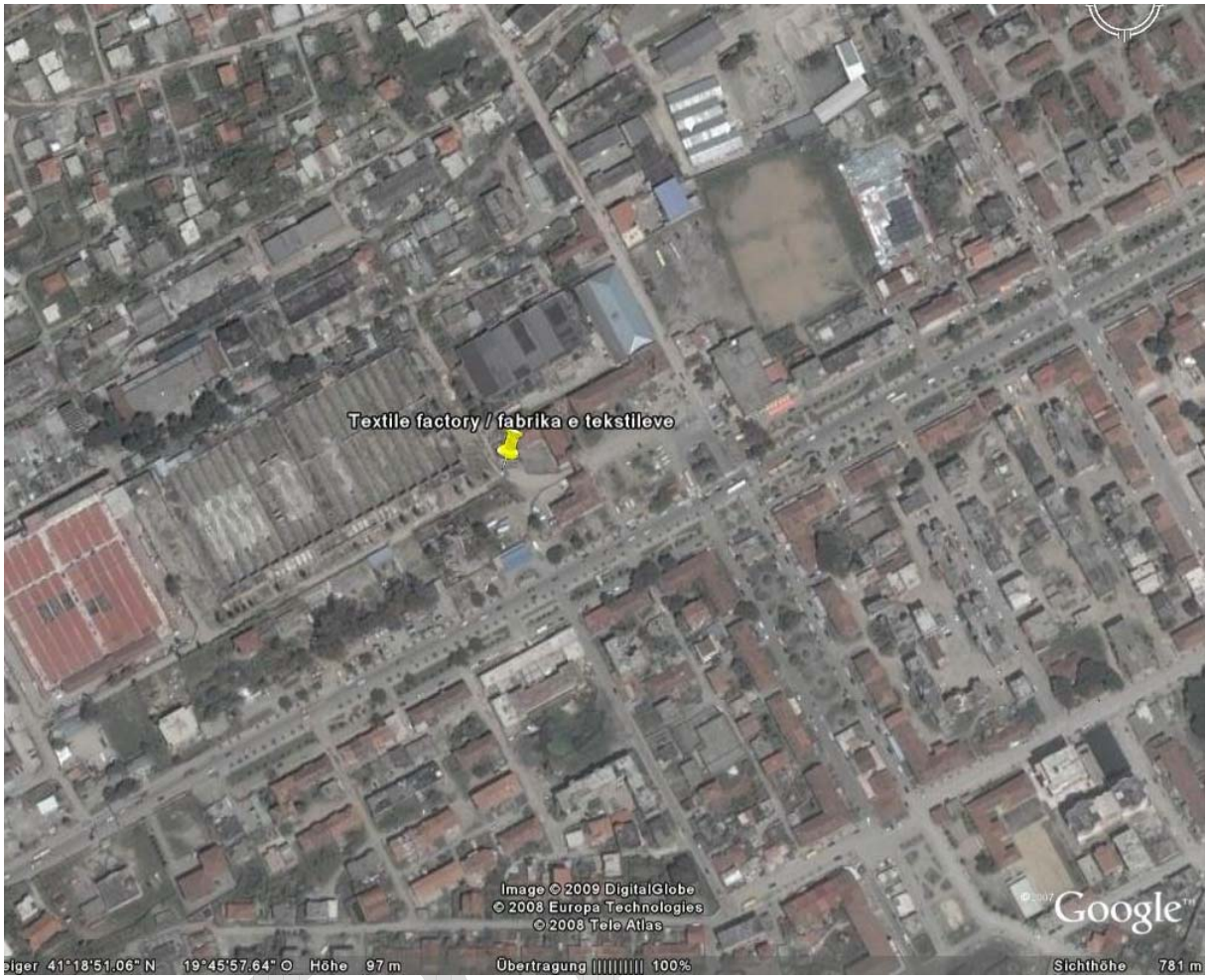


Figure 26: Overview of the old textile factory

Quality of life

The area is about 5 km west of the city center. It can be reached by means of public transport. Schools are in the vicinity of this site.

A landfill, known as a real challenge for the environmental policy of Albania is more than 1.5 km away and does not influence the quality of life in this area. Around this area some new houses have been built.

The area is approximately 2 hectares. It is part of an old industrial site. Old broken chimneys (right next to the area) have to be considered as a threat to people. It will take some time until the area can be used for settlement. The location is swampy and it is also not clear whether some parts are contaminated with sewage from processing textiles.

Figure 27: Figure of the area close to the old textile factory in Sharrah

Land ownership

The real estate belongs to the Ministry of Economics. At present it is unclear if the site can be used for development or not.

Planned new structure

At present it is not clear what the area would look like in the future. No urban planning has been made.

People

The people already living at that area would not be affected because their houses are too far away and the group of people to be relocated (Sinti and Roma affected by the TORR) is small. Negative effects are unlikely.

General suitability

Due to the time it will take to develop this site, it will not be possible to offer adequate housing rapidly.

Old tractor factory

The municipality of Tirana proposed this site for housing. The area has a size of about 20 hectares. It is about 4 km to the east of the city center.

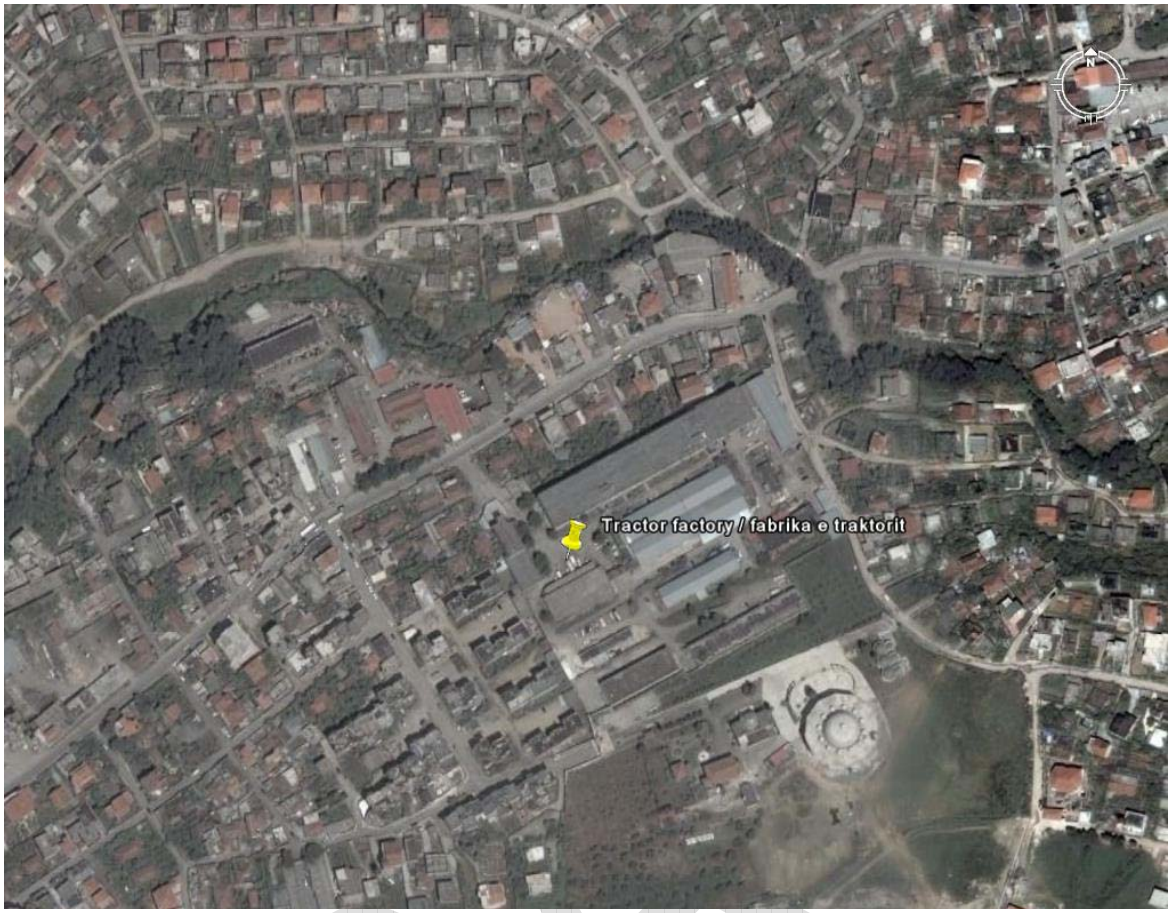


Figure 28: Overview of the old tractor factory

Quality of life

Two schools are in the vicinity (primary school, highschool). This urban area will fit into the existing urban infrastructure. The area is connected by public transport; a bus stop is within 5 minutes walking distance. The area is not affected by any kind of environmental damage.

Figure 29: Figure of the old tractor factory (preparation of construction)

Land ownership

The real estate belongs to the municipality of Tirana. The area is part of their social housing program.

Therefore the site is also very suitable.

Planned new structure

This area is meant to provide housing for more than 1,200 people. Approximately 393 apartments will be constructed at the site. A full urban development plan has been produced. Beside apartments, areas for small shops are part of the project. For example, 6-storey buildings are planned: 5 storeys are foreseen for living and 1 for shops. Therefore the area seems to be ideal also for providing an alternative livelihood for those affected by the TORR. At the time of our visit the area was already prepared for construction.

People

The people already living in that area would not be affected negatively by the settlement. Urban development is likely to stimulate the whole area positively (e.g. new shops etc.)

General suitability

The area is very suitable for the relocation of people and businesses.

3.11 CULTURAL HERITAGE

The corresponding map is 04_11_cultural_heritage.pdf.

3.11.1 Material references

- Tirana GIS, shapes „cultural“ and „religious“

3.11.2 Description and assessment of the cultural heritage in the project area

According to data from the Tirana geographical information system the following buildings and sites are situated in the project area:

"Religious" shape-file: two churches east of the existing ring road; one church north of the proposed alignment in the western part of the project area

"Cultural" shape-file: rather large area north of the canalized river

3.12 COMMUNITY SAFETY

In general very often the level of safety of pedestrians or cyclists is very low in Albania, particularly when crossing a road. In the project area the current situation is different (with the exception at Kavaja and Elbasan road), because the traffic density is very low. Therefore people are not in danger when crossing a road.

4 ASSESSMENT OF ENVIRONMENTAL AND SOCIAL IMPACTS

This chapter identifies significant impact factors and describes and evaluates the impact on envirionmental and social assets. The impact assesment is conducted in two steps. In the first step the potential impacts are described and evaluated. In the second step the potentially suited measures are described and assigned to the impact. In this stepwise process the remaining impact is identified and can be balanced with the other benefits but also costs of the project for the decision making process.

In the impact assesment air quality, noise and vibration are categorized as impact factors. Therefore the potentially affected assets can be reduced to the number described in chapter 5.1.3.

4.1 GENERAL METHODOLOGY

4.1.1 Scenarios

Except for the impact of noise and air pollutants on people, the current state is the baseline to assess the potential impacts. The operation phase is based on the traffic number in 2020.

The assesment on air quality considers, due to a lack of data on wind velocity, the “worst-case” scenario. This means that low wind velocities are considered in the model.

4.1.2 Methodology of assesment

The potential impacts are identified qualitatively and quantitatively. The impacts on affected assets consider given thresholds by official guideslines (e.g. on air quality) but also functional by the consultants own expertise. The impact assement identifies positive and negative effects.

Due to the differentiation between affected assets and impact factors like noise, vibrations are described separately.

4.1.3 Matrix to identify significant impact factors

The following matrix shows the potential impact factors, the affected asset and evaluates the significance of the impact factors.

From the potential stages of development:

- Accidents
- Decommissioning or closure
- Operation phase
- Construction phase

The first two mentioned are not relevant for the project. **Accidents** as a potential impact factors for human safety is not mentioned in the table, because the alignment considers signalized crossing and separate lanes for pedestrians and cyclists Also accidents with hazardous goods is also not considered to be of significance, because the area is not important in terms of water supply . This also counts in the phase where the house are demolished. First of all the houses will be demolished step wise and other people in the vicinity will be (if necessary) evacuated.

Also because the house are demolished step by step, the contribution to air quality is not significant.

The stage of development "**decommissioning or closure**" is not relevant for impact assesment on roads because the project idea is to build the road for more than 30 years. A decontamination ist therefore not foreseen.

Construction phase: This is the period for building the whole facility, among start of construction and commissioning. Furthermore this EIS distinguishes the impacts of construction phase into temporary (during the actual construction phase) and impacts caused by the facility permanently like sealing of soil and loss of habitat.

Operation phase: This is the whole life span of the facility. The EIS is going to assess the adverse impacts like air pollutants, emission of noise and vibration caused by operating the facility (traffic).

Cumulative effects are considered in the ESIA. The most important cumulative effects concern the traffic in 2020 and the new settlement to be build. The traffic study took the expected traffic into account generated by the new settlements and new traffic connections. These results influence the forecasted impacts on noise and air quality.

The table below shows those impacts that are significant in forecasting potential impacts.

Tab. 4.1-1: Impacts that are significant in forecasting potential impacts

				impact factors								
issues	assets	sub topic	indicator	resettlement	land demand (e.g. demolition of houses)	emission of noise	emission of air pollutants	barriers (e.g for migration of animals, cold air)	emissions of waste water	influence on groundwater flow	change of spatial structures	vibrations
environmental, economic and social issues	human being	human health, well being and safety	impacts of noise			x						
			impacts of air pollutants				x					
			impacts on vibrations									x
		economic impacts	business and economic activities (livelihoods)	x	x							
			loss of land (landownership)	x	x							
			loss (damage) of structures	x	x							x
		social impacts	social conflicts									
			residential area		x			x				
			loss of social services and infrastructures	x	x							
	landscape	landscape and visual resources, recreation	impacts on landscape and visual resources		x						x	
			impacts on recreation		x	x	x				x	
	ecology and biotic resources	fauna / flora	impacts on plants / habitats		x		x		x			
			impacts on habitats of animals		x	x	x	x	x			
			impacts on protected areas		x			x	x			
			impacts on migration corridors for animals					x				
	geology / ground conditions	geology / ground conditions	impacts on mining resources		x							
			impacts on soil		x		x					
			impacts potentially polluted areas		x							
	water	ground water	qualitative impact				x			x		
			quantitative impact		x				x	x		
		surface water	quantitative impact		x					x		
			qualitative impact		x				x	x		
	climatic conditions	micro climatic situation	impacts on the exchange of fresh and cold air									
	cultural heritage	religious monuments	impacts on churches		x							x
		other monuments	impacts on other monuments		x							x

4.2 DETAILED DESCRIPTION OF RELEVANT IMPACT FACTORS

The following describes in furher detail the relevant impact factors to be considered in the impact assessment.

These selected factors are described in further detail due to the given high importance of human health in an ESIA.

4.2.1 Noise

4.2.1.1 Environmental Impact without abatement and compensation measures

Operation phase

The different numbers in the following tables correspond with the traffic cells in the traffic study (Bernard Brenner engineers 2009). The scenario and the forecast for noise assume that emission equals to immission. This is a realistic scenario, because the houses have been built very close to the corridor of the TORR.

The forecast noise emission of the year 2011 (after building the TORR) from north to south of the Tirana Outer Ring Road (with the given design speed) will be:

	motorvehicles/24 hours	maximum speed	down grade	LmE(d)	LmE(n)
	m-v/24h	km/h	%	dB(A)	dB(A)
scenario 2011	31500	50	8	70.3	63.0
	15500	50	8	67.2	59.9
	18000	50	8	67.9	60.5
	19000	50	8	68.1	60.8
	16500	50	8	67.5	60.2
	14500	50	8	67.0	59.6
	8000	70	8	66.5	59.1
	8000	70	8	66.5	59.1
	7500	70	8	66.2	58.8
	8000	70	8	66.5	59.1
	8000	70	8	66.5	59.1
	5000	70	8	64.4	57.1

And the forcast noise emission of the year 2021 from north to south of the Tirana Outer Ring Road will be:

	motorvehicles/24 hours	maximum speed	down grade	LmE(d)	LmE(n)
	m-v/24h	km/h	%	dB(A)	dB(A)
scenario 2021	40500	50	8	71.4	64.0
	29500	50	8	70.0	62.7
	33500	50	8	70.6	63.2
	32500	50	8	70.5	63.1
	28500	50	8	69.9	62.5
	30000	50	8	70.1	62.7
	25000	70	8	71.4	64.1
	22500	70	8	71.0	63.6
	18000	70	8	70.0	62.6
	20000	70	8	70.5	63.1
	12500	70	8	68.4	61.0
	9500	70	8	67.2	59.9

If the design speed (as a possible mean to reduce the emission level) is changed to 40 km/h the noise level for 2021 will be reduced to:

	motorvehicles/24 hours	maximum speed	down grade	LmE(d)	LmE(n)
	m-v/24h	km/h	%	dB(A)	dB(A)
scenario 2021	40500	40	8	70.2	62.8
	29500	40	8	68.8	61.5
	33500	40	8	69.4	62.0
	32500	40	8	69.2	61.9
	28500	40	8	68.7	61.3
	30000	40	8	68.9	61.5
	25000	40	8	68.1	60.7
	22500	40	8	67.7	60.3
	18000	40	8	66.7	59.3
	20000	40	8	67.1	59.8
	12500	40	8	65.1	57.7
	9500	40	8	63.9	56.5

This figures shows, that even reducing the design speed the accepted noise level (due to WHO standards) is exceeded.

The difference (with the give speed design) between to the WHO threshold for human disturbance at night of 45 dB(A) is, without abatement and compensation measures:

	motorvehicles/24 hours	maximum speed	down grade	LmE(n)	Difference to 45 dB(A) nght
	m-v/24h	km/h	%	dB(A)	dB(A)
szenario 2021	40500	50	8	64.0	19.0
	29500	50	8	62.7	17.7
	33500	50	8	63.2	18.2
	32500	50	8	63.1	18.1
	28500	50	8	62.5	17.5
	30000	50	8	62.7	17.7
	25000	70	8	64.1	19.1
	22500	70	8	63.6	18.6
	18000	70	8	62.6	17.6
	20000	70	8	63.1	18.1
	12500	70	8	61.0	16.0
	9500	70	8	59.9	14.9

Taking the previous impact on noise into account (compare baseline description) from the total length of the TORR (5+250 km) a length of approximately 4.5 km along the road, the noise situation in 2021 will be worse (exceeding acceptable noise levels) comparing with the current baseline. This is in particular an important impact because the resting time a night might be interrupted.

Construction phase

In the construction phase single events with a high noise emission can occur. This concerns the deconstruction of houses and the vehicles for construction and deconstruction.

With an estimated amout of 250 trucks per day single noise events can interfere with the daily excepted noise levels.

4.2.1.2 Environmental Impact with abatement and compensation measures

Operation phase

In order to reduce noise levels to an acceptable level, the effects of noise barrier walls were integrated in the model.

A noise barrier wall (height = 3 meters) at both sides of the TORR will reduce the noise level (in the hight of 3 m) near the road to:

	motorvehicles/24 hours	maximum speed	down grade	LmE(d)	LmE(n)
	m-v/24h	km/h	%	dB(A)	dB(A)
szenario 2021 with barrier walls h = 3.00 m	40500	50	8	69.2	61.8
	29500	50	8	67.8	60.5
	33500	50	8	68.4	61.0
	32500	50	8	68.2	60.9
	28500	50	8	67.7	60.3
	30000	50	8	67.9	60.5
	25000	70	8	67.1	59.7
	22500	70	8	66.7	59.3
	18000	70	8	65.7	58.3
	20000	70	8	66.1	58.8
	12500	70	8	64.1	56.7
	9500	70	8	62.9	55.5

A noise barrier wall (height = 3 meters) at both sides of the TORR and a changed design speed of 40 km/h will reduce the noise level near the road to:

	motorvehicles/24 hours	maximum speed	down grade	LmE(d)	LmE(n)
	m-v/24h	km/h	%	dB(A)	dB(A)
szenario 2021 with barrier walls h = 3.00 m	40500	40	8	68.9	61.5
	29500	40	8	67.5	60.2
	33500	40	8	68.1	60.7
	32500	40	8	68.0	60.6
	28500	40	8	67.4	60.0
	30000	40	8	67.6	60.2
	25000	40	8	68.9	61.6
	22500	40	8	68.5	61.1
	18000	40	8	67.5	60.1
	20000	40	8	68.0	60.6
	12500	40	8	65.9	58.5
	9500	40	8	64.7	57.4

A noise barrier wall (height = 3 meters) at both sides of the TORR and a reduced design speed of 30 km/h will reduce the noise level near the road to:

	motorvehicles/24 hours	maximum speed	down grade	LmE(d)	LmE(n)
	m-v/24h	km/h	%	dB(A)	dB(A)
szenario 2021 with barrier walls h = 3.00 m	40500	30	8	67.8	60.5
	29500	30	8	66.4	59.1
	33500	30	8	67.0	59.6
	32500	30	8	66.9	59.5
	28500	30	8	66.3	58.9
	30000	30	8	66.5	59.2
	25000	30	8	65.7	58.4
	22500	30	8	65.3	57.9
	18000	30	8	64.3	56.9
	20000	30	8	64.8	57.8
	12500	30	8	62.7	55.4
	9500	30	8	61.5	54.2

The **noise barrier** walls will be reduce the noise level for abutting owners in rooms near the road that are not higher than 10 meters above the road. The difference between the noise level without barrier walls and with barrier walls are 2.5 dB(A) near the street. The costs for noise barrier walls nowadays rise up to 200 €/m². Therefore considering a total length of barrier walls on both sides of the TORR could be integrated in the project design on a length of 4 km. In total 24.000 m2 noise barrier walls are needed (both sides on a length of 4 km TORR, hight 3 m). The costs will amount to 4.8 Mio. €. But event thought integration noise barrier walls, there will be still some noise level above the recommended standards for human health on noise protection (in particular during night) left.

For the multistorey buildings on a length of about 1.3 km along the road, the use of noise barrier wall is not applicable. Therefore **sound proof** double-sided could reduce the expected noise level significantly. For the multy-storey buildings by the sea, a noise barrier wall will have no effects, because the multi-reflections of the soundwaves between the buildings at the right and the left side of the road can not be obviated by a barrier. For the people in the floors below the noise barrier wall, sound proof windows can reduce the noise level in the rooms. The maximum of the reduction is about 50 dB, with sound proof windows of the highest quality. The costs for sound proof windows for noise protection are about 1.000 €/window. For buildings that are higher than the noise barrier walls (3m), this windows should be attached. These windows can bring up the noise level down to the accepted level of 45 dB(A) at night in the most sensitive daily span of resident. Taking at least 500 appartements into consideration with at least 2 windows per appartement 1000 windows are needed as a highly effective mean to protect people. Therefore the cost would amout to up to 1 Mio. €.

The people who already have a high previous noise impact (for example along the Kavaja road and the Elbasan road) are not considered in the abatement measured, because the TORR does not significantly contribute to the already existing situation with exceeding acceptable noise levels.

Construction phase

Single high emission of noise during the deconstruction of houses can be reduced significantly by successive work flow. Another mean to reduce the noise level for works with high sound emissions is to limit the work on the day time from 8:00 a.m up to 8 p.m from Monday to Friday. Working on Saturday should be limited to unavoidable needs during the construction period. The Sunday should be left out for construction works.

After integration of these proposals in the construction concept no negative impact is expected to occur.

4.2.2 Vibration

This Chapter presents the results of the assessment of vibrations associated with the proposed Tirana Outer Ring Road (TORR). The assessment of the impact of vibration will be accomplished by estimating the site-specific vibration levels and comparing them with assessment criteria and guidelines. The assesment considers the impact on people and structures

4.2.2.1 Environmental Impact without abatement and compensation measures

Operation phase

Potential impacts during the operational phase are caused by the traffic. There are two ways in which highway traffic can induce vibration in nearby buildings:

- Ground-borne vibration
- Air-borne vibration

The ground-borne vibration caused by the dynamic impact forces of tires on the pavement surface can propagate and excite foundations of the nearby buildings. The typical dominant frequencies range between 8-20 Hz. The ground-borne vibration levels induced by traffic depend on some site specific factors such as the highway traffic flow, unevenness of pavement surface, transmission path between the source and receiver, vehicle speed, vehicle weight and building parameters. Since significant ground-borne vibrations are generated by irregularities in the road surface they are unlikely to be important when considering disturbance from new roads. An overall estimation of the ground-borne vibration associated with TORR is achievable with a rapid assessment method introduced by California Department of Transportation (Caltrans) (1996). The Figure 30 introduces the vibration impact assessment method by Caltrans.

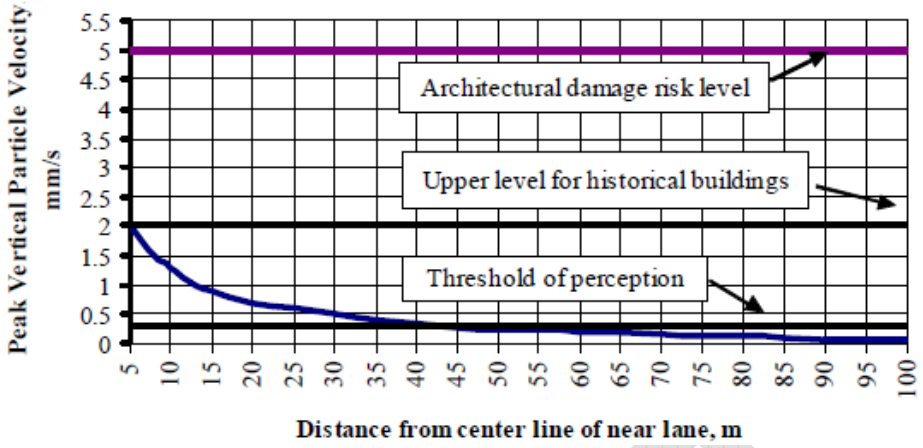


Figure 30: Estimation of impact of traffic induced ground-borne vibrations according to CALTRANS

The estimated vibration impact can be evaluated using next Table, which shows the effects of vibration on people and buildings according to the Guideline of UK Transport and Road Research Laboratory (TRRL) (1971). The results are also comparable with the evaluated vibration intensity according to ÖNORM S 9010 (1982).

Tab. 4.2-1: Evaluation of the effects of vibration on people and building according to TRRL (1971)

PPV [mm/s]	Human Reaction	Effect on Building
0-0,15	Imperceptible	Unlikely to cause damage of any type
0,15-0,3	Threshold of perception	Unlikely to cause damage of any type
2,0	Vibrations perceptible	Recommend upper level to which ruins and ancient monuments should be subjected
2,5	Continuous exposure to vibrations begins to annoy	Virtually no risk of architectural damage in houses with plastered walls and ceilings
5	Vibrations annoying to people in buildings	Would cause architectural and possibly minor structural damage.
10-15	Continuous vibrations unpleasant and unacceptable	

The estimated maximum peak velocity 5m from center line of near lane is **2 mm/s**. The structural damage threshold equals to **5 mm/s** and vibrations of this amplitude begin to annoy people in buildings. Based on the consideration of these criterions the ground-borne vibration impact induced by traffic is negligible.

Max. Velocity induced by ground-borne vibration 2 mm/s < 5 mm/s Structural damage threshold

The low frequency sound 50-200 Hz, produced by engines and exhaust systems, which can excite building components above ground is called air-borne vibration. When resonance is achieved, light flexible structure elements, such as windows panes, may start to rattle. There is no evidence that

exposure to airborne vibration can cause even minor structural damage to buildings. It can however be a source of annoyance to local people. Because of the interaction between noise and airborne vibration it can be predicted that the measures against the possible noise impact will also mitigate the annoyance associated with vibration.

But also without the integration of noise barrier walls it is unlikely that existing structures are damaged and peoples health is endangered due to vibrations

Construction Vibration

Effects on Buildings:

The most significant source of vibration during the construction phase of the proposed project will be from the piling operations. The excitation during piling is periodic signal over lang time. The amplitude of the vibration levels depends on the soil conditions, piler type, ram weight and ram velocity. A general prediction of the maximum vibration can be accomplished by using the diagram on Figure 31, according to Crabb, Hiller (2002), which shows the reduction of vibration relevant to the distance between piler and the receiver under average soil conditions.

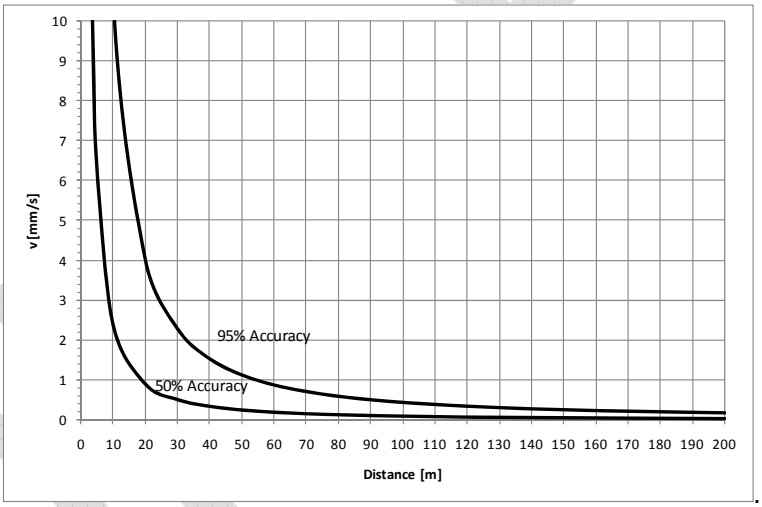
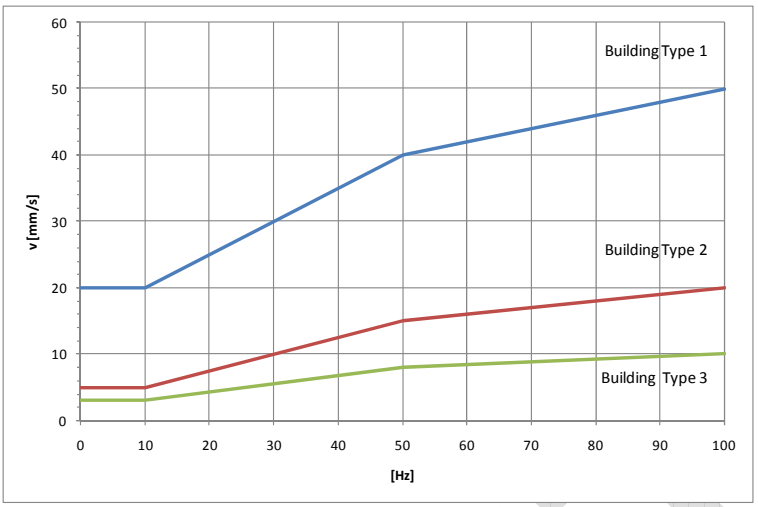


Figure 31: Peak vibration velocity induced by a piler during normal operation Crabb, Hiller (2002)

Die Figure 32 shows the maximum allowed vibration levels according to DIN 4150-3 (1999), which is used to estimate the effects of the vibration impacts on the buildings.



Building type 1: Commercial and industrial buildings, v_{min}=20 mm/s
Building type 2: Residential buildings, v_{min}=8 mm/s
Building type 3: Historical buildings and ruins, v_{min}=3 mm/s

Figure 32: Assessment criteria according to DIN 4150-3 (1999)

The ram velocity should be adapted and in case of exceeding the mentioned limit values the velocity of piling operation should be reduced. At the beginning of critical construction work a monitoring system (3D-Accelerometer) should be applied to sensitive structures, and the actual vibration velocity should be measured. The monitoring of the vibration levels on potentially sensitive structures would prevent the risk of architectural damage.

Another important vibration source is the vibration roller. According to Wieck (2003) the maximum peak velocity results to 8 mm/s at 2 m distance from a 10t vibration roller, Figure 33. Also here the measurement of the vibrations would guaranty the prevention of damage risk.

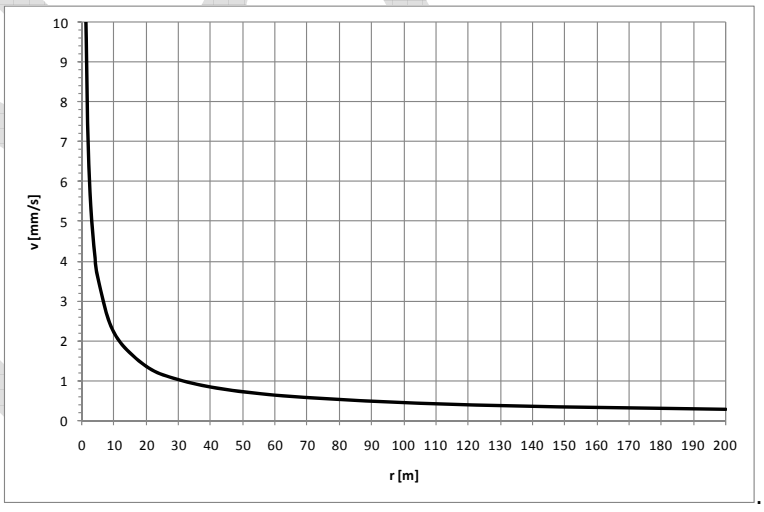


Figure 33: Peak vibration of a vibration roller, Wieck (2003)

Effects on Human:

The assessment of vibration induced by constructional operation contents also the estimation of vibration effect on the people in the buildings. The next table shows the human reaction on the vibration impact according to ÖNORM S 9010 (1982).

Tab. 4.2-2: Evaluation of the effects of vibration on people and building according to ÖNORM S 9010 (1982)

Evaluated Vibration Intensity K	Human Reaction
0-0,1	imperceptible
0,1-0,2	Threshold of perception
0,2-0,4	weak perceptible
0,4-0,8	perceptible
0,8-1,6	clearly perceptible
1,6-6,3	strongly perceptible
6,3-100	very strongly perceptible

Where:

$K=56.\pi.f.v$ for $1 \leq f \leq 2$ Hz v: Estimated vibration velocity, f: Frequency of the vibration

$K=67.\pi.(f)^{3/4}.v$ for $2 \leq f \leq 8$ Hz

$K=320.\pi.v$ for $8 \leq f \leq 80$ Hz

The evaluation of the vibration caused by piling operations is for different vibration frequencies shown on the Figure 34.

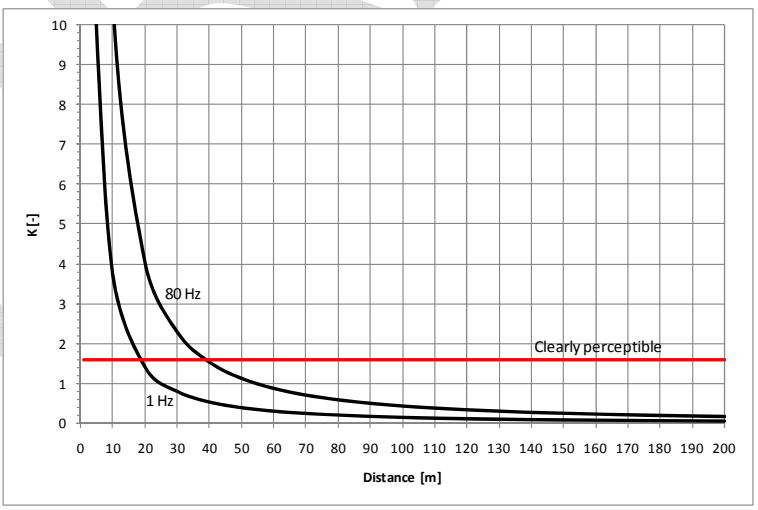


Figure 34: Evaluated vibration intensity of piling operations for the frequency range 1-80 Hz

Similarly the effects of the vibration roller are discussed on the next diagram. The effects on the human are obviously weaker than the piling operations.

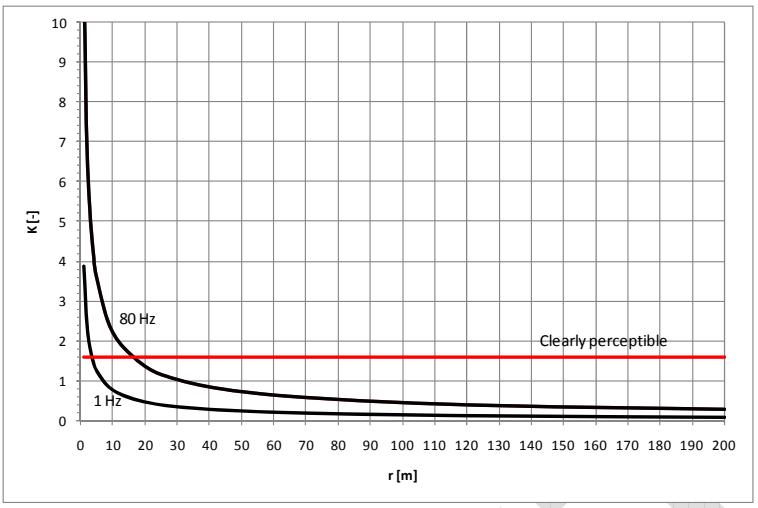


Figure 35: Evaluated vibration intensity of vibration roller for the frequency range 1-80 Hz

4.2.2.2 Environmental Impact with abatement and compensation measures

Operation phase

Further means to avoid impacts are necessary, because neither damages on existing structures nor a danger for human health is expected to occur.

Construction phase

To avoid the annoyance of people in the buildings and to prevent architectural (in the construction phase) damage risk some mitigation measures are necessary. These are:

- Regulation of the working hours and reduction of the ram velocity of the piler operation on the sensitive areas.
- Regulation of the working hours and reduction of the vibration velocity of the vibration roller on sensitive fields.

Integrating this measure in work flow during the construction no negative impact will remain

4.2.3 Air pollution

Assumptions for the operation phase

For assessing the impacts on air quality caused by the TORR the German software MLuS 02, 2005 is used. This software is based on the German “Handbuch für Emissionsfaktoren des Straßenverkehrs HBEFA. MLus 02, 2005 models the future emissions and immissions at points of interest of air pollutants based on following criteria:

- Measured data on air pollutants at nearby gauging stations for estimating the current state or initial level of air quality in the year 2007 (Data from the municipality of Tirana)

- Technical data on the alignment such as longidutinal gradient, number of lanes, the design speed and average daily traffic
- Wind velocity (in m/s)
- Distance from the alignment to the points of interest for estimating the imissions

MLuS 02, 20005, was developed for calculating emissions caused by traffic along streets with no or very little density of housing. In this case, MLuS 02, 2005 is applied under the assumption that emission is equal imission at the first row of houses in 10 m distance to the alignment and due to time and information constraints.

For doing the calculation on air pollutants the alignment is divided into two subsections. Section 1 starts at Road Kavaja and ends at intersection 6. Section 2 starts at intersection 6 and ends at Road Elbasan. A significant change in the longidutinal gradient, in the structure of the adjacent land and the location of two representative gauging stations are the reasons for dividing the alignment into these two sections.

Section 1 – Road Kavaja to intersection 6

Measured data from Gauging station 4, located at the Crossing 21 – Dhjetori, were taken to determine the initial level of pollution for the first section of the alignment. Due to a lack of data on NO2 percentile values no assessment of future pollution through the TORR can be carried out. The measured average yearly PM10 value for this gauging station is 354 µg/m3 (Monitoring results on the urban air quality, Tirana, 2007). MLuS 02, 2005, allows a maximum value of 200 µg/m3. Hence, the calculation for section 1 are based on this value of 200 µg/m3 and not the measured value of 354 µg/m3.

The average longidutinal gradient for section 1 is 1.135 degree.

Section 1 contains 4 lanes. The design speed is 50 km/h.

The average daily traffic of section 1 is estimated with 31600 vehicles/24 hours. 10 % of this traffic is estimated as heavy traffic.

Due to a lack of information on average wind situation in the project area, a value of 0.5 m/s were estimated for running the calculations. This value stands for a quite stable weather and climate situation almost no wind and will lead to an underestimation of potential dissemination or air pollutants (Häckel, 2005) In fact, the real situation will show a higher average wind velocity.

Section 1 is mostly situated in urban area. Therefore emissions caused by the TORR can be seen as immissions at the first row of houses close to the TORR. For running the calculations an average value of 10 m for the distance between alignment and point of immission are chosen.

Section 2 –Intersection 6 to Road Elbasan

Measured data from Gauging station 5, located at the Directory of Hygiene and Epidemiology, were taken to determine the initial level of pollution for the second section of the alignment. Due to a lack of

data on NO2 percentile values no assessment of future pollution through the TORR can be carried out. The measured average yearly PM10 value for this gauging station is 96 µg/m3 (Monitoring results on the urban air quality, Tirana, 2007).

The average longidutinal gradient for section 2 is 4.3167 degree.

Section 2 contains 4 lanes. The design speed is 70 km/h.

The average daily traffic of section 1 is estimated with 18600 vehicles/24 hours. 10 % of this traffic were estimated as heavy traffic.

Due to a lack of information on average wind situation in the project area, a value of 0.5 m/s were estimated for running the calculations. This value stands for a quite stable weather and climate situation almost no wind and will lead to an underestimation of potential dissemination or air pollutants (Häckel, 2005) In fact, the real situation will show a higher average wind velocity. Even higher than in section 1, because section two lies mainly in unsettled area, apart from the segment in Sauk. Therefore emissions caused by the TORR can be seen as immissions at the first row of houses close to the TORR in Sauk. For running the calculations an average value of 10 m for the distance between alignment and point of immission are chosen.

4.2.3.1 Environmental Impact without abatement and compensation measures

Operation phase

Section 1 – Road Kavaja to intersection 6 – PM 10 emissons [t/y] and immissions [µg/m3]

Section 1 has a length of about 3889.59 m. For this length an emission of PM 10 was calculated with 241.66 g/h. Transformed into tons per year the value is 2.12. Hence, section 1 of the TORR causes an emission of 2.12 tons per year of PM 10 particels.

In a distance of 10 m of the alignment an additional yearly load of 11.527 µg/m3 of PM 10 is calculated for section 1. To put the values in some relation, such a result would exceed the Austrian and German maximum 24 hours mean value of 50 µg/m3 more than 165 times a year. At the moment in Austria and Germany such an exceeding of the value is allowed only 35 times a year, compared to more than 165 times if using the values of Section 1 of the TORR. This high pollution is due to the very high intial level of PM 10 pollution at the gauging station close to the project area.

Section 2 –Intersection 6 to Road Elbasan– PM 10 emissons [t/y] and immissions [µg/m3]

Section 2 has a length of about 1359.217 m. For this length an emission of PM 10 was calculated with 51.06 g/h. Transformed into tons per year the value is 0.47. Hence, section 2 of the TORR causes an emission of 0.47 tons per year of PM 10 particels. Adding the emissions of Section 1 and 2 the TORR causes an emission of 2.59 tons of PM 10 per year.

In a distance of 10 m of the alignment (in the area of Sauk) an additional yearly load of 6.969 µg/m3 of PM 10 is calculated for section 2. To put the values in some relation, such a result would exceed the Austrian and German maximum 24 hours mean value of 50 µg/m3 more than 165 times a year. At the

moment in Austria and Germany such an exceeding of the value is allowed only 35 times a year, compared to more than 165 times if using the values of Section 2 of the TORR. This high pollution is due to the very high intial level of PM 10 pollution at the gauging station close to the project area.

Construction phase

During the construction phase dust during the process of deconstructing houses and transporting materials to build the TORR high levels of dust emission can not be excluded.

4.2.3.2 Environmental Impact with abatement and compensation measures

Operation phase

The level of air pollution is overall in Tirana very high and does already exceed European standard on human health. The TORR might contribute in some parts of the project area to a higher level of air pollution where at the same time the TORR improves the traffic flow and combustion gases are reduced (less traffic jam). Therefore potentially negative impacts in the project area have to be balanced with the positive impacts along the houses at the existing road network.

Taking the already existing very high air pollution into consideration does not contribute to a significant deterioration of air quality in the project area.

Therefore the main task to reduce the high levels of air pollution also in the project area is to develop an air pollution strategy for the whole city. Therefore additional measures are neither necessary nor effective.

Construction phase

The spread out of dust can be first of all limited by covering the raw materials with a sheet. Secondly the streets have to be washed with water after a construction day.

Materials that can be blown off should be stored at place against the wind direction and outside of densely populated areas.

Furthermore house should be deconstructed successively in order to prevent the generation of high dust levels at once. Structures should be also demolished in periods with rain.

After integration these recommendations in the work flow for the construction phase no negative impact will remain.

5 ENVIRONMENTAL AND SOCIAL ACTION PLAN (ESAP)

In the following table the impacts and the measures are described. Furthermore the costs are assessed as well as the responisibility during the implementation.

Impact	Impact description	Mitigation and compensation measures	Responsibility	Cost	Monitoring measures
Noise	Operation phase The TORR will significantly increase noise levels in those parts of the project where there is little traffic now. The WHO noise standards are expected to be exceeded (45 dB(A) at night) Construction phase Discontinous intensive noise emission due to road construction works and demolition of houses	Operation phase Noise barriers have been considered but found to be an inadequate option because the noise modeling shows that they would not be effective given the height of the multi-storey buildings and they would not fit in the concept of the TORR as an urban boulevard integrated in its environment rather than as an express motorway Sound proof double sided windows in the area with multistorey buildings can reduce the expected noise down to the accepted night time noise level (per WHO standards) Construction phase Prohibition of night time work unless exceptional circumstances warrant	Operation phase Municipality of Tirana Construction phase Municipality of Tirana	Operation phase Sound proof windows (500 apartments with each 2 windows would approximately cost EUR 1M)	Construction phase External environmental monitoring and works supervision including periodic noise measurements

Impact	Impact description	Mitigation and compensation measures	Responsibility	Cost	Monitoring measures
Air emissions	Operation phase Current levels of particles (PM10) are about 10 times above Albanian and European standards. It is expected that the TORR will not aggravate this situation, and would in fact have an overall positive impact on air quality by reducing traffic congestion Construction phase High levels of dust pollution can occur.	Operation phase Develop a general air pollution plan for the city of Tirana (independently of the TORR) Construction phase Truck loads will be covered to prevent dust emissions. Watering of active tracks. Demolition of houses during rainy periods. Phased deconstruction of houses.	Operation phase Municipality of Tirana Construction phase Municipality of Tirana	-	Construction phase External environmental monitoring and works supervision
Vibrations	Operation phase No significant impact either on houses or on human health Construction phase Potential impact on houses and well being of people	Construction phase Prohibition of night time work unless exceptional circumstances warrant. In sensitive areas baseline of the condition of existing buildings	Construction phase Municipality of Tirana		Construction phase External environmental monitoring and works supervision

Impact	Impact description	Mitigation and compensation measures	Responsibility	Cost	Monitoring measures
Social and economic impacts – Businesses and economic activities	Operation phase No negative impact; likely to cause positive impacts (more traffic, more customers) Construction phase Positive impacts concern JOBS for construction workers. Negative impacts concern the loss of business due to the land take of the TORR	Construction phase Financial compensation for loss of houses OR relocation of businesses in the resettlement sites (e.g Usina tractor)	Construction phase Municipality of Tirana	Construction phase Cost is estimated and described in the Resettlement Action Plan	Construction phase External resettlement monitoring
Loss of land	Operation phase Positive impacts are likely to occur, because the connection of the area with the road network will be improved Construction phase Loss of land	Construction phase Financial compensation or resettlement	Construction phase Municipality ofTirana	Construction phase see RAP	Construction phase External resettlement monitoring

Impact	Impact description	Mitigation and compensation measures	Responsibility	Cost	Monitoring measures
Loss /damage of structure	Operation phase No impact Construction phase Loss of houses and structures Loss of shelter for vulnerable people	Construction phase Financial compensation or resettlement. Specific assistance for vulnerable people.	Construction phase Municipality of Tirana	Construction phase see RAP	Construction phase External resettlement monitoring
Barrier effect	Operation phase Potential barriers to pedestrians and cyclists and danger of accidents due to uncontrolled crossing of the TORR	Operation phase Single roads for pedestrians and cyclers. Installation of traffic lights along the road to ensure save crossings	Municipality of Tirana	Costs are included in the project design	Yearly safety records
Loss of social services and infrastructures	Construction phase Loss of a sports field close to a school	Construction phase Compensation if possible in the form of a replacement sport field or otherwise	Construction phase Municipality of Tirana	Construction phase see RAP	Construction phase External monitoring

Impact	Impact description	Mitigation and compensation measures	Responsibility	Cost	Monitoring measures
Landscape	**Impacts on landscape and visual resources:** Construction phase: no impacts Operation phase: loss of open area; fragmentation oft he landscape; loss of vegetation structures; disruption of range views	Construction phase Protection of vegetation structures like hedges between the construction phase Operation phase Restoration of the small rivers to natural condition (e.g. abolishment of the landfills) Landscape beautification along the new road (planting of trees) Configuration of landscape to optimize habitats	Construction phase Municipality of Tirana	Construction phase Clean up of landfills 20.000 € (20 € per m^3) Configuration of landscape: 20.000 € (planning costs, physical rehabilitation of up to 5 ha) Landscape beautification 32.000 € (40 € per tree: 800 trees)	Construction phase Ecological monitoring in the construction phase
Recreation areas	Construction phase: noise; visual disturbance Operation phase: loss of recreation area; noise; visual disturbance / barriers	Construction phase Connecting pathways and bicycle routes in the Park with new sections around the lake; connection between the Park and the new settlement in the south of the lake Park rehabilitation proposals of the Park concept on the two topics of land and water surface and rehabilitation of pathways in the Park should be also considered.	Construction phase Municipality of Tirana	Construction phase 40.000 € (5 € per m2 / 3 km x 2,5 m)	Construction phase External monitoring

Impact	Impact description	Mitigation and compensation measures	Responsibility	Cost	Monitoring measures
Fauna and Flora – Habitats	Construction phase: loss of habitats for animals and plants; pollution of animal habitats; noise (birds, bats) Operation phase: loss of habitats for animals and plants; pollution of animal habitats; noise (birds, bats)	Construction phase Protection of vegetation structures like hedges between the construction phase Storm water tanks to manage the discharge of waste water and to improve the whole ecological system (e.g. riverine forests) Configuration of landscape to optimize habitats (see measures above) Revaluation of natural elements (e.g. restoring small wetlands and streams) / ecological park management should be also considered	Construction phase Municipality of Tirana	Construction phase Costs for water treat-ment: included in project design	
Fauna migration corridors	Construction phase: no impact Operation phase: fragmentation of animal habitat and barrierers (for example for otter and turtles)	Construction phase Bridges in corridors for wildlife at three location (see description of baseline) and guiding systems to safeguard migration routes Intersections apart from corridors (already part of the project design)	Construction phase Municipality of Tirana	Construction phase Included in project design	
Impacts on mining resources	No impacts				

Impact	Impact description	Mitigation and compensation measures	Responsibility	Cost	Monitoring measures
Impacts on soil	Construction phase: Erosion Operation phase: Soil contamination due to infiltration of run-off water	Construction phase Storm water tanks to manage the discharge of waste water and therefore prevent a further spread of pollutants	Construction phase Municipality of Tirana	Construction phase: Included in project design	
Potentially polluted areas	Construction phase: exposing of contaminated sites Operation phase: no impact	Construction phase Proper disposal of polluted material, if any Clean up of the landfills which are potentially polluted	Construction phase Municipality of Tirana	0	
Groundwater quality	Construction phase: Spills on the ground and infiltration of contaminants to ground water table Operation phase: Spills on the ground and infiltration of contaminants to ground water table Infiltration of contaminated runoff	Construction phase Proper disposal of polluted material, if any Clean up of landfills which are potentially polluted Storm water tanks to manage the discharge of waste water and to improve the whole ecological system	Construction phase Municipality of Tirana	Construction phase: Included in Project design Clean up of landfills: see item above	
Groundwater availability and quantity	No negative impact: loss of natural infiltration areas contributing to aquifer recharge is not significant as the water remains in the watershed				

Impact	Impact description	Mitigation and compensation measures	Responsibility	Cost	Monitoring measures
Surface water quality	Construction phase: crossing of streams; pollution Operation phase: crossing of streams; pollution	Construction phase Storm water tanks to manage the discharge of waste water and to improve the whole ecological system (e.g. riverine forests), therefore the pollution of subsoil water can be prevented		Construction phase Costs are integrated in the project design of the road	Construction phase Control of water quality in the lake Total suspended solids, total hydrocarbons, visual (macrophytes) quarterly
Surface water availability and quantity	No impacts				
Cultural heritage	**Impacts on churches and other monuments:** no impacts (there are no monuments near by the alignment **Chance finds** Construtrion phase Chance finds when carrying out earth moving works	Construction phase Notification and assessment procedure for chance finds	Construction Contractor Ministry of Culture	0	Construction phase Works supervisor and Municipality to monitor

6 PUBLIC CONSULTATION AND DISCLOSURE PLAN (PCDP)

6.1 INTRODUCTION

The Tirana Outer Ring Road is being developed by the Municipality of Tirana to provide a by pass route between the North and the South accesses to Tirana. The Municipality of Tirana is seeking EBRD's involvement in the Project. In addition to Albanian regulations, the Project is therefore complying with requirements contained in EBRD's 2003 Environmental Policy. The Project was categorised as "A", requiring a full Environmental Impact Assessment (EIA) and associated public consultation and disclosure. This Public Consultation and Disclosure Plan was prepared as part of the EIA process to describe consultation and disclosure activities to be implemented as part as the EIA process and further during the construction and operation phases of the Project. In addition to the EIA, a Resettlement Action Plan (RAP) has also been prepared by the Municipality of Tirana. Consultation and disclosure activities associated with this RAP are also addressed in this PCDP.

6.2 IDENTIFICATION OF POTENTIAL STAKEHOLDERS

Potential stakeholders in the Project are identified as the following:

1. Physically or economically displaced people:
   - People who are physically displaced by the Project (having to move because of the Project because they permanently reside in land required for the Project),
   - People who are physically displaced by the Project (people who may be affected by land acquisition but are not physically displaced, for example landowners who do not reside on the plot of land to be acquired for the Project),
2. People affected by environmental or social impacts other than land acquisition:
   - People living in the Project area, potentially impacted by the Project's environmental and social impacts (for instance by noise) but not physically or economically displaced by the Project,
3. People and organisations interested in the Project:
   - People not living in the Project area and not directly affected or impacted by the Project's environmental and social impacts but who are interested by public transportation, environmental or social issues in Tirana,
   - Policy makers and officials handling transportation, environmental and social issues in the central Government and in the Municipality of Tirana,

- Civil society organisations, including political parties, unions, business associations, non governmental organisations, interested in transportation, environmental and social issues in Tirana, nationally and internationally,
- Lenders, including the EBRD,

4. Organisations participating in the Project construction and their workers:
   - Businesses tendering or contracted for Project construction (local or international contractors and consultants and their sub-contractors),
   - Workers involved through contractors in the Project construction.

6.3 PUBLIC CONSULTATION PLAN

The EIA documentation will be disclosed to the public for 120 days starting end February 2009 (e.g. until end June 2009). The Resettlement Action Plan, specifically addressing mitigations associated with physical and economic displacement, will be disclosed to the public starting end March 2009.

The following table shows anticipated public consultation activities for the different groups of stakeholders identified in section 2.

Group of stakeholder	Public consultation activity	Timeline
1. Physically or economically displaced people	a. Public hearings (one in Tirana, one in Sauk) b. Individual interviews on resettlement and compensation c. Grievance mechanism	Early May 09 April to December 09 Whole Project life
2. People affected by environmental or social impacts other than land acquisition	a. Public hearings (one in Tirana, one in Sauk) b. Open house (one in Tirana, one in Sauk) c. Grievance mechanism	Early May 09 Early May 09 Whole Project life
3. People and organisations interested in the Project	a. Public hearings (one in Tirana, one in Sauk) b. Open house (one in Tirana, one in Sauk) c. Grievance mechanism	Early May 09 Early May 09 Whole Project life
4. Organisations participating in the Project construction and their workers	a. Information session for prospective bidders b. Grievance mechanism for workers	June 09 Whole construction period

The public hearings (one in Tirana, the other one in Sauk) will include:

- A brief presentation on the project in general (justification, technical design - about 20 minutes),
- A summary of the key findings of the EIA (baseline, impacts, mitigations, action plan - about 20 minutes),

- A summary of the key findings of the RAP (baseline, impacts, mitigations, action plan - about 20 minutes),
- A questions and answers session where all questions from the public will be responded to or noted for further response.

The public hearings will be advertised several times in the local press at least 5 days in advance. Detailed minutes will be recorded.

In the “open house”, documents and experts are made available to the public for a given period of time (for example half a day) in a given location. Documents should include the EIA and RAP (their summaries in Albanian) and maps and drawings of the Project. Experts are engineers and technicians from the Municipality available to answer the public’s questions. The open house will be advertised several times in the local press at least 5 days in advance. Participants should be registered and their questions recorded.

6.4 DISCLOSURE PLAN

According to EBRD’s requirements, the Environmental Impact Assessment is to be disclosed for a period of 120 days. To be able to seek meaningful feedback from Albanian stakeholders, the EIA, a document that non specialists might find lengthy and complex, shall be summarised in a Non Technical Summary which will be fully available in Albanian. The RAP should also include an executive summary in Albanian.

In practice, the disclosure of the EIA documentation shall be organised as follows:

- In Albania:
  - The Municipality will make the Non Technical Summary available to the public at its offices in the Town Hall during normal working hours,
  - A reasonable number of copies shall be provided as well as reasonable reading space,
  - The Municipality will disclose the Non Technical Summary in Albanian and in English on its website (www.tirana.gov.al),
  - The Non Technical Summary will also be made available to the public at the EBRD’s Resident Office (Abdi Toptani Street, Torre Drin, 4th floor),
- Internationally:
  - The Non Technical Summary will be made available to the public via the EBRD’s website (www.ebrd.com), the whole EIA will be made available in paper form at the Business Information Centre at the EBRD’s headquarters in London (one copy),

6.5 GRIEVANCE MECHANISM

In addition to the existing Municipality's web based grievance and question mechanism (www.tirana.gov.al) , the following provisions shall be made:

- An officer shall be designated to handle grievances,
- Information shall be passed to Municipality's receptionists and security officers so that stake-holders willing to lodge a grievance be directed to the adequate office,
- Any grievance shall be registered and acknowledged receipt of within 5 five working days,
- Any grievance shall be responded to in writing within 22 working days.

6.6 CONTACT PERSONS

Project Implementation Unit for Tirana Roads Development Project

Scanderbej Square, Pallati i Kultures Kati 2, Tirana

In attention to Mr. Mihail Cico Project Director

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Department of Transport and Mobility in the Municipality of Tirana

Bulevardi Deshmoret e Kombit No.1 Kati 3.

In attention to Mr. Entoni Punavija, Director of Department.

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