Energji Ashta

A Project Company of VERBUND and EVN

ASHTA HYDROPOWER PLANT PROJECT

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

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Acronyms

AEF	Agency of Environment and Forests
AGS	Albanian Geological Survey
ANCTP	Albanian National Council of Territory Planning
APC	Albanian Power Corporation.
ASA	Academy of Sciences of Albania
BOD	Biochemical Oxygen Demand
COD	Chemical Oxygen Demand
COB	Commune of Bushat
CC	Construction Company
DC	Design Company
CDD	Committee of Dikes and Dams
CTP	Council of Territory Planning
DCM	Decision of Council of Ministers
DFS	Directorate of Forest Service
DPH	Department of Public Health
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
ERE	Energy Regulatory Entity
EU	European Union
FYROM	Former Yugoslav Republic of Macedonia
GWh/y	Gigawatt hour/year
Ha	Hectare
Hidmet	Hydro meteorological Institute
HMWB	Heavily Modified Water Bodies
HMI	Hydro meteorological Institute
HMWB	Heavily Modified Water Bodies
HPP	Hydro Power Plant
IHA	International Hydropower Association
IEA	International Energy Association
IUCN	International Union for Conservation of Nature
LEAP	Local Environmental Action Plan
METE	Ministry of Economy, Trade and Energy
MH	Ministry of Health
MAF	Ministry of Agriculture and Food
MoEFWA	Ministry of Environment, Forests and Water Administration
MTTP	Ministry of Tourism and Territory Planning
MW	Megawatt
NAoNR	National Agency of Natural Resources
NAP	National Academy Press
NCTP	National Council of Territory Planning
NEA	National Energy Agency
NEAP	National Environmental Action Plan
NEPD	National Energy Policy Document
NGO	Non Governmental organization
NSE	National strategy for Energy
PHI	Public Health Institute
Ql	Quintal (100 kg)
REA	Regional Environmental Agency
REAP	Regional Environmental Action Plan
REC	Regional Environmental Center
SEA	Strategic Environmental Assessment
SN	Sewerage network
SoE	State of Environment
SoER	State of Environment Report
SS	Suspended Solids
TPP	Thermo Power Plant
TSS	Total suspended solids
TWh	Terawatt hour
UN	United Nations
UNECE	United Nations Economic Commission for Europe

VOC	Volatile Organic composition
VNMOC	Volatile non-methane organic composition
WB	World Bank
WCD	World Commission on Dams
WHO	World Health Organization

1 Introduction

1.1 Executive summary

1.1.1 Introduction

Albania is rich in hydro energetic resources, but only about 35% of this potential has been used so far. The total hydro-power reserves which have not yet been used, are estimated at 3000 MW. The National Strategy for Energy (METE, 2002) specifies that one of the main directions regarding the energy production in Albania shall be: "to encourage exploitation of renewable resources, in view of providing a most effi-cient use of the national resources on the one hand, and the protection of the envi-ronment on the other." Studies prepared by Albanian and foreign specialized institu-tions and companies have identified a number of potential new hydro power plants (HPP) which could utilize the water resources of Drini, Vjosa and Devolli rivers. Other resources for power production are the mountainous torrents, whose hydro-energetic reserves are estimated at 100 – 120 MW.

The Ashta HPP, with a capacity of 48 MW, is intended to increase the power produc-tion in Albania from renewable resources, and to use, at higher effectiveness, the water regime of the Drini River cascade. The Ashta HPP will be the sixth successive HPP on the Drini River. Four of which (Fierza, Komani, Vau Dejes and Ashta), are in Albania and the remaining two are in FYROM.

The EIA report was prepared to evaluate the Ashta HPP project from the biophysical and socioeconomic environmental viewpoint. This report aims to determine the pos-sible effects that the Ashta project may bring about, to the biophysical and social en-vironment of the project area, as well as its compliance with the national and interna-tional environmental protection policies.

Among others, this report has considered:

- compliance with the international conventions and standards;
- harmonization of the project with the country's development and environmental pro-tection policies;
- identification of the protection status for the areas to which the project will be ex-tended;
- identification of the main impacts and the proposals for mitigation measures; and
- identification of the central and local decision-making bodies, with regard to the re-sponsible legal decisions that will be taken relating the progress of the project.

The preparation of the EIA report on construction and operation of Ashta HPP is based on the Albanian environmental legislation, International Conventions endorsed by Albania, the EU Water Framework Directive, related WB Guidelines, as well as guidelines by the International Hydropower Association and the World Commission on Dams.

In compliance with Law no.8990, "On Environmental Impact Assessment", dated on 23 January 2003, and its pertinent sub-legal acts, the Ashta HPP project requires a detailed EIA study and process.

1.1.2 Environmental baseline

Physical Environment

Project location

The Hydropower Plants Ashta 1 and Ashta 2 shall be built on the Drini riverbed, in the territory of the Commune of Bushat (COB), while the Spathari reservoir is located in the territory of Vau Dejes municipality. The project axis: Spathari weir – Ashta village is located North of the villages Stajka, Kosmaçi and Ashta.

From Spathari weir to Ashta 2 powerhouse, the project track geology of the Drini riv-erbed is a gritty gravel area. Only a small part of this track (Ashta 2 powerhouse site location) belongs to clayey flysch formations.

The project area includes the Spathari reservoir and the Drini and Gjadri rivers merg-ing in this reservoir, as well as the Drini riverbed flowing downstream of the Spathari weir down to Ashta village. This project has direct effects on the following:

- Spathari reservoir;
- a few small islands created by sedimentation within the reservoir;
- limited areas of land in the villages Vau Dejes and Spathari;
- Drini riverbed from the Spathari weir to the village Ashta; and
- gravel areas North of the villages Stajka, Kosmac and Ashta.

Geology

The project track lies on Quaternary alluvial deposits consisting of sands and gravel, apart from one area, namely the drilling CD 09/08 (ALTEA Gjeostudio 2000, 2009; and Jacobs S., 2009). This drill, which is near the designed construction site for the building of the Ashta 2 HPP powerhouse, runs through layers of clays and silts, be-longing to the flysch layers of Maastrikian-Eocene (Cr2m-Pg2) formations, of the Krasta tectonic zone.

Tectonics

Tectonically, the study area is part of the Preadriatic foreland basin, affected by old and new tectonic faults. The new tectonic faults (shown by the seismic data only) are activated during and after Pliocene sedimentation phase. The map of the new active faults in Albanian territory (Aliaj et al., 2000) indicates that the project area is bordered to the northwest and to the east from a new tectonic fault (fig. 2.7), in northwest-southeast direction. This neotectonic fault passes close to Spathari village and through the Spathara reservoir.

Seismology

According to the seismic intensity map of Albanian territory (Map of Seismic Region-alization of Albania, Scale. 1:500.000, Tirana 1980 (approved by DCM no 371, of 12.20.1979), the project area (fig. 2.15) is situated on the seismic intensity VIII de-gree MSK-64, estimated for 100 year (with 70% probability), for an average soil category (2nd Soil Category, according to the technical condition KTP-N.2-89), while the Drini River bed area on IX degree. The expected maximal earthquake magnitude is Ms=7.2

Groundwaters

The project area has considerable reserves of ground waters because it overlies the Quaternary gravel aquifer of Drini River. The whole sector from Mjeda to Berdica village, where the Drini riverbed gravels contact the buried alluvial gravels, serves as a recharge area. The general direction of ground water flow is South-West and South.

Some of the villages in the COB have water supplies from the hydrogeological wells, while the other villages including those in the project area (Stajka, Kosmaci, Ashta), get water supplies from private water wells. The private water wells are generally 10-12m deep. The ground waters of the quaternary gravel layers have very good physi-cal-chemical composition in compliance with Albanian standards for drinking waters. In Stajka-Kosmaci area, close to the riverbed, the water-bearing layers situated at small depth (4-5m from the surface), are not being actually used for reasons related to the safety and cleanliness of the water.

Surface waters

The project area is included in the lower part of the flow of the Drini River after leav-ing the Vau Dejes HPP. The Gjadri River merges with the Drini River once it flows downstream from the the dam of Vau Dejes HPP to the Spathari weir. This weir is the intake structure for the Ashta HPP.

Drini is an international (trans-border) river. Its watershed, which includes territories from Greece, FYROM, Albania, Kosovo and Montenegro, has a total area of 19,582 km2, 14,173 km2 of which belong directly to the Drini River and 5,187 km2 belong to the Buna River. Both rivers, the Drini and the Buna meet about 30 km, before they discharge into the Adriatic Sea on the border Albania-Montenegro. The river length, from its source, the Ohrid Lake in Struga, to its end, is 285 km and its average dis-charge at Vau Dejes is 320 m3/s.

The Gjadri River is a mountainous rapid river flowing out of the Terbuni mountains. Its watershed is about 200 km2 and length is 40.5 km. The average annual discharge for long term period is 8 m3/s.

The quality of the Drini River waters, was regularly monitored and recorded by the former Hydro-meteorological Institute until 1990. The data on the main chemical fig-ures have been recorded since the 1960's. Based on these records, it can be stated that the Drini river waters are lightly alkaline, whereas the nutrient levels are low. The water quality analysis including the content of the heavy metals in the Drini River waters, are generally within the required standards for potable water (DCM no.145, of 26.02.1998: "Hygienic-sanitary regulation for the potable water quality monitoring, the design, the construction the use and the supervision of the potable water supply systems").

The flows of the Drini and Gjadri Rivers cause large floods on both banks of the Drini River, from the Spathari weir to the confluence of the Drini River with the Buna River. The effect of the Drini River overflowing extends to the territory affects both banks of the Buna River too. Some interventions and flood protection works have been introduced in order to reduce risks and damages.

In the 20th and the 21st centuriy, several major floods occurred in the study area. Based on the flooded areas condition, after the flooding and its duration, the 1962-1963 flooding has been considered the largest one during the two last centuries. The December 2009 - January 2010 flooding, during which the Drini discharge was esti-mated about 2,350 m3/s, was studied in details by POYRY (POYRY, 2010), on be-half of Energji Ashta. The available data on the water level of the January 2010 flooding are recorded upstream, downstream, and very close to Spathari weir. The photos of the relatively large water discharges show that the measured levels are in an area of typically low speeds, but that the drawing effect of the weir is possible. According to this study it results that in the case of exceptional discharges there are considerable large areas of land as well as residential areas flooded on both banks of the Drini River, from the Spathari weir to its discharge into the Buna River.

Erosion and sedimentation

Prior to the construction of the Vau Dejes HPP in 1970, the bottom solid transport of the Drini River at the Vau Dejes gorge was estimated at about 520,000m3 per year. It is estimated that about 510,000m3 year gravels and sands have been extracted from the Buna and Drini riverbed,downstream of the Spathari weir. Nowadays, in the pro-ject area, the Drini riverbed is being supplied with sediments coming only from the solid discharge of the Gjadri River.

The construction of the HPP's cascade on the Drini River has basically reduced the erosion effect of the Drini riverbed. There is considerable effect from the Vau Dejes HPP dam in the project area. But, after the 1990's, due to the reckless extraction of the Drini riverbed sediments, for the supply of the construction industry, there has been a significant amplification of the erosion processes from the Spathari bridge to Drini River discharge into the Buna River, and further on, on the banks of the Buna River in the Adriatic Sea coastal area.

Atmospheric environment

Climatic characteristics

The climatic characteristics have been established on the basis of the data from the meteorological stations of Shkodra Airport, Bushati, Mjeda and Vau i Dejës. The study area belongs to the sub-division of Northern Mediterranean Continental climate with hot dry summer and mild wet winters. The average annual temperature is be-tween 14.5 and 16.5 °C, and the average precipitation ranges from 1750 to 2070 mm.

Air quality

The project area is within a rural area, where there are no activities that may have a significant effect on the air quality. Although there are no monitoring data on the air quality for the project area, we may assume it is within the acceptable standards as provided by the Albanian legislation, because of the lack of industrial activities, little traffic of vehicles, and very few construction activities.

Noise

The study area is far from the urban and industrial activities. For this reason, the lev-els of noise are not affected by the vehicles, the heavy trucks or machinery, the power generators. There is no monitoring of the noises. Still, considering actual eco-nomic activities and the intensity of the traffic on the roads in the project zone and based on some preliminary noise measurements it has been estimated that the noises are at the acceptable levels for the residential areas.

Biological environment

Ecological characteristics

The greater Drini-Buna-Shkodra Lake ecosystem represents a natural resource of instrumental value alternated with a series of different habitats. Its physical, chemical and hydrological characteristics are reflected on a rich level of biological diversity.

Despite the rich biodiversity and high ecological values representing the Drini-Buna-Shkodra Lake ecosystem, part of the upstream of the Drini River is greatly affected by the existence of several hydropower plants, and according to the Water Frame-work Directive; 2000/60/EC, such water bodies are part of the Heavily Modified Wa-ter Bodies (HMWB) [HMWB are bodies of water which as a result of physical alterations by human activity are substantially changed in character]. As a consequence, migration routes of fish from the Adriatic Sea to Ohrid Lake and conversely have been discontinued since the mid twentieth century. None of the hydropower plants erected on the Drini River have any fish-pass channels, or any other form such as fish-ladders, etc. to provide for fish migration.

Protected Areas

Ashta HPP is not expected to have direct impact upon protected areas. The closest protected area are:

- the wetland/terrestrial protected landscape of Buna River
- Ramsar area Shkodra Lake and Buna River; and
- Managed Natural Reserve of Shkodra Lake. The proposed project area is located a few kilometers away from the border of the protected areas.

An earlier option which was designed in the early 1970's, envisioned the construction of Bushati HPP, was rejected in the beginning of 2000 as an option that would have had significant impact on the environment and protected areas, especially with the changing water regime and the deviation of the Drini River flow from its riverbed and confluence with Shkodra Lake and the Buna River. The Ashta HPP project will use the existing Spathari weir and does not forecast the construction of a new weir which may further fragment the habitats.

Despite the rich biodiversity that distinguishes the managed natural reserve of Shkodra Lake, the project area (including the area which would likely be inundated from the increase of the Spathari reservoir level) does not have a protected status. This area has lower biodiversity compared to the surrounding ones (Lahmeyer International, 2001) because it is mainly sand and gravels with very wide berth and which is regularly subjected to floods (LEAP for the COB). Even the Shkodra Lake ecosystem is not expected to be affected by the Ashta HPP construction.

Main types of habitats

Among the main types of habitats are:

- Riparian forests of gritty earth rivers or streams dominated from Salix alba and Alnus glutinosa (classification according to the "NATURA 2000" – 92A0 Salix alba and Populus alba galleries). This type of habitat, currently at a very fragmented stage (5 to 6 small islands along the flow of the Drini River), constitutes the dominant type in the segment from the dam of the Vau Dejes HPP up to the ending planned portion of Ashta. It represents a type of habitat of local importance but one that is constantly threatened by floods of the Drini River. Flooding is also accompanied by erosion of surrounding land, associated with lifting of plants or trees, while wiping or creating new habitats steadily along its entire length;

- Riverine gravel shrubs of gravelly river or stream beds dominated by Tamarix par-viflora and Vitex agnuscastus (classification according to the “NATURA 2000”–92D0 Southern riparian galleries and thickets);

- Riparian water associations of reeds and other high helophytes (classification accord-ing to “EUNIS – C3.2 Water-fringing reed beds and tall helophytes) dominated mainly by Phragmites australis, Typha angustifolia, etc. This association is known for a high ecological plasticity, highly tolerant of excessive moisture in the soil and water level fluctuations;

- Mediterranean maquis (classification according to “EUNIS”–F5.2 Maquis). This type of habitat is met only in the north-eastern part of Drini River and is slightly affected by flooding due to the increase in the Spathari reservoir level. It is generally dominated by evergreen woody species, bushes and semi-bushes which can live for extending amounts of time in hot weather and lack of rain. Most important species are Phillyrea angustifolia, Punica granatum, Pistacia lentiscus, Myrtus communis, Quercus ilex, etc.; and

- Agricultural land is located on the outskirts of villages and urban areas. (Classification according to “EUNIS – Domestic X25 Gardens of Villages and urban peripheries. Ar-able lands and their associated irrigation systems constitute a small area of the habi-tats present within the study area. The most important crops cultivated in these areas are Corn, Barley and Alfa Alfa. Horticulture in the study area is mostly presented by olive trees, vineyards and other fruit trees. The value of this habitat is low. The vege-tation is dominated by common plant species typical of cultivated lands, with low plant species diversity and low value.

Species of flora with protection status

The presence of rare and/or threatened species of plants in the project area is low because of the limited number of habitats, which are common and affected by the floods. Most of them are taxon vulnerable and those with low risk level. Endangered species located in this area belong to the group of species with a wide realm, and that may be affected by changes in the hydrological conditions of the environment in which they are found. In this area, their realm represents a very small percentage of their proliferation in the Albanian territory. Data available and field observations do not show presence of any endemic and sub-endemic species.

Fauna

Fish

Even though the Drini River is populated by a relatively high variety of fish, there is noticeable low presence of fish species in the project area. This is explained by the fact that Drini River is part of the Heavily Modified Water Bodies (HMWB) since it has seven dams between Ohrid Lake and the Adriatic Sea, including the Spathari weir which is located in the project area; and also because of low biological activity ob-served in the project area. Through the electro fishing technique it has been ob-served that some species are found in both below and above the Spathari weir, but there are also species which are either below or above, which indicates that this weir is a barrier in the free migration movement of fish and has fragmented habitats.

Amphibians

Field observations and data collected from literature show that in the study area there are 11 species of amphibians. None of them are endangered globally. Only one species of frog, common frog of the Balkans (Rana balcanica) is evaluated with a deteriorating status (VU) at the national level, due to growing pressure for com-mercial collection.

Reptiles

Drini River and its surrounding environment offer appropriate habitats for the pres-ence of three species of water reptiles and 19 species of land reptiles. The majority of the reptiles met in the area are related to dry habitats which include a series of open grassy habitats, shrubs, rocky environment, agricultural land and housing. All species of reptiles that are met in the study area have a legally protected status.

Birds

The area directly affected by the project has low bird presence which is explained by: (i) low biological activity in the area; (ii) high human impact in the riverbed; and (iii) presence of better habitats for food and shelter in the vicinity (e.g. Shkodra lake).

Nevertheless, this is a transitional zone in the Drini River ecosystem in its course after Vau Dejes dam until its confluence with Buna and Shkodra Lake. Because of the presence of the variety of habitats that provide food and shelter for a number of winter or summer birds as well as migratory birds for the spring and fall seasons, this broader Shkodra Lake ecosystem has a rich ornitofauna.

Mammals

Mammals in the study area are dominated by small mammals (Insectivores and Ro-dents) and bats (Chiroptera). The Spathari reservoir creates favourable conditions for bats which they use for hunting insects and drinking water. Carnivores (Carni-vora) are represented with five species. Among the carnivores (Carnivora) the most important are the Common otter (Lutra lutra), the jackal (Canis aureus), and the fox (Vulpes vulpes).

All the mammal species found in the study area are included in the IUCN Red List. The presence of Common otter (Lutra lutra) on the entire length of Drini River illus-trates a healthy aquatic river biome. Dams built along Drini River not only have no adverse impact on the population of this mammal, but rather have increased its chances of finding food and shelter. Human activities such as anxiety, hunting and fishing (including usage of explosives and toxic substances), and exploitations of gravel in the river beds seems to have been the major factor that determined the status and the distribution of Common otter (Lutra lutra) along the Drini River.

Socioeconomic environment

Population

The Commune of Bushat (COB) has a population of 22.762 people and 5.827 fami-lies, residing in 14 villages: Bushati, Barbullush, Rranxa, Stajka, Kosmaci, Ashta, Melgusha, Plezha, Shkjeza, Kukeli, Sumezi, Fshati i Ri, Hoten and Konaj. In the last years, the population figures have remained almost at the same level, which con-firms that the number of people who have moved in is equal to the number of those who moved out. In the villages affected by the project activities there are no minority groups.

Land use

The plotting of agricultural land in the Bushati commune has rendered the use of machinery rather difficult. The population migration, to urban centres or abroad, has left considerable areas of arable land not properly used and laboured. The surface of the arable land is 5361 ha, while the meadows 707 ha. This commune has 1.436 ha of land, as part of the forestry which is administered by the Department of Forestry in Shkodra, including 342 ha of gravelly land on the Drini River banks, 292 ha of hilly terrain, and 802 ha of mountainous area (Mount Jushi).

Agriculture and livestock

The COB has favourable climatic conditions, which are essential for healthy agricul-tural and livestock activities. There are a large number of small and fragmented farms (1.1 ha on average), at a distance of 1-5 km from the houses, which is a sig-nificant handicap for the agricultural sector.

The livestock is amongst the main source of economic activity in the commune of Bushati. There are 9,075 cattle, 7,045 sheep and goats, 4,485 pigs, 900 horses, 62,500 birds (hens, turkeys, ducks, and gooses). Each family has a small number of farm animals, which is also linked to the limited area of land.

Employment and economic activities

The main economic direction is agriculture and livestock. There are also small wood-processing mills, a milk-processing mill, as well as mills for processing aluminum, marbles, construction aggregates, etc. The commune has natural resources to fur-ther develop the production of limestone as raw material for the production of lime, cement and ballast. The clay reserves provide opportunities for the production of tiles and bricks.

The other branches like trade, craftsmanship and services have witnessed good de-velopment lately. In 2007 there were 165 private physical and legal persons: 102 in trade, 27 in production areas, 36 in services, etc. In the village of Melgusha, there is a large fruit and vegetable street market which offers agricultural products even from villages beyond COB.

Infrastructure and services

Water supply

The commune provides the water supply for the villages of Bushati, Shkjeza, Ranxa, Mali i Jushit, (Mount Jushi), Melgusha, Barbullusha, Kukela and Hoten. Each village ensures its water supply within its own territory. In above-mentioned villages, the water supply runs on mechanical leverage and electric pumping. In the recent years, the potable water supply was significantly improved, thanks to the support rendered by the Austrian Government. This project has helped to improve various water sup-ply aspects, such as the distributed amount and the control over the figures. Re-cently, the projects for the potable water supply have been finalized for the villages of Ashta, Kosmaci and Stajka.

Sewerage

There are no sewage systems in the COB, except a limited area in the Bushati village. Each family uses individual septic holes for the wastewaters. In such circumstances, the wastewaters may come up to the surface sometimes, making the surrounding an inappropriate place for living. The septic holes constitute a serious threat for the groundwater as well, which, as mentioned earlier, is a potable water resource.

Power supply

There have been significant improvements in the power supply, particularly after the new power substation of Bushati was built. Nevertheless, the rural areas in general have a less regular power supply than the large urban areas.

Transport

There are a number of national roads passing through the commune, whichis a crossroad for Shkodra and Lezha cities, as well as for Mjeda and Torovica villages. The communal road Bushati-Kosmaci-Stajka–Shelqet, 5.3 km long, runs through villages that are close to the project area. The roads between Kosmaci andAshta (2.5 km) and the one between Stajka and Kosmaci (3.5 km) are both in a poor shape. The road maintenance is not effective, since holes are formed in the gravel refilling during rainy weather. The roads to the villages Stajka and Kosmaci have been asphalted.

Education

There are 10 kindergartens, thirteen primary schools, eight 9-year schools (basic education), and two high schools with an educational staff of 185 people in the COB. 90 students completed the secondary education in 2005, 105 in 2006 and 114 in 2007. This community is inclined towards education and there have been numerous graduates in a number of professional fields.

Health and health services

There are two health services in COB, one in the village Bushat and another in Bar-bullush. There are First-Aid centers in every village, providing satisfactory ambula-tory services to the local population, although they need necessary professional equipment as well as the necessary medicines for emergencies. There are 8 physi-cians and 35 nurses and midwives providing services in this commune. The health services run 24 hours, in shifts. It has also got a maternity house with qualified staff, thus satisfying the needs in this commune. Recently, these health centers have been reconstructed and supplied with the necessary professional equipment.

State of environment

Air quality

Although there is no monitoring data for air quality in the project area, it is believed to be at acceptable levels as requested by the Albanian legislation, for the reason that, there are no industrial activities, little traffic of vehicles, and very few constructions in the rural area.

Noise

The project area is far from the urban and industrial activity areas. For this reason, the levels of noise are not affected by the vehicles, the heavy trucks or machinery, the power generators. There is no monitoring of the noises. Still, considering actual economic activities and the intensity of the traffic on the roads in the project zone, it has been estimated that the noises are at the acceptable levels for the residential areas.

Urban Solid Waste

The COB has a worrying situation in urban waste management. On the villages situ-ated along the Drini River urban waste has been thrown along the riverbanks, mak-ing it a threat for the river waters, as well as the ground waters. The amount of urban waste in the commune is estimated at 15 ton/day and about 5,500 ton/year. The COB owns a vehicle and containers for the collection of the urban solid waste. A sanitary landfill for urban waste disposal for the Prefectures of Shkodra and Lezha has recently been constructed in the COB. The new landfill was inaugurated in 2011 and is being operated by a serious German company in the field. It is expected to apply contemporary technology for the urban waste processing, thus respecting the environmental standards.

Wastewater

There are no sewerage systems in the COB, except a limited area in the Bushati village. In all house there are septic holes, which constitute a serious threat for the ground waters, which, as mentioned earlier, are a potable water resource. In such circumstances, the waste waters may come up to the surface sometimes, making the surrounding inappropriate for living.

Hazardous waste

There are no industrial activities to generate hazardous waste in the COB. However there are some gas stations, pharmacies as well as animal pharmacies, medical ser-vices, car repair shops, etc., which generate waste that may be classified as hazard-ous, such as fuels, car oil, chemicals, medications, body parts or

bloody bandages, etc. Considering the vicinity of the residential areas to the surface waters such as Drini andGjadri rivers , as well as the fact that the soil pollution by the hazardous waste may be a threat to the quality of groundwater, there is need for proper com-mitment and monitoring of the environmental standards from the local authorities, as well as for environmental management of activities that may generate such category of waste.

Archaeological/historical/cultural heritage

The territory of the commune was inhabited since the ancient times. The heritage is present through certain natural and cultural objects, caves, springs. The cultural heri-tage is present with bridges, roads, monumental graves, residential houses, etc., as well as religious buildings such as mosques, churches, etc. Such places belong to the ancient history, continued in the medieval times, and there are a few remnants left in the present. There are no such objects in the project area.

Tourism

There is not much tourism activity in the commune, while this commune offers opportunities to use certain sites for tourism, including daily tourism. The forest of Mount Zefjana, the Spathari reservoir, the church of Saint Shtjefen (Barbullushi village), and an old cave (Bushati village), where archaeological objects have been found, may provide good starting opportunities for tourism.

1.1.3 Main impacts and mitigation measures

Main sources of environmental impacts

The Ashta HPP construction will take 40 months. On average, there will be between 100 and 150 workers employed during this period. The main parts of the HPP in-clude the water intake, the Ashta 1 powerhouse, the emergency spillway, the chan-nel for the fish pass from the Drini River to the Spathari reservoir and return, the in-take for Ashta 2, about 5 km long, the Ashta 2 powerhouse, the power stations, the drainage channel along the main channel, etc.

Two construction sites will be built: one near the Spathari weir and the other between the villages Stajka and Kosmaci. About 5.000.000 m3 of gravel will be moved at the two construction sites. The gravel will be mainly used for the construction of the 5-km long Ashta 2 headrace channel and other HPPs' structures as well. During the 40-month period, the HPP construction activities will involve 177,000 truck drives (425 per day on average) within the project territory and 9,250 truck drives (25 per day on average), outside the project territory. Workers and staff will work 6 days a week, from 07:00 to 20:00.

Water level in the Spathari reservoir shall be raised by about 1.5 m affecting habitats and vegetation in the banks and islands of this reservoir. About 5 km of the Drini riv-erbed shall experience a decrease in the volume of water down to about 30 m3/sec which is the amount foreseen for ecological water release. Ecological corridors pro-vided by the riverine vegetation along the riverbed between Spathari reservoir and about 5 km downstream of Spathari weir might be affected by the loss of water in this part of the riverbed. We do not expect interruption of migration routes for fish by the Ashta HPP channel, since those migration routes were interrupted back in 1974 with the construction of the Spathari weir. In fact, the new HPP Ashta might improve fish migration by means of introducing a fish pass, which is the first of this kind in Albania.

Impacts and mitigation

Landscape

The Ashta HPP structure includes the intake, the two powerhouses, the emergency spillway and the tailrace and headrace channels. The Ashta 2 headrace channels, together with the Ashta 1 tailrace channel are approximately 5 km long and 85 m wide. The construction period will be 40 months long. In the construction

site there will be earth digging, filling, channel digging, construction works, etc. During this pe-riod, the landscape will be gradually changing, with the HPP structures being set up towards completion.

The main mitigation measures regarding the landscape will consist as follow:

- hole refilling with materials generated by digging;
- concentration of vegetation at one or more sites, with caution not to throw that into the river and taking it away to the urban waste disposal site;
- afforestation or creation of green areas along the left side of the Ashta HPP main channel and in the surfaces that are not expected to be inundated by the Spathari reservoir, high slopes with native species would protect adequately the reservoir from solid discharges or erosion and will improve the landscape;
- rehabilitation and compensation measures to ensure restoration of green areas that will be lost by the construction works through: afforestation and/or creation of new generation of defence along the river with suitable plant species in order to reflect the native characteristics and wholesome previous habitats.

Tectonics and seismicity

Due to tectonics and seismic intensity on the project area, the seismic hazards, may be represented by soil liquefaction, fissures and soil subsidence phenomena, and may cause damage to concrete structures (Ashta HPPs' powerhouses, Spathari weir, headrace and tailrace channels), hazards which threaten the life of the builders and increase the costs due to the repair works.

Mitigation measures should among others take into account, during design and im-plementation, the seismic hazard parameters recommended from the Seismic haz-ard evaluation study (Aliaj Sh., et al., 2009). Drainage channels should be built at the feet of the structures. Such channels should be maintained during the construction period. Since the construction site is situated in a area of high seismic risk (Mmax = 7.2, Io = IX degrees - MSK-64), it is necessary to design the proper geometric con-figuration of the object and its foundations, as well as the proper construction hard-ware. Appropriate technical solutions should be worked out for the constructions un-der the level of the water table. Moreover, due attention should be paid for the tech-nical safety measures for emergency exits in case of earthquake. –Finally, precau-tion measures should be taken for the health care of the workers and staff, also con-sidering injuries in case of possible earthquakes.

Land use and soil

The total area of land that will be taken up by the Ashta HPP is about 400 ha of which 85,3 % is state property, 12,9% belongs to the COB and Municipality of Vau Dejes, and 1,8% or less than 7 ha, is private ownership. Most part (393 ha) of the land to be inundated by the Ashta HPP are alongside the riverbeds of Drini and Gjadri. The project does not extend to arable land, with the exception of a small area of less than 7 ha, which will be inundated from the rise of the Spathari reservoir level by 1.5 m, in the villages Vau Dejes, Spathari, Naraci and Laci. Whereas the area of the islands created by sedimentation within the reservoir that will be inundated is approximately 20 ha. The channel track and the Ashta 2 powerhouse, run very close to an area of arable land in Kosmac village, north-west of the village. It should be noted that this is just a few hundred square meters.

The project does not foresee any change in soil structure and traditional land use, as most activities shall be of a temporary nature, mainly using built streets. Neither oil spills, nor traffic in arable or other lands is foreseen.

In view of avoiding and/or mitigating the above mentioned negative impacts, the following mitigation measures are recommended:

- compensation of the land owners pursuant Albanian legislation,
- the topsoil dug out of for the construction of the Ashta 2 powerhouse must be used for refilling of the holes caused in the course of the unlawful extraction of gravels
- the movement of the vehicles should be monitored and unnecessary transport should be avoided,
- the buffer area should be reduced at its best, so as not to damage arable land,
- the place for storing reserve fuels, for the parking and the site for car services, should be cautiously determined, and
- the soil polluted by fuels, oils, or other polluting substances should be taken away, and deposited at the site determined by the commune of Bushati and the REA Shkodra.

Groundwater

Despite the fact that the hydro-geological and private water wells for the villages on both sides of the Drini River bed are far from the HPP structures, the activities of the digging machinery, the transport and the concrete works, may cause pollution of the groundwater.

The rise of the water level in the Spathari reservoir would inundate the vegetation on the small islands in the reservoir if left uncut. As a result of the rotten organic matter, the surface waters would be polluted, which would be extended to the groundwater, because the Drini River serves as recharge area for the groundwater of the water bearing complex of the Quaternary gravel deposits on both sides of the project area.

The project is not believed to have any impact on the amount of the groundwater.

The mitigation measures should be focused as follows:

- During the construction period, maximal care should be taken to prevent the pollution of the groundwater by the hazardous substances like oils, fuels, etc. In case of acci-dental leaking of such substances, the polluted earth has to be removed to the dis-posal site of the hazardous waste. Such site will be determined in cooperation with the COB and the REA Shkodra; and
- Cutting down trees and bushes, and clearing the vegetation on the small islands in the Spathari reservoir that would be inundated because of the rise of the water level, which will thus reduce the chances of the pollution of the groundwater by the sub-stances generated from the decomposition of the submerged vegetation.

Surface waters

During the construction phase, the possible impacts will be at acceptable levels, because the construction will be along the riverbed. Interventions, if any, will be limited, as the Spathari reservoir is existing for 40 years. The irrigation and drainage systems in the project area would not be affected.

The rise of the water level in the Spathari reservoir by 1,5 m, will extend its area by 99 ha. Most of the area to be inundated belongs to the Gjadri River, whereas the vegetation-covered area is approximately 27 ha. From the above, 20 ha are located on the islands within Spathari reservoir and on the rest of the private land which will be compensated to respective owners as it is requested by the Albanian legislation on this regard. Some 9,000 m3 of top soil will be dug out in one of the islands that will be inundated close to the water intake. The top soil excavated will later be used for the construction works, especially to cover the southern

escarpment of the Ashta 1 - Ashta 2 headrace channel, which will be later covered by vegetation, such as grass and bushes. The earth works, and in particular the lower level of water intake from the reservoir from 19 m asl. to 16,5 m asl., will cause a temporary rise in the water muddiness of the Drini River, which means an increase of solid discharge in this river.

Spathari Islands

The mitigation measures include:

The construction of temporary protection works to facilitate the building of the Ashta HPP channel (5 km long) in order to avoid erosion along the northern side of this channel on the occasion of higher river flows. For this reason, it is recommended to construct this channel mainly during dry period when the river flow is at minimum levels; and

Cutting down trees and bushes, and in general clearing away the vegetation on the islands and the banks of the Spathari reservoir which are going to be submerged, so as to reduce the impact of the decomposition of the submerged organic matter on the quality of the reservoir water.

Flooding

During the construction phase, it is believed that there will be no further aggravation of the flooding by the Drini River, because the existing works, which serve as protec-tion from the floods, will be in place until the construction of the HPP headrace chan-nel starts. During this period, there will be a ban on the extraction of the construction aggregates (gravels and sands) on the left side of the Drini River flow, from the Spathari weir to Ashta2 powerhouse, which reduces one of the causes to the flood-ing of the villages Shelqet, Stajka, Kozmaci and Ashta.

In conclusion, the flood risk will be no greater than prior to the Ashta HPP construc-tion period. This risk will actually decrease as construction makes progress and the Ashta HPP headrace channel is built, as this would serve as protection weir for the territory south of the project area.

During the extraordinary flooding of 2010-2011, when a vast area of land was flooded in the district of Shkodra, the villages south to the project area were not affected, due to the initial works for the construction of the headrace channel between the Ashta 1 and Ashta 2 powerhouses. The said channel served as protection weir against the flooding.

Hence, during the construction and operation phases of the Ashta HPP, there will be positive impacts regarding the protection from the flood hazards in the territory south to the project area, in the villages Shelqet, Stajka, Kozmaci and Ashta.

Erosion and sedimentation

A temporary rise of erosion is expected in the case of extraordinary discharge of the Drini River. Furthermore, the excavation works in the Drini River bed and the Spathari reservoir, would increase the amount of the solid sediments discharged. This amount of sediments, as well as the lower level of water intake from the reser-voir from 19 m asl to 16,5 m asl, would cause a temporary rise in suspended solids discharged from the Drini River. Through the Drini River, a slightly larger amount of suspended solids would flow downstream into the Buna River and further in the Adriatic Sea.

During the construction and operation stages of Ashta HPP no negative impacts re-lating erosion in the coastal area are foreseen. On the contrary, it is estimated that this project would bring some positive impacts, due to the larger amount of the sus-pended solids that would be discharged from the Drini River, and the lowering of the water intake from the current level of +19 m asl at the Spathari weir, to +16.5 m asl which would allow the flow of larger quantities of solid sediments from the Gjadri River.

Others physical effects during construction/operation stages

Gases of greenhouse effect

The power production relying on the water resources does not discharge carbon di-oxide or other gases in the atmosphere, which could cause air pollution or the greenhouse effect. Hydro power plants (HPPs) are a clean, renewable source of en-ergy. The power generated by the Ashta HPPs, will be sparing us an amount of about 225.000 t/year carbon gas (CO2), which would produce the needed fuel to generate the equal power. Such amount of CO2, may be assimilated by a forest with 250,000 trees for 40 year (The global cooling centre, 2008; and Francfort J.E., 1997). Meanwhile, the additional amount of methane generated by the increase of water surface in Spathari reservoir (including flooded islands) is estimated at 590 t/year CO2. (http://news.softpedia.com/news/Temperate-Area-Reservoirs-Emit-a-Lot-of-Methane-160312.shtml)

Air quality

During the construction period for the Ashta HPPs, dusts and gases will be generated by construction and transport activities.

The construction works will involve vehicles and machineries like excavators, dig-gers, cranes, scraper, etc. Considering the daily workload of these vehicles and ma-chineries, the average consumption of fuel during the period of the construction works will be 1000 l/day, in an area of 10 km2. By comparing the daily gas dis-charges during construction period in the project area, to the amount of gases dis-charged by vehicles into the area of the city of Shkodra (a similar area of about 10 km2), the air pollution by the gases discharged from vehicles in the Ashta area re-sults to be at much lower levels.

In order to reduce dust emissions and maintain gas discharges to minimal levels, it is recommended to take the following mitigation measures:

- splash the roads with water in dry weather;
- create gravel and other barriers with a double environmental purpose and effect, such as to reduce the dusts to the villages near the project area and to reduce the noise coming from machineries, equipment and vehicles running in the construction sites;
- use fuels at the acceptable standards for EU regarding the sulphur content; and
- monitor air quality in the villages which may be affected by the project works.

Noise

Transport vehicles including heavy trucks and various machineries like excavators, diggers, scrapers, cranes, etc. would create noise throughout the whole period of 40 months for the HPPs construction.

By modelling the noise levels generated by the vehicles and machineries that will be used for the construction of the HPP structures, it seems that the average noise val-ues in the residential areas nearest the project area would be at the level 35 45 dB(A). The noise generated in the project area will be lower than the average na-tional standards. In order to further reduce the noise level in the residential areas closer to the project zone (Stajka, Kosmaci and Ashta), gravel and other barriers would be established to serve as buffer or noise absorber for the residential areas, the nearest being at least 400 m from the construction site. Working hours must also comply with national standards, and no working is allowed late at night.

During the operational stage there is no noise generation issue because noise level coming from turbines Hydromatrix will be around the level of 30 dB (A), while the closest house to turbines' building is located more than 400 m away.

Wastewater

Construction works will be conducted in two sites, fully equipped for construction works, as well as the administration offices. The polluted waters will be generated by the human activities mainly. There will be about 100-150 workers contracted for the work.

Wastewaters will be treated by a compact biological treatment plant, which the company will build up in the initial phase of the construction. This will be running till the end of this phase. This plant will run in the compliance with the urban waste waters treatment, pursuant to the DCM no.177, dated on March 31.2005.

Solid and hazardous waste

The HPP construction and operation activities do not generate solid waste, which would need special attention in view of environmental protection. Solid waste might however be created by various packages materials like: metal, wood, carton or plastic, for the machineries or equipments that will be installed and used during the HPP construction works, and also food waste of the construction workers and administration staff.

Materials which may be reused will be collected by licensed recycling companies and the rest of waste classified as urban waste will be disposed in the sanitary land-fill at the village Plezha, which has started to operate pursuant international standards.

Even with regard to hazardous waste, the construction and operation activities do not involve processes that generate such category of waste. As provided in the Law No.9537, dated 18.05.2006 “On the administration of hazardous waste”, in the con-text on the HPP construction activities, the following materials will be considered as hazardous waste: used lubricant oils, paints, solvents and their wrapping, worn out tires, batteries, etc.

All hazardous waste should be registered, inventoried and monitored. The liquid waste classified as hazardous waste, must be protected in special containers, with the floor coated with boards or concrete to ensure against possible leaking into ground and may pollute ground waters. The site must be fenced.

All hazardous waste have to be removed, collected and transported by licensed companies, to disposal sites designed by the REA in Shkodra.

Biological environment

The Ashta HPP impacts on biological environment are negligible as compared with the ones from the existing dams and reservoirs upstream of Drini River valley and are mainly related to:

- the construction activities,
- the increase in the level of the existing Spathari reservoir,
- the deviation of Drini River flow in the Ashta HPP headrace and tailrace channels,
- the construction of the Ashta HPPs’ channel (about 5 km long and 85m wide), as well as
- the construction of an embankment, about 1.5 km long, on the left of the Drini River, downstream Ashta 2 powerhouse, will be serving as physical barriers, which will fragment the river e cosystem and interrupt migration routes.

Judging from the site location and the height of the weir (which is an existing one), the negative impacts of Ashta HPP on biodiversity are relatively low, since the pro-ject lies in an area characterized by a lower biotic activity (Lahmayer International, 2001), which is very flood prone (REC, 2008; UNECE, 2006). Drini riverbed

is al-ready affected in almost half of its length from the construction of three hydropower plants in the Albanian territory. Nevertheless, in all cases new hydropowers are associated with loss in habitats and restrictions on the realm of typical riverbed species, interruption or fragmentation of ecosystems and reduced biodiversity, as well as changes in floristic composition and functioning of ecosystems.

The area affected from inundation in the Spathari reservoir does not represent a pristine area in a botanical viewpoint, but rather an area with a large anthropogenic interference factor (a number of villages along the Drini River valley), resulting in the formation of forests and bushes with high levels of degradation. Similar formations, in better conditions, may be found in all areas not affected byinundation. Most losses would likely occur during the construction phase and would gradualy recover in time.

In order to mitigate the negative impacts, the Ashta HPPs' project envisages the following:

- construction of a fishpass which would allow the migration of the ichtic fauna from the Spathari Reservoir to the Drini River;

- maintaining the continuity of the biological activity in the Drini River along the Ashta HPPs' project site through the provision of a quantity of ecological water release of minimum 30m3/s that will continue to flow in the 5-km long existing riverbed segment. Furthermore, the biotic activity shall be ensured by the newly vegetated areas and corridors that shall be created along the riverine areas, as well as formerly gravel mining areas;

- afforestation or the creation of green space in the areas that would not be affected by the inundations in the Spathari reservoir, high slopes with native species would protect adequately the reservoir from solid flows or erosion;

- clearcutting of forest trees or shrubs before the increase of the level of Spathari reservoir to avoid the effects of lack of oxygen and high concentration of methyl mercury resulting from the decomposition of organic matter and thus harm fish and other aquatic biomes.

- Improvements on the biological characteristics might also result from lowering the altitude of the intake at Ashta 1 HPP, from 19 m asl (the current altitude of discharge at the Spathari weir) to 16,5 m asl; which would likely lead to an increase in the solid sediments discharges into the Drini River downstream Spathari weir. Such increase, though modest, will likely have an impact on the reduction of coastal erosion and the improvement of the biotic activity in river.

- Also, the Ashta HPPs' channel (about 5 km long), as well as the embankment (1.5 km long), downstream Ashta 2 powerhouse, will serve as physical barriers, which will reduce the impact of human pressure on this segment, thus providing for the im-provement of the environmental situation, including the resurgence of the badly dam-aged vegetation and the biological activity. This barriers will also serve as protection from the flooding in the south of this area.

- Finally, the project foresees rehabilitation and compensation measures to ensure restauration and ecological balance affected by the construction works. Afforestation or creation of new vegetation along the river to avoid eroision will use native, water-resistent species such as Platanus orientalis, Populus alba, Salix alba, Salix purpurea, Salix amplexicaulis, Salix elaeagnos subsp. angustifolia, Alnus glutinosa, Alnus incana, etc.

Socio- economic environment

The construction of the Ashta HPPs does not involve expropriation of public or pri-vate buildings. Besides, the area of land affected by the project is 98,2 % state or communal property, mainly the Drini and Gjadri riverbeds, whereas only a small part (1,8%) is agricultural land under private ownership, which will be compensated pur-suant to the relevant legal provisions.

The project could damage communal roads as a consequence of the circulation of heavy trucks during the construction phase. Mitigation measures might include an agreement between the construction company and the commune authorities regard-ing the maintenance of the roads which will be used by the heavy vehicles in the context of the HPP construction and road rehabilitation works during and after the completion of the construction works for the HPP.

The Ashta HPPs will improve the power supply situation and will produce clean en-ergy.

The COB will directly benefit from the project. During the 40-month construction pe-riod, there will be about 100-150 workers hired for the construction works, which is a considerable number, also taking into account that this benefit goes first to the local people of the villages nearest the project area. Besides, the commune will also bene-fit the local taxes paid by the company Energji Ashta. Benefits will also go to the lo-cal construction companies which will be sub-contracted by the developers. The pro-ject will provide favourable conditions and will encourage new businesses, new trad-ing activities or services, for the workers hired for the HPP construction.

Cumulative impacts

Drini River is a Heavily Modified Waterbody due to heavy human influence with construction of five dams and one weir. The Spathari weir is the last one built in 1974, only 2 km downstream of Vau Dejes dam. The free flow regime of the river has been altered, habitats were fragmented and the fish migration patterns have been negatively affected because there is no fish-pass in any of the existing HPPs along the Drini River cascade. The deposition of sediments in the six consecutive reservoirs has minimized the sediment transport, as well as the amount of nutrients which are discharged into the Spathari weir together with the river water.

The above-mentioned arguments might explain the lower biotic activity that is ob-served in the segment of the Drini River, right downstream of the Spathari weir to the village Ashta (5 km long), as described by Lahmayer International (2001), which cor-responds to the project area for the Ashta HPPs'. Other reasons for the low biotic activity in this river segment can be related to the increased human activity and pressure, which has led to the destruction of the riparian vegetation, the unlawful fishing by inappropriate means and methods, the dumping of urban waste into the riverbed, the reckless and often unlawful extraction of the construction materials (gravels and sands) from the Drini riverbed, etc.

The cumulative effects that HPP Ashta brings are negligible as compared with the impacts from the existing dams and reservoirs upstream of Drini River and are re-lated to the increase in the level of the existing Spathari reservoir, while there are foreseen mitigation measures to allow fish migration (currently fish migration is inter-rupted), vegetation corridors, as well as flow of solid materials.

In order to mitigate the cummulative negative impacts, the Ashta HPPs' project envisages

the construction of a fishpass which would allow the migration of the ichtic fauna from the Spathari Reservoir to the Drini River,

providing ecological water release estimated at about 30 m3/s that will continue to flow in the 5-km long existing riverbed segment,

water intake from the Spathari weir to occur at a lower level (16.5 m asl as compared to the current level of 19 m asl) which allows an increase in the discharge of water sediments which could provide sediments for beach nourishment, and

Ashta HPPs' headrace channel (about 5 km long) will be serving as a physical barrier, which will reduce the impact of human pressure, would restore some ecosystem functions through vegetation, as well as protect nearby areas from floods.

1.1.4 Environmental Management Plan

The Environmental Management Plan is aimed at avoiding and mitigating impacts on the biophysical and socioeconomic environment, focusing on:

Health and safety of workers and prevention of environmental pollution;

Compliance with environmental standards and best available techniques;

Performance of all project activities in a safe and effective manner, proper mainte-nance of machinery and equipment to protect workers and prevent environmental damage;

Procurement of all measures to control, prevent, or dispose any leakage of hazard-ous materials/fluids;

Construction of project facilities in accordance with the best national and international standards; and

Monitoring of all activities with potential environmental impact during the construc-tion and operation of the Ashta HPPs'.

1.1.5 Environmental Monitoring Plan

The preparation and implementation of the Environmental Monitoring Program is required by the Albanian environmental legislation. The Environmental Monitoring Plan will ensure the assessment of the environmental situation in the project area during construction and operation stages, in terms of air quality, noise levels, surface waters quality, quality of ground waters on the water wells, solid and hazardous waste management, and biodiversity.

Particular attention must be taken especially on the following items:

- the rehabilitation of habitats and planting of vegetation in the project area;
- the performance of macro-invertebrates and fishes in the Spathari reservoir, the fish-pass, and the Drini River segment from the Spathari weir to Ashta 2; and
- overall biodiversity tendencies in the project area, including surveys about wintering birds, creation of new habitats, ecological corridors, etc.
- the quality of the Drini River waters upstream and downstream of the HPP construction site;
- the amount and the quality of the ground waters in the villages close to the HPP struc-tures in the course of construction;
- the air quality in the project area and the houses nearby;
- the noise levels in the houses closest to the HPP in the course of construction; and
- the environmental management of the solid and hazardous waste generated during the course of construction.

The information and data that would be collected from monitoring will serve to moni-tor the proper performance of mitigation measures during the implementation of the project and operation of the HPPs', as well as to take remedial actions if needed to address improper execution of planned mitigation measures or any other degrada-tion of surrounding environment in relation to the project activities.

These data will be reported pursuant legal provisions (DCM no.103, "On the Envi-ronmental Monitoring in Republic of Albania", dated on March 31.2002) to the REA in Shkodra.

1.1.6 Conclusions

Compared with the earlier alternatives (Bushati HPP), the Ashta HPP project has several advantages including:

- the area of agricultural land directly affected by this new project is only 7 ha. This area of land will be inundated due to the rise of water level in the Spathari reservoir;
- the project will not inundate any residential or business buildings, etc.;
- the project will not change the existing hydrological regime of the river in the highly important complex Drin-Buna-Shkodra Lake;
- the project will not affect any Protected Area or objects of the archeological/historical/cultural heritage;
- the project will not affect the Shkodra Lake and the Buna River ecosystems;
- it has the shortest length channel and affects only a segment of the Drini River bed (Spatharie-Ashte, 5 km in length), whose biodiversity as been identified (Lahmayer International, 2001) as much poorer than the rest of the riverbed (segment Ashta 2 HPP-the Buna River).
- it will open migration routes for fishes (fish-pass) since those routes have been interrupted back in the 70-ies with the construction of Vau Dejes Dam (upstream) and Spathari weir (downstream); and
- the project will not have negative impacts on the coastal area erosion at the Buna River mouth and its nearby coastline.

The Ashta HPP's represent a sustainable alternative for the increased production of energy from renewable resources, without causing serious negative impacts or damages to the environment, because:

- The construction of the Ashta HPPs' does not foresee transboundary impacts. The project will be located at a distance of at least 10 km from the Buna River and the Shkodra Lake, which are transboundary surface waters;
- The project takes into account the most advanced international standards, regarding the ecological water release into its riverbed, for the purpose of allowing the continuity of the biological activity on this riverbed;
- The excavated material, mainly gravels and sand, will be used for the construction of the HPP structures, whereas, the topsoil, will be used to improve the quality of the low quality lands and the refilling of holes created as a result of the unlawful extraction of gravels in the last 20 years;
- There are no major long-term effects from the construction stage, concerning environmental pollution, and there will be no discharge at all of polluting substances into the air, soil and water during operation. During the operation, the Ashte HPP will spare from emitting into the air of an amount of 225.000 t/year CO_2, that would have to be released for the production of this amount of energy in the case of a plant running on fuels;
- The amount of gas emmission into the air, discharged by the vehicles and machinery in the project area, has been estimated to be low, and within the acceptable standards for the urban areas.
- The excavated material that will be transported during the construction phase, will be mainly gravels, which will cause minimal amount of dust. Nevertheless, in time of dry weather, water splashing of roads will be used to reduce the dusts;

- The modelling of noises in the residential areas close to the project area, shows that the noises generated by the machinery and the vehicles that will be used for construction and transport, will be below the standards provided in the guidelines of the WHO, the World Bank, as well as Albanian legislation;

- The project will not have any impact on the quantity and the quality of groundwaters in the territory of the villages to the South and South-West of the project area, since the basement of the channel linking Ashta 1 powerhouse with Ashta 2 powerhouse consists of gravels which are permeable;

- The presence of the 5 km long channel will serve as embankment to protect the agricultural land and the villages south to the channel (Stajke, Kosmac, Ashte) from erosion and flooding,. This channel, together with the embankment 1.5 km long, on the left of the Drini River, downstream Ashta 2 HPP, will be providing for the rehabilitation of the damaged riverine areas;

- A slight increase of the solid sediments discharged into the Drini River as a result of the lower level for the water intake at the Spathari weir; from 19 m asl at present to 16,5m asl is expected;

- The construction of the fish pass at the Spathari weir, will re-establish the continuity of the ichtic fauna. Such continuity and fish migration routes were interrupted in 1974 with the construction of the Vau Dejes Dam and Spathari weir;

- The Ashta HPP will be built in the area with the low biotic activity of the riverbed (Lahmayer International, 2001). The area where the channel shall be constructed is also degrated by human activities. The flora and fauna of the project track are quite common for the affected area from project activities. The construction of the channel, which will serve as physical barrier to reduce the human activity in this river segment, will help and encourage the restoration of the damaged riverine vegetation and the biological activities;

- The project foresees planting of native vegetation to compensate for the clearcutting of trees, due to the inundation of the small islands within the Spathari reservoir. Afforestation would include an area three times larger from that affected, and would include the Bushati communal park, the Southern part of the Ashta HPPs' channel and elswhere as agreed with communal and forestry department officials;

- It will not affect the irrigation system of the agricultural lands. The present amount of 20 m3/sec for the main irrigation channel, discharged form the Spathari reservoir, at the village of Mjede, will remain unchanged. The drainage channel along the left side of the Ashta 1 - Ashta 2 channel, will add to the amount of discharge for the irrigation of the agricultural lands in the commune of Bushat; and

- the Ashta HPPs will provide for the employment of the local population, in particular from the villages along the project area (Ashta, Kosmaci, Stajka, etc.).

- The construction and operation of the Ashta HPPs will be subjected to environmental monitoring, consisting of the following:

- the air quality in the project area and the houses nearby;

- the noise levels in the houses closest to the HPP in the course of construction;

- the environmnetal management of the solid and hazardous waste that will be generated in the course of construction;

- the quality of the Drini River waters upstream and downstream of the HPP project track;

- the amount and the quality of the groundwaters in the villages close to the HPP pro-ject area;
- the rehabilitation of habitats and planting of vegetation in the project area;
- the performance of macroinvertebrates and fishes in the Spathari reservoir, the fish-pass, and the Drini River segment from the Spathari weir to Ashta 2; and
- overall biodiversity tendencies in the project area, including surveys about wintering birds, creation of new habitats, ecological corridors, etc.

1.2 Power situation in Albania and Ashta HPP

The country's economic development, the improved well-being and quality of life in general, as well as the attraction of foreign entrepreneurs, have set the demand for reliable power sources at reasonable costs.

In Albania, the power production relies mainly on the power generated by the HPPs north of the country.

On the perspective of better distribution and better usage of water sources, there is an increasing interest in the construction of small HPPs. There were 80 such small HPPs built until 1990. In the recent years, there have been increasing demands for the construction of the small HPPs (Study on the evaluation of the renewable power potentials in Albania (CO-PLAN, 2007).

During the last 4 years, some 150 concession contracts have been issued for the construction and operation of small HPPs, some of which with only local entrepre-neurs. According to the Ministry of Economy, Trade and Energy, a total of about 400 small HPP's are planned to be built in Albania.

Following the 1990's, as a result of the political and social changes, the current ca-pacities for the power production cannot match the increasing demand for power. Power shortages have been dealt with by combining power cuts with the supply from the neighbouring countries. In years of low precipitations (like in 2005), the situation aggravated because the low water reserves in the reservoirs required maximal effi-ciency in the usage of the hydro energetic capacities already in place.

The following table (tab.1.1.) presents the total capacity installed for power produc-tion in Albania. More than 98% of the annual power comes from the HPPs, with three HPPs on the Drini River cascade yielding 85% total production.

Tab.1.1. The capacities of the Thermo and Hydro Power Plants in Albania

Central	Installed	Effective	Average
HPP Fierze	500.0	152	1,328
HPP Koman	600.0	171	1,500
HPP Vau Dejes	250.0	100	880
Drini River Cascade	1,350.0	423	3,708
HPP Ulez	27.0	14	120
HPP Shkopet	25.0	10	90
Mati River Cascade	52.0	24	210
HPP Bistrica 1	23.0	19	165
HPP Bistrica 2	5.5	4	35
Bistrica	28.5	23	200
Other HPP-s	20.0	2	20
TPP Fier	159.0	10	76
TOTAL	1,609	482	4,214

Source: The integrated power development and industrial area of Porto Romano, its infrastructure and outlining. Ministry of Economy, Trade and Energy, AKBN, Tirana, 2007

Up until 1998, there were 83 small HPPs in Albania, with their capacity ranging from 5 to 1200 kW and a general capacity of 14 MW. 8 of them were built in Shkodra re-gion with a capacity of 5.52 MW. The initial purpose for building the small HPPs was to supply the remote mountainous villages. All the small HPPs are in urgent need of repairing.

Figure 1.1 shows the annual production of the three HPPs on the Drini River cas-cade, namely Vau Dejes, Fierza, and Komani. The difference of the power produc-tion through years is due to the fluctuation in precipitations. Thus, the fall in the power production in the 1990's was affected among others by low values in precipi-tations.

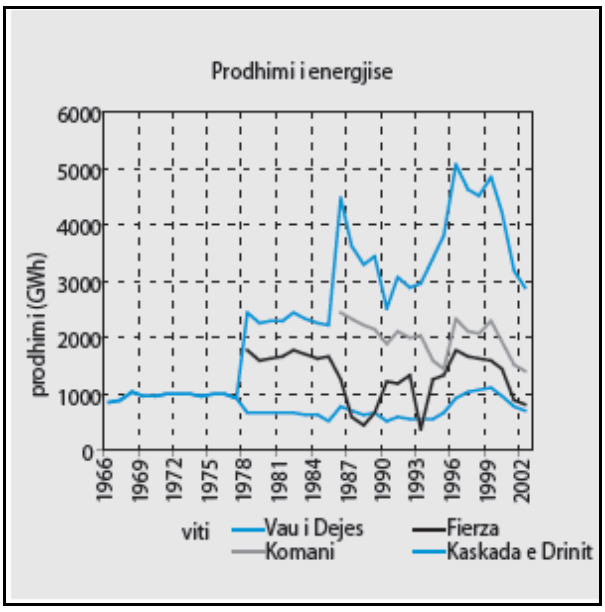

Fig. 1.1-The power production from the Drini River cascade (GWh/year)

Based on data from the Institute of Statistics, part of the national resources related to the general production of the power decreased significantly in the period between 1998 and 2001, falling from 83,9% to 48%. Low production was caused by damages of the existing installations and lack of investments. Another cause to the problem is the centralization of the energy sector (Austrian Energy Agency, February 2006).

The power shortages have been compensated by imports. Albania increased its power imports from 300 GWh in 1998, to 2.200 GWh in 2002, whereas in 2007 the power import reached 2.800 GWh.

The development in the country is closely related to increases of power production. The latter, and in particular electric power, are top policy priorities in Albania.

For this purpose, the Albanian Government drafted the National Strategy for Energy, which has set the development of this vital sector as its main goal, in order to ensure the power supply (in particular the electric power), as well as guarantee a rational use of power, by respecting the environment and promoting sustainable develop-ment.

The National Strategy for Energy specifies that one of the main directions shall be to encourage exploitation of renewable resources, thus providing for most efficient use of the national resources on the one hand, and the protection of the environment on the other (METE, 2002)

Albania is rich in hydro energetic resources, but only about 35% of this potential has been used so far. The general hydro-power reserves which have not yet been ex-ploited, are estimated at 3000 MW. Studies

prepared by Albanian and foreign spe-cialized institutions and companies have identified a number of potential new hydro power plants (HPP) which could utilize the water resources of Drini, Vjosa and De-volli rivers. Other resources for power production are the mountainous torrents, whose hydro-energetic reserves are estimated at 100 – 120 MW.

In the recent years, there concession contracts have been signed for Ashta HPP on the Drini River, with a capacity of 48 MW, several HPPs on the Devolli River cascade with an estimated capacity of 320 MW. Another major investment, namely HPP of Skavica is currently in the course of procurement and will have an estimated capac-ity of 350 MW.

Ashta HPP is intended to increase the power production from renewable resources, and to use, at higher effectiveness, the water regime of the Drini River cascade. This HPP will be the successive sixth on the Drini River, four of which (Fierza, Komani, Vau Dejes and Ashta), are located in Albania, while the two remaining are located in FYROM.

1.3 Goal of the EIA report

Preparation of the EIA report is a legal obligation of the Law No. 8943, dated 05 September 2002 "On Environment Protection", Law No. 8990, dated on 23 January 2003 "On the Environmental Impact Assessment" and a large number of other legal acts and regulations for eventual potential environmental impacts from construction and operation activities of Ashta HPP. This report aims to determine the possible effects that this project may bring about, to the biophysical and social environment of the project zone, as well as its compliance with the environment protection policies and standards in the area.

Together with some other legal documents specified by the MoEFWA, this report will be submitted to this Ministry for review and approval. Eventually, this project will get the final approval by the National Council of Territory Planning (NCTP).

Among others, this report has considered:

- compliance with the international conventions and standards;
- harmonization of the project with the country's development and environment protec-tion policies;
- identification of the protection status for the areas to which the project will be ex-tended;
- identification of the main impacts and the proposals for mitigation measures; and
- identification of the central and local decision-making bodies, with regard to the re-sponsible legal decisions that will be taken relating to the progress of the project.

1.4 Legal and institutional framework

1.4.1 Institutional capacities

As a result of the multi-year efforts of all stakeholders at home and abroad, and the contribution of the international community, in September 2001, the National Environmental Agency was upgraded into the Ministry of Environment. The establishment of the Ministry of Environment is an important step in the framework of the country's efforts for sustainable development, which was followed by other important steps, guiding towards a contemporary structure of this ministry in the challenge of accomplishing its mission. The ministry structure reflects not only the positive international experiences and those of the countries in transition, but also the country's needs and reality, regarding sustainable management of the environment as well as the country's aspirations for EU integration.

The Ministry of Environment was established as the specialised state agency for the environmental protection in Albania. It is responsible for drafting and implementing the policies of the government on

environmental protection, for drafting legal and sub-legal acts on the field of environment, for cooperating with the incumbent ministries or institutions concerning environmental issues, for organizing and coordinating environmental monitoring, for drafting bilateral or international agreements for the environmental protection, for examining and issuing environmental permits for various economic activities, for the promotion of information, awareness and public participation in important debates on the environment, etc.

Environmental monitoring is one of the main responisibilities and one of the main sources of information for the preparation of the report on the Environmental situation. It is conducted on contractual basis, as provided for by the Decree of the Council of Ministers no.103, dated on 31.03.2002 “On the environmental monitoring in the Republic of Albania”. The partner institutions with the Ministry of Environment are the research institutions under the authority of the Albanian Public Universities or other ministries, such as the Institute of Public Health, the National Center of Energy, the Institute of Nuclear Physics, the Faculty of Natural Sciences, the Museum of Natural Sciences, the Center of Biological Studies, etc.

In 2005, the Ministry of Environment was transformed into the Ministry of Environment, Forestry and Water Administration (MoEFWA). The change in the name brought additional legal responisibilities and larger authority in the field of surface waters and forestry.

With a limited staff and budget, the MoEFWA focuses on certain priority fields such as institutional consolidation and enhanced capacities, the completion and (EU) aproximation of the legislation, the enforcement of the legislation related to environment, the protection and sustainable development of the resources, the rehabiliation of hot environmental areas of historical pollution, etc., as well as on the enhancement of cross-border, regional and international cooperation in view of better responding to the challenges of the country’s integration into the EU. In addition to the MoEFWA, there are several other central and local institutions with legal responsibilities for the protection of environment and sustainable development in Albania.

1.4.2 Legislation related to the environment

Up until 2002, the environmental protection was addressed by the 1993 Law “On Environment Protection” and an amendment in 1998. For this period, the law pro-vided the needed support and set the foundations of numerous processes and activi-ties for the environmental protection.

The environment legislation in the South-Eastern countries underwent significant changes and improvements in the last decade. In almost all these countries, the ini-tial legislation was improved during the last decade. Thus, a comprehensive legisla-tion on the environment and its EU approximation was considered as a priority objec-tive and commitment for the MoEFWA.

The Albanian Constitution approved in 1998 provides for the responsibility of the Albanian authorities for the protection and the maintenance of healthy environment, ecologically appropriate for the present and the future generations. To this end, the government is tasked to establish a more comprehensive legal and institutional framework for the environment, nature and the protection of biodiversity.

The main principles underlying the Albanian legislation relating to the environment are the same as those of the European Union:

- Sustainable development;
- environmental responsibility;
- pollution prevention;
- polluter pays principle;
- environment rehabilitation;

- integration of environment concerns with each sector policies;
- compensation for environment damage;
- public awareness and participation in decision-taking; and
- transparency in the decision-making relating to the environment.

The Law “On the Environmental Protection” (amended in 2008) is a framework act, which provides for:

- reasonable use of the environment and reduction of discharges and pollution to the environment, anticipation of damage, rehabilitation of damage to the environment;
- improvement of the environmental conditions relating to the improvement of the qual-ity of life and the protection of public health;
- protection and careful use of the renewable natural resources and their effective management
- coordination of activities organized by state institutions in view of achieving the goals for environmental protection;
- international cooperation for environmental protection and sustainable development;
- promotion of public participation in activities relation to environmental protection and sustainable development;
- integration of economic and social activities with the demands for the environmental protection and sustainable development; and
- establishment and consolidation of the institutional system for environmental protec-tion at central and local level.

There are several laws and by-laws that have been approved during the last ten years, such as:

- “On the Protected Areas”;
- “On the Protection of Air from Pollution”;
- “On the Protection of Marine Environment from Pollution and Damage”;
- “On the Carbon and Plastic Packing Tax”;
- “On the Environmental Impact Assessment”;
- “On the Strategic Environmental Assessment”;
- “On the Environmental Management of Solid Waste”;
- “On the Protection of Biodiversity”;
- “On the Protection of Wild Fauna”;
- “On the Wastewater Management”;
- “On the Protection of transboundary water bodies”;

- "On the Administration of Noises in the Environment".

There are also a number of International Conventions signed by Albania, such as:

- The Convention on Biodiversity
- The Framework Convention on Climate Change;
- The Convention on the Right of the Public to Information (Aarhus Convention);
- The Convention on the Protection of Wild Fauna and Flora;
- The Convention on the Protection of Migrating Species of Wild Fauna (Bonn Conven-tion);
- The Convention of Environmental Impact Assessment in Transboundary Context (ESPOO Finland).

In addition to drafting laws, great efforts have recently been made to preparing by-laws in order to facilitate implementation. It is significant that most of these acts are Decrees of the Council of Ministers (DCM), such as:

- DCM "On the Monitoring of Environment in the Republic of Albania";
- DCM "On the Approval of the National Action Plan for Environment";
- DCM "On the Standards for AirEmissions";
- DCM "On the Standards for Liquid Discharges and the Zone Classification Criteria";
- DCM "On the Proclamation of Monuments of the Albanian Nature";
- DCM "On the Proclamation of the Butrinti Area as Ramsar Site";
- DCM "On the Approval of the Coastal Management Plan";
- DCM "On the Establishment of the Inter-sector Committee for the Implementation of the National Action for the Environment";
- DCM "On the Establishment of the Institute of Environment";
- DCM "On the Administration of the Protected Areas";
- DCM "On the Regulation for the Approval of the Protected and Buffer Areas";
- DCM "On the Certification of Experts for the Preparation of Reports on Environmental Impact Assessment and Auditing"; and
- DCM "On the Required Documentation for the Environmental Permit and its Elements".

Some of them, such as the one on Environmental Monitoring, the National Action Plan for Environment, etc. were passed in 2002 and are still in force at present.

Another important direction regarding a comprehensive legal framework is the preparation of other by-laws issued by the MoEFWA. Hence, MoEFWA issues regulations for the ministry, the departments, the commissions under its authority, internal ordinances to provide for the normal functioning of the ministry's structures and other bodies under its authority.

Drafting and implementing environmental legislation, as well as the efforts of the MoEWFA and other central and local institutions responsible for the implementation of this legislation, provide for the legal perspectives and opportunities, to enable and significantly improve environmental protection and boost proper management of natural resources.

The Law on Environmental Impact Assessment (EIA) no. 8990 dated on 23 January 2003, is one of the most important legal acts to prevent the environmental pollution or the damage to the environment from the human activities.

This law requires a general assessment regarding the environmental effects from the proposed projects or other activities that will be taking place, in order to prevent or mitigate the negative effects on the environment.

The law determines the activities which are subject to undergo a summarized or rather a thorough process of Environmental Impact Assessment (EIA).

This chapter on EIA provides the provision for the obligation to conduct Environ-mental Impact Assessment for all projects and activities listed in the Annexes 1 and 2 of this law.

A particular article provides for the Strategic Environmental Assessment (SEA) for:

strategies and action plans for the economic development sectors; and

national and regional land use plans in urban and rural areas, industrial areas, as well as coastline and protected areas.

This law also includes a basic chapter on procedures for the EIA. It provides a list and details for the procedures to follow, the requirements for review and approval, the authority where they shall be submitted, as well as the documentation it shall contain. The MoEFWA approves the methodology for the EIA process, defining the details for the preparation of the EIA and SEA reports

As mentioned above, considering the project size and the eventual effects on the environment, the law provides for two categories, namely

a summarized process, or

a thorough process of EIA.

The Regional Environmental Agency (REA) conducts the initial screening, examines and evaluates the EIA reports and submits them to the MoEFWA with its comments. The final decision shall be taken by the Minister of Environment, Forestry and Water Administration within 2 or 3 months, depending on the category of the project.

There are provisions on the procedures related to the evaluation commission which examines the application.

The decision for the environmental permit is taken by the Minister within 5 days from the date that the commission in charge submits its findings in writing.

This law also provides for the right to appeal in a court of law by the one who ap-plies for environmental permit in case of a refusal, as well as in the cases in which the Minister might revoke a permit that has already been issued.

A special provision for public consultations as part of the EIA process is provided in the framework of decision-taking. The general public, NGOs, and other stakeholders can, in the cases of eventual irregularities, request a re-evaluation of the EIA from the MoEFWA.

1.4.3 International Conventions on environmental issues

One of the ways to address environmental issues has been to join a number of inter-national conventions and protocols. Due attention has been paid and hard work has been done for the preparation of the annual national reports and participation in training and activities organized. Here follow some of the activities carried out:

With regard to the Framework Convention on Climate Change, the most important activity was the publication of “Albania’s Second National Communication with the UN Framework Convention on Climate Change”.

The tasks deriving from the participation in the ESPOO Convention on the Environ-mental Impact Assessment in cross-border context, to which Albania has been a signatory party since 1991, were reflected onto the new law “On the Environmental Protection”. Among others, the law provides that, in cases when there are projects for which an environmental impact assessment is required, and which could have an impact on the neighbouring countries, the Republic of Albania complies with the pro-visions in the ESPOO Convention of the UN Economic Commission for Europe (UN-ECE), as well as any other general principles or standards of the international laws relating to environmental issues.

The purpose of the Protocol on Strategic Environmental Assessment (the Kiev Pro-tocol) is to set the conditions which provide for better environmental protection, also including health.

Each party should ensure that the strategic environmental assessment shall be con-ducted for plans and programs relating to agriculture, forestry, fishing, energy, indus-try, including mining, transport, regional development, waste management, tele-communication, tourism, urban and rural planning for use of land, which determine the framework for the incoming approvals of the projects listed in the annexes of the Protocol, for which strategic environmental assessment is required, as provided for by the local legislation.

Albania has ratified several conventions and protocols on environmental issues, which, in addition to the institutional consolidation and the further improvement of the legal framework, will have a continuous effect on a better environmental manage-ment.

Although Albania has not yet adopted the EU Water Framework Directive, its provi-sions have been taken into account in the preparations and the work done for the EIA report, as well as in the context of the protection of the Drini River ecosystem from the construction works. It has also been considered on Ashta HPP exploitation with regard to the rivers and the groundwaters. In particular, due attention has been paid in the chapters about the biodiversity in the Environmental Management Plan and the Environmental Monitoring Program (Annex V of the Directive).

In this report, due account has been taken of the guidelines from the WB, IEA and WCD.

1.4.4 Determining the boundaries of the study area

The project area includes the Spathari reservoir and the Drini and Gjadri riverbed, from the Spathari reservoir downstream west of Ashta village.

This project has direct impacts on the following:

the Spathari reservoir;

a few small islands within this reservoir;

limited area of land in the villages Vau Dejes and Spathari;

the Drini riverbed from the Spathari weir to the village Ashta; and

gravelly area north of the villages Stajka, Kosmaci and Ashta.

The indirect impactsof the project activities may affect the following areas:

the southern part of the lands in the villages Stajka, Kosmaci and Ashta;

other villages of the COB, whose water supply resources are in the water-bearing layers of the fields of lower Shkodra area, south of the project track;

the Drini and Gjadri Rivers, regarding the rehabilitation of the fluvial ichtiofauna, from the construction of a fish-pass close tothe Spathari weir.

2 ENVIRONMENTAL BASELINE

2.1 Physical environment

2.1.1 Geographical description of the project area

The project area lies in lowland between the Vau Dejes HPP and the confluence of Drini River with Buna River.

The Hydropower Plants Ashta 1 and Ashta 2 have been planned to be built on the Drini River bed, in the territory of the COB. The project Axis: Spathari weir – Ashta village, goes north of the villages Stajka, Kosmaçi and Ashta, on the left of the Drini River flow (fig.2.1.1).

Figure 2.1.1. Satellite view of the project area

Figure 2.1.2. Panoramic view of the basin of Lower Drini downstream Vau i Dejes, viewed from the hills north of Jubani village- left margin Spathari weir, right margin Kosmaci village (Photo Sven Ja-cobs, 2009)

Major part of the land planned to be used by the project is the expanded riverbed, and the rest is a former forested area. By a recent DCM, 353 hectares of land by the Drini River was transferred to the COB. This land is a gritty one actually, covered by gravels (fig.2.2), as the trees were cut down and the land surface has been mainly used to extract construction aggregates from the Drini riverbed.

The reckless exploitation of gravels and sands and the lack of maintenance for the embankment to protect the villages in the south of the Drini riverbed, has caused numerous flooding, such as that in 2004, when the Drini river waters flooded the vil-lages Ashta and Kosmaci.

The construction site of the Hydropower Plants Ashta 1 and Ashta 2, would affect limited areas of land in the village Ashta, at the construction site of Ashta 2 power-house, as well as agricultural land next to the Spathari reservoir as a consequence of the rise in the level of this reservoir from 22.00 m asl. to 23.50 m asl. The rest of the area directly affected by the project belongs to the Drini riverbed. The materials excavated from the channel will go for the construction of the Hydropower Plants Ashta 1 and Ashta 2, mainly consisting of gravels and sands, part of which will be used for the construction purposes in the project, while the largest part will be for sale as construction materials.

Fig.2.1.3. View East-West, of the project zone, seen from the Spathari weir, near the construction site for the Ashta 1 Hydropower Plant

South of this axis, are the fertile lands of the villages Stajka, Kosmaçi and Ashta, as well as the hills of Ashta. The powerhouse of Hydropower Plant Ashta 2 will be built between the villages Kosmaci and Ashta, about 5 km distance from the centre of the COB, about 7.5 km distance from the city of Shkodra and about 90 km distance from the city of Tirana. Whereas Ashta 1 HPP powerhouse will be built near the existing Spathari weir (fig. 2.1.4).

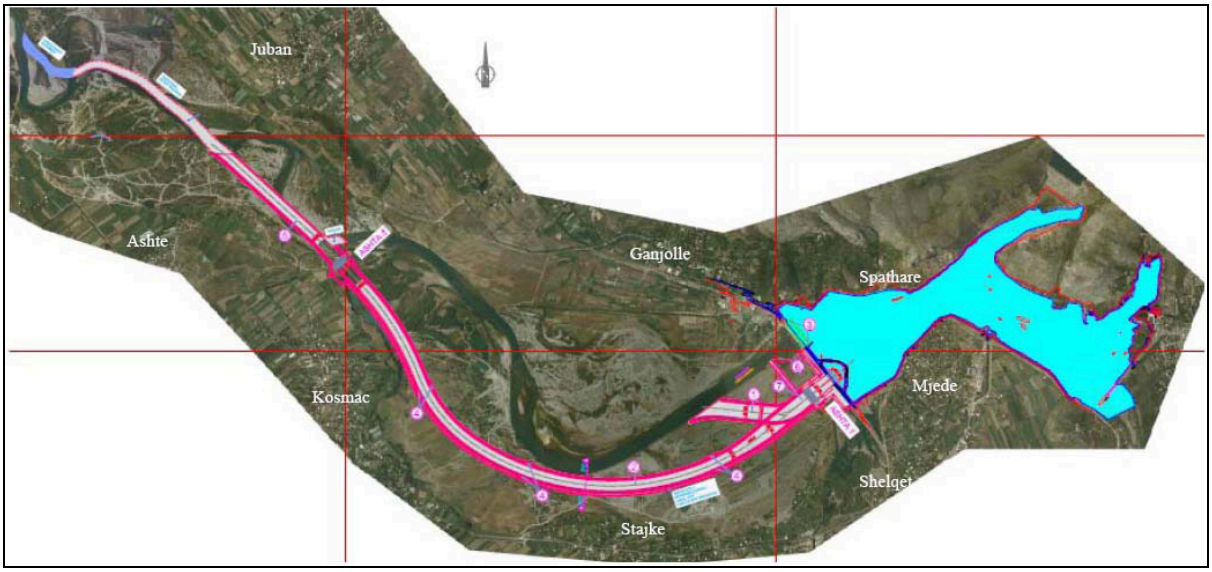

Fig. 2.1.4. Scheme of the project and its location

Parts of the villages Kosmaci, Stajka and Ashta have been included in the project area, which is mainly covered by gravels and sands, which are exploited by the con-struction companies for extraction of construction aggregates. This area used to be partly forested and under the management of the Department of the Forest Service and the Water Basins. Its reckless exploitation, and the unlawful deposit of the urban and solid waste, has aggravated the environmental situation.

The project indirectly affects the village of Jubani on the right of the Drini riverbed, opposite to the village of Ashta, due to the fact that the segment of the riverbed between these two villages will be kept deep (fig. 2.1.4), during the Ashta HPP operation .

2.1.2 Geology

The geological study of the project area, concerning the preparation of the Environ-mental Impact Evaluation report, was based on the following:

Albania's geological map (Xhomo et al, 2002);

Observations in the project area and its surrounding;

the study of the results for the earlier drilling carried out by the Albanian Geological Survey for the purpose of the water supply for the villages around the project area;

The results of the geological drilling carried out at the beginning of the year 2009, by the ALTEA Gjeostudio 2000, ordered by the company Energji Ashta (ALTEA Gjeostudio 2000, 2009);

The geological report prepared by Sven Jacobs (Jacobs S., 2009) for the purpose of the construction of the Ashta Hydropower Plant, along the Drini riverbed, on the track of the project channel.

The data was drawn and evaluated as follows:

data on the tectonics and the stratigraphy of the study area, from the Vau Dejes Hydropower Plant to the confluence of Drini River with Buna River, has been taken from the Geological Map of Albania (Xhomo et al, 2002) and the report prepared by the geologist Sven Jacobs (Jacobs S., 2009);

data on the stratigraphy in the project area from the Ashta 1 to the Ashta 2 power-houses, has been taken from the ALTEA Gjeostudio 2000 and the report prepared by the geologist Sven Jacobs (Engineering-Geology report on Ashta HPP. Jacobs S., 2009); and

data on the stratigraphy in the area south to the track of the project, has been taken from the reports of the Albanian Geological Survey, for the purposes of provid-ing water supply to the villages of this area.

2.1.2.1 General Geologic Overview

The project area lies in the external Albanides within the northern sector of the Krasta – Cukali tectonic zone, partly in the Krasta sub zone and the Lisna – Spiteni unit. The Lisna – Spiteni unit lies in the North-East and the East of the project area in position of a hanging wall to the rocks of the Krasta sub zone (footwall) and is confined by thrusts and tertiary overthrusts. It builds up the prominent geomorphologic feature of Maja e Shllimit (Shllimit peak) North of Spathari weir. In the project area, from the Vau Dejes HPP to the confluence of Drini River with Buna River, the spectrum of bedrocks reaches from upper Triassic (T3) to lower Jurassic (J1) limestone with megalodonts, stromatholith limestone and limestone with Orbitopsella praecursor (liassic foraminifer) to middle triassic volcanics and radiolarites ("Tectonic Schema of the Albanides" in Geological map of Albania, Xhomo et al, 2002). The Paleogene (Pg) formations are represented partly from Eocene (Pg2) limestone often covered by Quaternary deposits, from Paleocene-Eocene (Pg1-2) and from Maastriktian-Eocene (Cr2m-Pg2) flysch formations. Both the latest flysch formations belong to the Krasta tectonic zone.

The Quaternary deposits (Q) represented from the Pleistocene- Holocene (Qp-h) and the Holocene (Qh) deposits, have a relatively small thickness and lie in the shape of a cover, on both banks of the Drini river bed, from Vau Dejes to the conflu-ence of Drini River with Buna River. Such deposits are composed from:

Marshy and lake deposits, consisting of clays, silts, sands and turf, which are found west of the study area, near the Shkodra Lake, relatively far from the Ashta HPP construction site;

Alluvial Deposits, consisting of silts, sands and gravels, are found on the Drini river-bed and along its valley, from Vau Dejes to the Buna River, and farther on to the seaside; and

Mixed deposits of Pleistocene-Holocene (Qp-h) age, consisting of sands and grav-els, which are found in the area of Lac-Qyrsac (in the Southeast of Spathari reser-voir), Juban and Guri i Zi (in the North) and Berdice, Bushati and Pacram in the South.

2.1.2.2 Geological settings on the project area

Stratigraphy

The project track lies on Quaternary deposits consisting of sands and gravel, apart from the drilling CD 09/08 (ALTEA Gjeostudio 2000, 2009; and Jacobs S., 2009). This drill, which is near the designed construction site for the building of the Ashta 2 HPP powerhouse, runs through layers of clays and silts, belonging to the flysch for-mations of Maastrikian-Eocene (Cr2m-Pg2), of the Krasta tectonic zone.

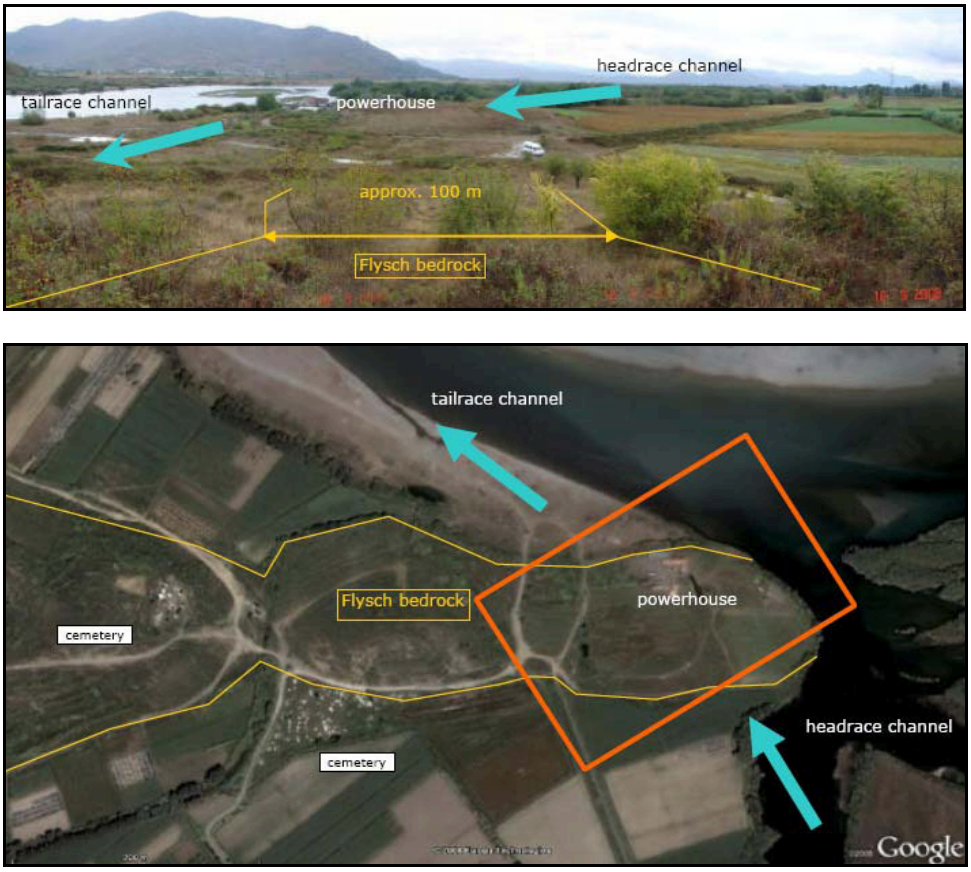

Figure 2.1.5. Location of Ashta 2 Powerhouse in flysch bedrock (According to Jacobs S, Engineering-Geology report on HPP Ashta, 2009)

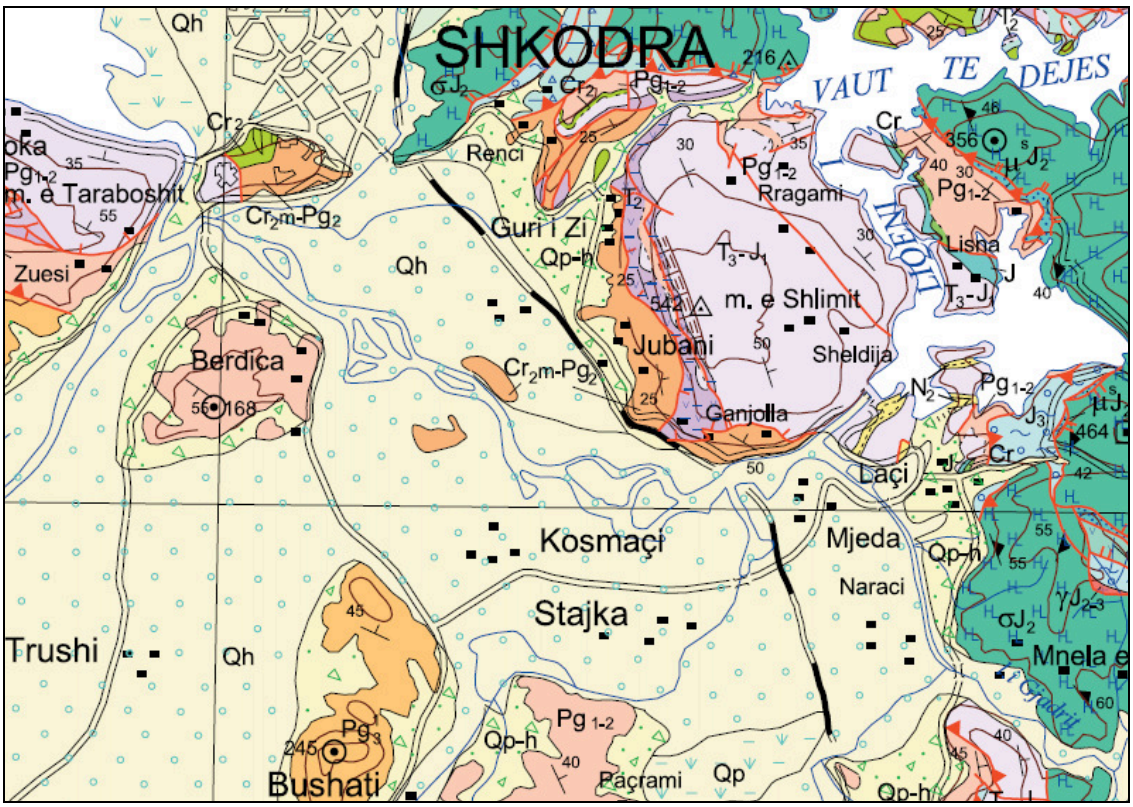

Fig. 2.1.6. Geological map of the study area, (according to the geological map of Albania, 1:200.000, Xhomo et al., 2002)

Qh: Holocene. Marshy-Lacustrine Deposits (Q_4k-l): clays, silts, sands, turfs.

Qh: Holocene. Alluvial Deposits aluviale(Q_4al): silts, sands, gravels.

Qp-h: Pleistocene-Holocene. Mixed alluvial-prolluvial deposits: sands, gravels.

N_2: Pliocene. Clays, sandstones, conglomerates

Pg_{1-2}: Paleocene-Eocene. Mergele, flysch aleurolito-sanstone, zone of Albanian Alps.

Cr_{2m}-Pg_2: Maastrichtian-Eocene. Flysch: (clays, silts, sands, marls)

Cr_2: Upper Triassic. Limestones with rudistes, biomicritic limestones,

J_1: Lower Jurassic. Limestones dolomitized; Tectonic zone of Albanian Alps.

J: Undivided Jurassic. Limestones

T_3-J_1: Upper Triassic –Lower Jurassic. Limestones

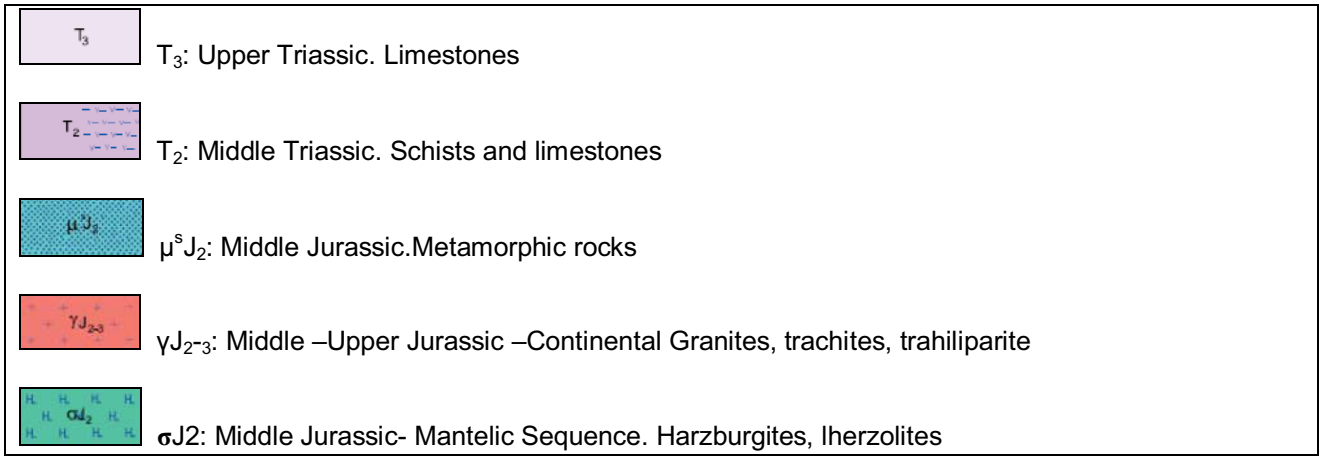

Fig. 2.1.7 Legend of the geological map

Considering the fact that the potable water and part of the irrigation water for the ar-able land in the south of the project track, comes from groundwaters of the Quater-nary gravel deposits, there has been a stratigraphic study of the upper layers of this area. The data on the Quaternary deposits in the area south to the project track has been taken from the hydro-geological wells of the AGS, done for the purpose of pro-viding potable water supply for the villages in this area.

Further down is the description of the lithology through three hydro-geological wells, drilled in the villages Ashta, Kosmaci and Stajka, which border the project area. It should be pointed out that in the three hydrogeological wells the drillings were stopped on waterbearing gravels.

The tables below provide the lithology of the hydrogeological wells in these villages.

Tab.2.1. Well lithology in the village Ashta

Ashta Well	
Composition	Depth
subclays	0.0-6.0
gravels	6.0-16.0
silty clays	15.0-27.5

Tab.2.2. Well lithology in the village Kosmaci

Kosmaci Well	
Composition	Depth
subsands	0.0-6.0
fine gravels and sands	6.0-15.0
gravels	15.0-27.5

Tab.2.3. Well lithology in the village Stajka

Stajka Well	
Composition	Depth
subsands	0.0-2.0
fine gravels	2.0-16.0
gravels	16.0-21.5

By comparing the lithology of the drilled wells by the ALTEA Geostudio 2000 (ALTEA Geostudio 2000, 2009), on the track of the HPP channel, with that of the above men-tioned hydrogeological wells (tab. 2.1, 2.2 and 2.3), it turns out that, the size of the sedimentary material becomes smaller while it leaves the Drini riverbed. The pres-ence of the silty clays in the lithologic column of the Ashta hydrogeological well con-firms the passage from the Quaternary gravel deposits to the flysch layers of Maas-trikian-Eocene (Cr2m-Pg2).

Tectonics

Tectonically, the study area is part of the Preadriatic foreland basin, affected by old and new tectonic faults. The new tectonic faults (shown by the seismic data only) are activated during and after Pliocene sedimentation phase. The map of the new active faults in Albanian territory (Aliaj et al., 2000), indicate that the project area is bor-dered to the northwest and to the east from a new tectonic fault (fig. 2.1.8), in north-west-southeast direction. This neotectonic fault passes close to Spathari village and through the Spathari reservoir.

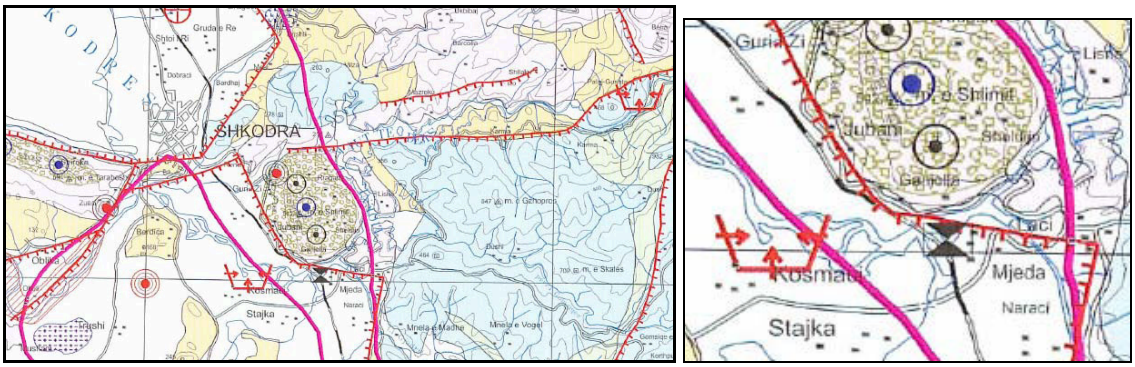

Fig.2.1.8. The active neotectonic faults (in red colour) in the project area (According to Aliaj Sh. et al, in the ”Geohazards map of Albania”, 2000)

2.1.3 Mineral resources

The mineral resources consist of construction aggregates, which are composed mainly by sands and gravel, on the Drini riverbed, on both sides of the project area.

From Vau Dejes to Shkodra, the construction aggregates are extracted from six zones (Stajka, Ganjolla, Vukatana, Kuci, Ashta and Bahcallek), with a general area of 6.49 km², consisting of approximately 11 mln

m³ of construction aggregates. The project area includes the inert extraction zones of Stajka, Ganjolla and Ashta, with their reserves given in the table below:

Tab.2.4. The reserves of the construction aggregates in the Drini riverbed in the pro-ject area

No	Object	area (km²)	thickness (m)	reserves (m³)
1	Stajka	0,56	2.0	1.100.000
2	Ganjolle	1,12	2.0	2.200.000
3	Ashta	0,56	2.0	1.300.000

Source: Laze P. et al., 2004

These construction aggregates consist mainly of gravel, and a small part of them are sands. The granular composition of these construction aggregates is given in the table below (tab.2.5).

Tab.2.5 The grain size distribution of the construction aggregates in the project area

Size	Amount in %, for each place		
	Stajka	Ganjolle	Ashta
≥ 80 mm			6.0
40-60 mm.	5.0	10,6	14.0
20-40 mm.	10,2	17,8	21,6
10-20mm.	29,3	20.0	26.0
5-10 mm.	20,3	15,2	11.0
≤ 5 mm.	33,5	36,4	21,4

Source: Laze P. et al., 2004

2.1.4 Soils

For the description of the soil quality aspects for the EIA report on the area covered by the planned project of Ashta HPP, the following reference materials have been used:

Report on the assessment of the environmental impacts and hydrodynamical as-pects of the riverbeds statement. MAF, Institute of Soils (Laze P., et al., 2004);

Pedological Map of Albania, scale 1:250,000 (Zdruli P., et al., 2001);

Consultations held with Mr. V. Kovaci, soil expert

2.1.4.1 Soils in the project area

The soils of the Ashta HPP project area contain unconsolidated deposits, not inher-ently joined, such as small stones, gravels and sands of the Pliocene-Quaternary and Quaternary deposits, which lie along the track of the channel.

Such formations have little resistance and high water permeability. Their volume var-ies from 1.4 to 1.9 g/cm3, whereas their porosity from 24 to 40 %. Such formations are insoluble, with deformation module from 50 to 1000 kg/cm2. The inner friction coefficient varies from 0.25 to 0.60, whereas the inner friction angle varies from 30-38o coarse gravels to 20o-fine gravels (Laze P., et al., 2004).

The pedological and agronomical evaluations made in the soils on both banks of the Drini river along the project area, shows that they belong to the types Dystric Cambi-sol (CMdy), Dystric Leptosol (LVdy) and Eutric Cambisol (CMeu).

These three types belong to the region 0001 (after SIS Albania, year 2000), which contains predominantly soils of the type Leptosol and Cambisol, and sporadically, soils of the type Fluvisol and Histosol. These soils have Holocene age alluvial depos-its as geological-lithological sublayers (Zdruli P., et al., 2001).

From the agronomical viewpoint, these soils are relatively deep, with colored hori-zons, not properly differentiated. They have high water permeability. Its vegetation has strong and a very active root system.

The following table provides a profile with some of the main chemical and physical-chemical indicators, related to the fertility and the pollution of these soils.

Tab.2.6. Data from the analysis of soils along the Drini riverbed

No	Parameter	Measuring unit	value
1	Water pH	unit	7.2
2	Electrical Conductivity	µS/cm	0.232
3	Humus	%	1.8
4	Total nitrogen		0.169
5	Assimilable phosphor	Ppm	13.2
6	Assimilable potassium		45
7	Total Phosphor	%	0.120
8	Nitrogen in form of ammoniac content	mg/100 g	-
9	Nitrogen in nitrate content		0.84
10	Organic mass	%	5.87
11	Nickel (total element content)	ppm	208
12	Chromium (total element content)		254
13	Cobalt (total element content)		82.2
14	Lead (total element content)		328
15	Zinc (total element content)		90.6
16	Copper (total element content)		67.6
17	Manganese (total element content)		1052
18	Potassium (total element content)	%	1.004
19	Natrium (total element content)		0.1142

Source: Laze P. et al., 2004

Tab.2.7. Texture composition of the soils

No		Fractions in mm					
1	Name of						
2	Fraction	21.24	13.6	19.48	14.64	13.52	17.52

Source: Laze P. et al., 2004

The values for granularity are as follows: Sandy from 5.9 % to 21.4 %, Loam from 55% to 61.3 % and Clay from 17.4% to 33 %. Relying on the above mentioned frac-tions, these soils are of the textural type of Silty-Loam and Sandy-Loam.

The soils have normal levels of acidity, from 7.2 to 7.3, with relatively low levels of organic matter and humus. The soil fertility level is at normal level. The levels of Ni-trogen (N) and Phosphorus (P) content are very low and consequently there is no pollution risk from these chemical elements.

In the soils on both banks of the Drini river, along the whole track of the project, the form of ickel with total nickel content is from 75 ppm (regarded as normal level), to 208 ppm (abnormal level). The contents of chromium and cobalt are respectively at 254 ppm and 82.2 ppm, whereas that of lead is at the levels from 300 to 342 ppm.

2.1.5 Seismology

For the description of the seismological aspects for the EIA report on Ashta HPP, the following reference materials have been used:

The map of the seismic regionalization of Albania (Sulstarova et al., Tirana, 1985);

Seismic regionalization of Albania (Sulstarova et al., Tirana, 1985);

Catalogue of historical and instrumental earthquakes in Albania (Sulstarova et al., 2005);

Geohazards Map of Albania (Shkupi et al., 2000);

Engineering-Geology report on Ashta HPP (Jacobs S., 2009); and

Ashta HPP report on seismic hazard evaluation (Aliaj Sh. et al., 2009).

The following order of steps were undertaken to study the seismicity of the project area:

The regional and local tectonics and seismicity;

The study of the historical and instrumental earthquakes at local and country scale; as well as

Seismicity in the project area

2.1.5.1 Regional and local tectonics and seismicity

Albania is one of the most seismically active countries in Europe (Meco & Aliai, 2000). The interaction between the Adriatic and the Albanian microplates is the main reason for seismic activity in Albania.

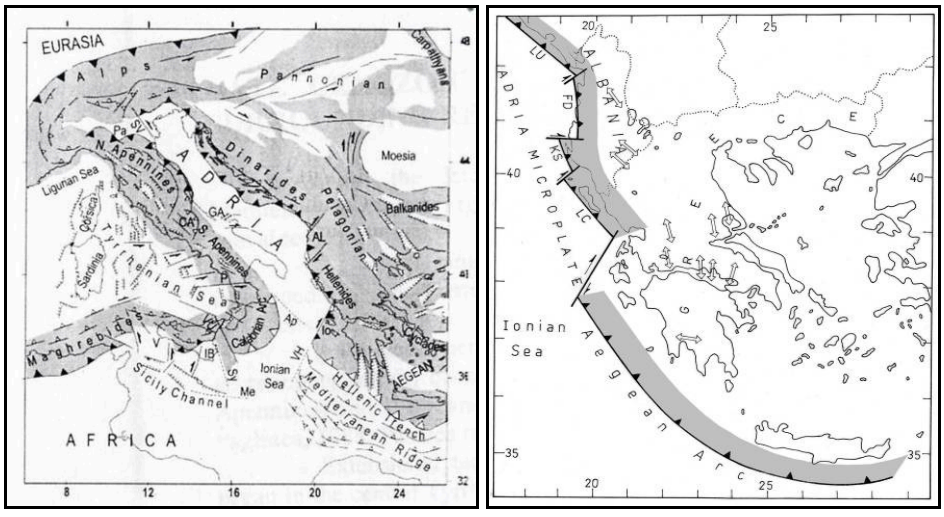

Fig.2.1.9.The Adria's microplate and the regional tectonics

A close relationship between seismic events and neotectonic faults can be observed in Albania. During the Pliocene to Quaternary (Meco & Aliai, 2000) the Albanian terri-tory was affected by uplift and extension, leading to the formation of mainly NW-SE striking horst-graben structures.

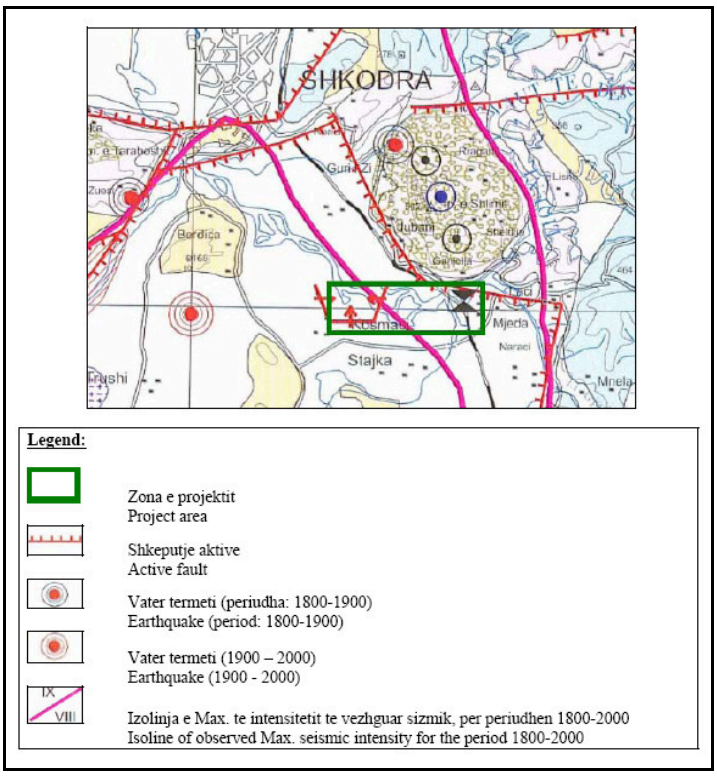

Fig.2.1.10. Active neotectonic faults in the project area & main seismic events during the last 200 years.

(According to Aliaj Sh. in the Geohazard Map of Albania, Scale 1:200.000 (Shkupi et al., 2000)

Based upon a seismo-tectonic synthesis, several longitudinal and transverse seis-mogenic zones have been identified in Albania (Meco & Aliai, 2000;Aliaj et al, 2004). The Albanian territory is divided in 10 different earthquake source zones. The project area lies within the north-western most seismic zone, the Lezha-Ulqini (LU), which is a coastal zone containing pre-Pliocene WNW-striking pure compression thrust faults that parallel the Dalmatian costal offshore line. These thrust faults are cut by rare ENE-trending strike slip faults (Aliajet al. 2004).

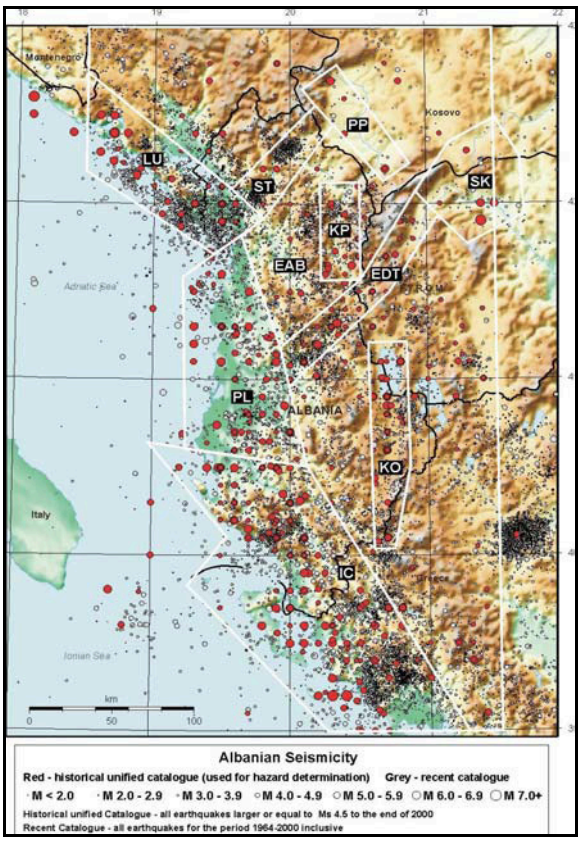

Fig.2.11. Schematic presentation of the seismic zones in Albania and the recorded earthquakes, which have served as the basis for their classification. (Aliaj Sh. Et al., 2004). The study area lies partly in the zone Lezha-Ulqini (LU), of the earthquake belt Ionian-Adriatic and the earthquake zone Shkodra-Tropoje (ST). The red circles show the high-risk earthquakes, and the grey circles show the other types of earthquakes. M< 2.0, M 2.0-2.9, M 3.0-3.9. M 4.0-4.9. M 5.0-5.9, M 6.0-6.9 and M 7.0 + show the scale of the earthquakes.

Of the ten identified earthquake source zones the Lezha-Ulqini (LU) and the Shkodra-Tropoje (ST) ones are of importance for the project region.

The maximal magnitude in the zone Lezha-Ulqini (LU), which includes most part of our study zone, is Mmax=7.2 (Aliaj Sh. et al. 2007). The other part (the eastern end, near the dam of Vau Dejes) of this region belongs to the earthquake zone Shkodra-Tropoje (ST), with clear faults in the North-East direction, along the tectonic zone of Mirdita. The expected magnitude in this zone is Mmax = 6.5 (Aliaj Sh. et al. 2007).

2.1.5.2 Historical and instrumental earthquakes in Albania

In addition to the tectonic model, the authors (Aliaj et al, 2004 & 2009) of the territo-rial division of the country into 10 seismic zones (fig.2.1.11) also relied on the cata-logue of the historical and instrumental earthquakes in Albania.

A large number of micro to low scale earthquakes distinguishes Albanian seismicity. Medium to high grade events do not happen very often (fig. 2.1.12). During 1976 to 1992, the Albanian seismological network registered some 1,200 earthquakes with a magnitude M>3.0 (equivalent to a horizontal acceleration of 0.28 m/s²), among them a 100 with M>4.0 (=0.52 m/s²) and a mere 5 with M>5.0 (=1.0 m/s²) (Meco & Aliai, 2000). Most of the recorded earthquakes had their hypocenter in a depth of 10 to 20 km, only a few had a deeper seismic centre of 30 km in depth.

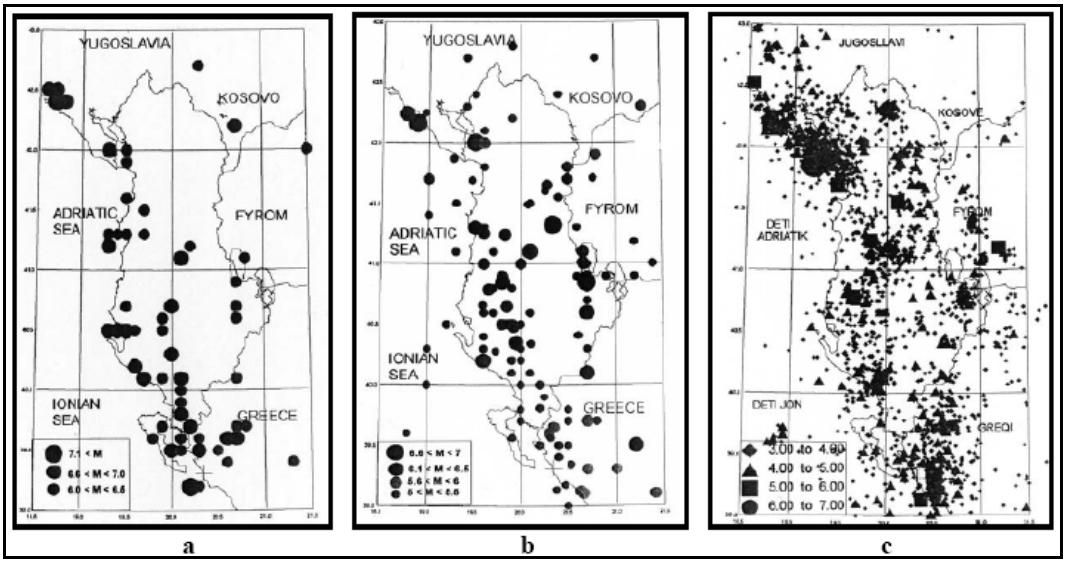

Fig.2.1.12. The hypocenters of the historical earthquakes in Albania

a-The hypocenters of the historical earthquakes for the period 58-1900 (M>6.0) (Source: Sulstarova E., et al., 2003)

b- The hypocenters of the historical earthquakes for the period 1900-2005 (M>5.0) (Source: Muco B. et al., 2002)

c- The hypocenters of the historical earthquakes for the period 1976-2005 (M>3.0) (Source: Aliaj Sh. et al., 2007)

2.1.5.3 Seismicity in the study area

Brief history of the earthquakes in the Shkodra region

Based on the seismic events described in the historical records, as well as those recorded at the seismological stations, known as historical and instrumental earth-quakes, there is relatively sufficient information concerning the seismological zones of the Albanian territory.

Below is an ordering of several historical earthquakes, mentioned in the written re-cords, as well as several strong instrumental earthquakes (for which there are measured records in the last 100 years only), in the zone of Shkodra and its sur-roundings.

The scarce studies which have survived to this date, show that, during the 19th cen-tury, there were 77 earthquakes of intensity over 7 degrees (classification MSK-1964). Among those, during the period February-October 1855, there were 12 strong earthquakes in Shkodra region. During the 20th century, several strong earthquakes were recorded, of which we are describing only two.

Shkodra on the 1st of June 1905. Magnitude Ms=6.6; Intensity I0=IX degree (MSK-1964). Complete destruction of about 1500 dwelling houses only in Shkodra city; all other buildings of this city were heavily damaged. This earthquake caused about 200 dead and about 500 injured (Koçiaj et al., 1980);

Shkodra, in 1979. Magnitude Ms=6.9; Intensity I0=IX degree (MSK-1964). The epi-centre of this earthquake was located in the coastal area, near Petrovac, Montene-gro. This earthquake was one of the strongest ones occurred in the Balkan Penin-sula during the 20th century. Its magnitude was estimated from 6.6 to 7.2. In the Al-banian recorded earthquakes catalogue its magnitude is estimated approximately MS=6.9 (Karnik, 1996). The intensity of this earthquake in epicentre is IX-X degree (MSK-64). The main shock of April 15, 1979 earthquake caused 35 casualties and 382 injuries in Albania. More than 100.000 inhabitants (mostly in

the districts of Shkodra and Lezha) were left homeless. 17.122 dwelling houses and social-cultural facilities were destroyed almost completely. There were more casualties and eco-nomic loss caused on the coastal part of Montenegro.

Seismologic classification of the project area

According to the seismic intensity map of Albanian territory (Map of Seismic Region-alization of Albania, Scale. 1:500.000, Tirana 1980; approved by DCM no 371, of 12.20.1979), the project area (fig. 2.1.13) is situated on the seismic intensity VIII de-gree MSK-64, estimated for 100 year (with 70% probability), for an average soil category (2nd Soil Category, according to the technical condition KTP-N.2-89), while the Drini River bed area on IX degree. The expected maximal earthquake magnitude is Ms=7.2.

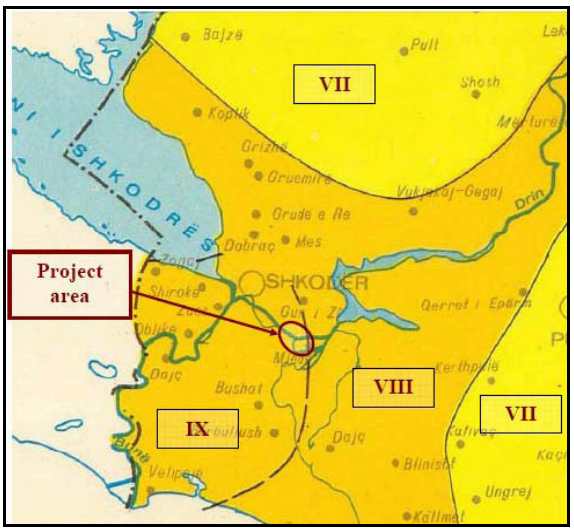

Fig.2.1.13. Seismic intensity (classification MKS-1964) of the project area. According to the Map of Seismic Re-gionalization of Albania, Scale. 1:500.000, Sulstarova et al., Tirana 1980.

2.1.6 Groundwaters

The hydrogeological study of the project area, for EIA report purposes, has relied on the following materials:

Albania's hydrogeological map, scale 1:200000 (Eftimi et al., 1983);

Hydrogeological reports related to the needs for the water supply for the villages in the area Vau Dejes – Buna River;

Consultations held with Ms. E. Dindi and Mr. Gogo Gjivogli, hydrogeologists;

Consultation with the people and the Bushati commune administration; and

Data on drinking water supply from Bushati commune.

2.1.6.1 Hydrological settings in the study region

The waterbearing complexes in the geological formations on both sides of the Drini River valley, from Vau Dejes to the Shkodra Lake, are divided into three groups: a-waterbearing complex of unconsolidated quaternary deposits of high permeability; b- waterbearing complex of consolidated geological formations of high permeability; and c- waterbearing complex of the geological formations of low permeability.

a- The waterbearing complex of the unconsolidated quaternary deposits of high permeability

This water bearing complex is represented by the alluvial Quaternary deposits (Q), on both banks of the Drini River flow, from Vau Dejes to the confluence with Buna River, including the Vukatana and Kozmac

lowland, on both sides of the Ashta HPP project area. The sandy-clayey flysch formations serve as basement for the gravel waterbearing layers.

The monitoring of the Drini River basin in the area Vau Dejes-Buna River reveals that the highest water table levels are in the period April - May. There is a decrease from late May which continues till late October, and this is the driest period of the year. The fluctuations of the static levels vary from 3.0 to 4.5 m.

The gravel aquifer of the Drini River provides the water supplies for all the villages situated on both sides of the river flow, such as: Vukatana, Mjeda, Spathari, Gan-jolla, Ashta, Kozmaci, Beltoja, Berdica e Siperme (Upper Berdica), Kuci, Trushi, Xhamia e Plumbit, etc.

b- The waterbearing complex of consolidated geological formations of high perme-ability.

The consolidated geological formations of high permeability include the Triassic (T), Jurassic (J) and Cretaceous (Cr) carbonate formations. Their waterbearing capacity depends on the intensification of karstic phenomena. These waterbearing complexes are not present within the Ashta HPP project track, but they are outcropped in the north, northeast and east of the Spathari reservoir.

c- The water bearing complex of the geological formations of low permeability

This waterbearing complex is represented by the clayey flysch formations of Neo-gene (N) age. Because of the low permeability, their waterbearing capacity is limited and practically useless. In the study area, such formations underlie the Quaternary gravel deposits, serving as water-supporting layers.

2.1.6.2 The ground waters in the project area

The project area overlies the Quaternary gravel aquifer of Drini River, which is com-posed by unconsolidated Quaternary alluvial deposits of high permeability, consist-ing mainly of coarse to fine gravels, as well as sands to a lesser extent. The ground waters of the alluvial gravels have good hydraulic connection with the surface waters of the Drini River. The whole sector from Mjeda to Berdica village, where the Drini riverbed gravels contact the buried alluvial gravels, serves as a recharge area. The general direction of groundwater flow is South-West and South.

The water table level varies from 1.0 to 3,5 m and rarely reaches 5 m deep. The fluctuations in water table levels are related to the fluctuations of the Drini River regime, showing good hydraulic connection between the riverbed gravels and the Quaternary gravel aquifer.

The layer permeability is estimated high in the sector from Mjeda village to Shkodra city. So, the conductivity is 100 to 400 m/day. The discharge for one meter draw-down is on average 50 l/s/m, in the sectors close to the Drini riverbed. The latter con-firms that the project area has considerable reserves of ground waters, which may be provided by drilling along the Drini riverbed at a distance of 200 meters from the riverbed. Going to the south of the project track, the hydrogeological parameters de-crease considerably. Near the recharge area, the ground waters have no pressure, whereas further to the south, the waters get pressure. On both sides of the project area, the thickness of the subclayey top cover increases while the distance from the Drini riverbed grows.

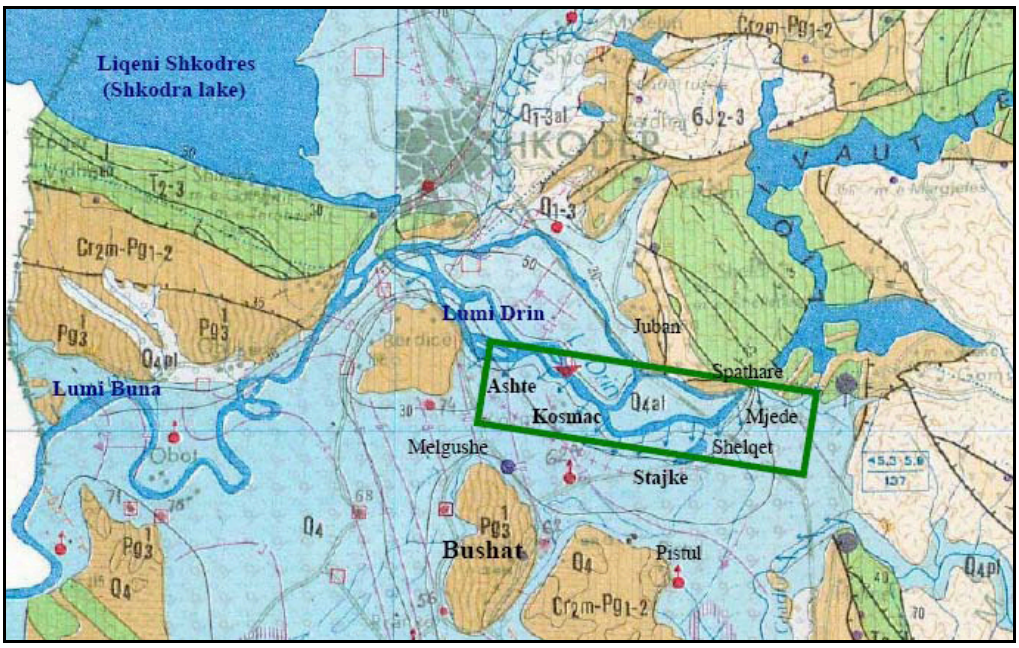

Fig.2.1.14. Hydrogeological map of the studied area. In green: the project area. (Source: Hydrogeo-logical map of Albania, sc. 1:200.000, Eftimi R. et al.,1983).

Legend

High water-bearing deposits (Q_4, Q_4al): coarse to fine gravels

(Q4, Q4al): Alluvial gravels covered by sediments of low permeability; Deposits of high waterbearing and permeability and large extension

Layers of limited extension, with medium or changeable waterbearing. Q_{1-3}, Q_{1-3}al: boulders, coarse to fine gravels, sands

Formations with karstic fissures, high waterbearing. T3 (Upper Triassic), Cr2 (Upper Cretaceous),Pg2 (Eocene): limestones, dolomites

Formations of very low waterbearing Pg1-2 (Paleocene-Eocene), Cr2m-Pg2 (Maastriktian-Eocene): silty-sandy-marly flysch

Formations of very low waterbearing Pg31 (Lower Oligocene): clays, silts, sands (flysch formations)

Hydroisohips

Main direction of the groundwater flow

Recharge area

Spring

Subartesian water well

Water supply works

Surface water collector with average discharge more than 5.000 l/s.

Fig.2.1.15. Legend of the hydrogeological map (according to Hydrogeological map of Albania, Eftimi R. et al., 1983).

Some of the villages of the COB (Bushati, Shkjeza, Ranxa, Mali Jushit, Melgusha, Barbullushi, Kukeli and Hoten), are supplied from the hydrogeological wells within the territory of each village. The other villages of this commune, including those in the project area (Stajka, Kosmaci, Ashta), are supplied from private water wells. The private water wells are generally 10 - 12 m deep. In Stajka-Kosmaci, close to the riverbed, the waterbearing layers are situated at small depth (4 – 5 m from the sur-face), are not being actually exploited for reasons related to the safety and cleanli-ness of the water.

Quantity of the groundwater of the quaternary gravels layers in the project area

Albanian Geological Survey has supported water supplies of some villages of the commune Bushati, projecting and drilling water wells. The following table (Tab. 2.8) presents hydrogeological data taken from the hydrological wells in the villages Ashta, Kosmaci and Stajka, which are close to the project track.

Tab.2.8. Hydrological data from 3 hydrological wells near the project area

No	*Location*	*Composition*	*depth (m)*	*discharge*
1	*Ashta*	*Gravels*	*6.0-16.0*	*10*
2	*Kosmaci*	*Gravels*	*15.0-27.5*	*50*
3	*Stajka*	*Gravels*	*16.0-21.5*	*50*

Quality of the ground waters of the Quaternary gravel aquifer south to the project area

The ground waters of the quaternary gravel layers in the sector south to the project track, in the territory of the Commune of Bushati, have very good physical-chemical composition in compliance with Albanian standards for drinking waters. They have no colour, no taste, no smell, temperature 12-14oC and mineralization at 0.48-0.60 g/l and total hardness at 1.31-13.5 German degree.

2.1.7 Surface waters

For the preparation of this material, we relied on the following materials:

Bushati HPP project. Evaluation report. APC, Tirana. (Lahmayer International, 2001).

Hidrology of Albania (Pano N. et al., 1984).

Floods modelling on Ashta HPP project area (Poyry, 2010).

Report on physical and chemical analysis of River Drin and River Gjadri (Sanxhaku M. et al., March 2009).

Regional Environmental Action Plan on the Basin of Drini River, the area Shkodra Depression and the Area of Lezha (UNECE, 2006).

2.1.7.1 Hydrographical characteristics of the study area

The project area includes the lower part of the Drini riverflow after leaving the Vau Dejes HPP. The Gjadri River merges with the Drini River once it flows downstream from the the dam of Vau Dejes HPP to the Spathari weir. This weir is the intake structure for the Ashta HPP.

Drini is the longest river in the country, as well as on the Adriatic Sea in the Balkan Peninsula. The Drini River flow is the third largest in the North Mediterranean, after the Rhone in France and the Po River in Italy. Drini is an international (trans-border) river. The catchment basin includes territories from Greece, FYROM, Albania, Kos-ovo and Montenegro. Its total area is 19,582 km2, 14,173 km2 of which belong di-rectly to the Drini River and 5,187 km2 belong to the Buna River. Both rivers, the Drini and the Buna merge about 30 km, before discharging into the Adriatic Sea in the border between Albania and Montenegro. The average altitude of the river basin is 970 m asl, and the maximum altitude is 2,748m asl. In the Albanian territory, about 50% of the river catchment basin is at the height of 850 m above the sea level. The river length, from its source, the Lake Ohrid in Struga to its end, is 285 km. The av-erage discharge of Drini River at Vau Dejes, is 320 m3/s, which amounts to 10 billion m3/year.

In addition to its hydrographic complexity, the Drini River has had a significant dy-namism due to its natural features as well as the human intervention. In the course of its recent history, a little over a century ago, the Drini River has been problematic, causing material damage as well as human victims. Because of its large water flow, the Drini has been causing a lot of damage and flooding at the end of its flow, after Vau Dejes, flooding the Zadrima Lowland or the Buna area. Following the well-known flooding of 1962-1963, the first efforts began, to ”force” the Drini to discharge into the Buna River only, by building up the Kosmac-Ashta embankment. Later on, the use of its hydro-energetic potential with the cascade of Vau Dejes, Komani and Fierza HPP’s began.

Fig.2.1.16. The Spathari weir and the Drini River downstream of the weir (right) and in the project area (left).

Gjadri River is the last branch of the Drini River, on its left. It is a mountainous rapid river, flowing out from the Terbuni Mountains. Its watershed is about 200 km2 and its length is 40.5 km. The average annual discharge for long term period is 8 m3/s.

The construction of the Ashta HPP closes the intervention cycle in the Drini River. It should be noted that the construction of this HPP will further reduce the risk of flood-ing by the Drini River in the area after the Vau Dejes.

2.1.7.2 Hydrological aspects of the Drini River

In the strict sense, the Ashta HPP exploits the Drini River waters after the Vau Dejes HPP. The Gjadri River merges with the Drini River once it flows downstream from the the dam of Vau Dejes HPP to the Spathari weir. The Gjadri River used to cause flooding, because it runs through a mountainous territory with heavy rainfalls.

The construction of the Vau Dejes and other HPP's along the Drini riverbed has radi-cally changed the river's hydrological regime (fig.2.9). The transport of the river sediments after the Vau Dejes Gorge has been stopped, whereas the amount of the maximum discharges has significantly decreased. Hence, the maximal discharges, with exceedence probability 99.99 (of 0,01% certainty) or returned period once in 10.000 years, estimated for the natural conditions of the Drini river, is 11,200 m3/s, but, after the construction of the HPPs' reservoirs upstream Vau Dejes, it has been estimated to reach up to 6,300 m3/s. Regarding its uniformity and regularization, there has been a change in the annual distribution of the water discharge. In fact, this is a direct result of the building of the Lake Fierza, which provides for compre-hensive season regularization through the year. In the figure below, there is an ex-ample of the distributive regularization of the water flow from the Vau Dejes HPP during an actual year.

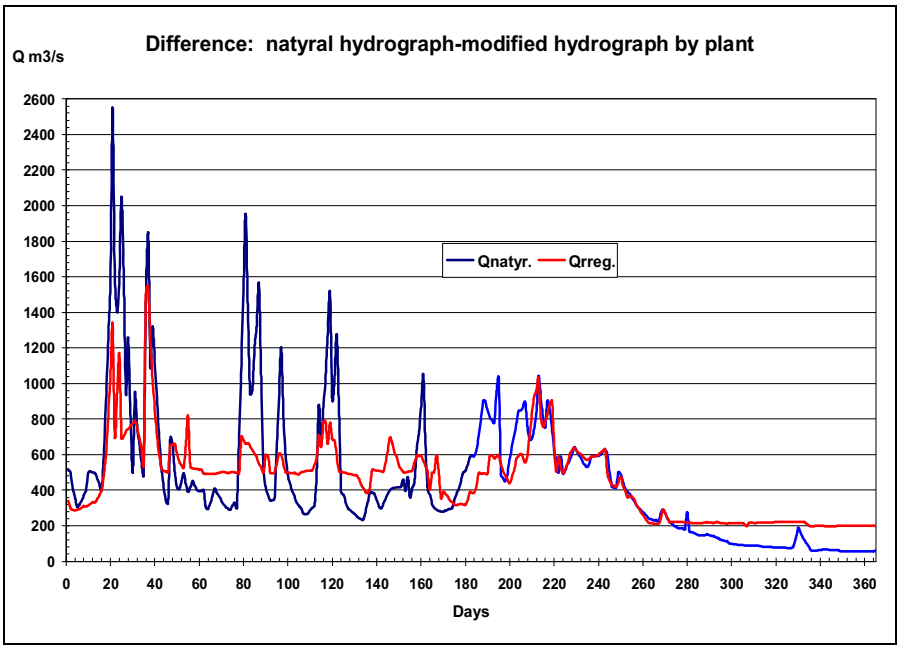

Fig.2.1.17. Impact of Vau i Dejes HPP on the variation of Drini River discharge, downstream Vau Dejes dam. (Source: Kolaneci M.,2009)

It is only the average discharge of the Drini River at the Vau Dejes downstream in the course of many years that has remained more or less unchanged. It has been slightly reduced due to the evaporation from the larger surface because of the new reservoirs, and the general trend of the changing climatic conditions in the territory of Albania, with a decrease of the annual rainfalls.

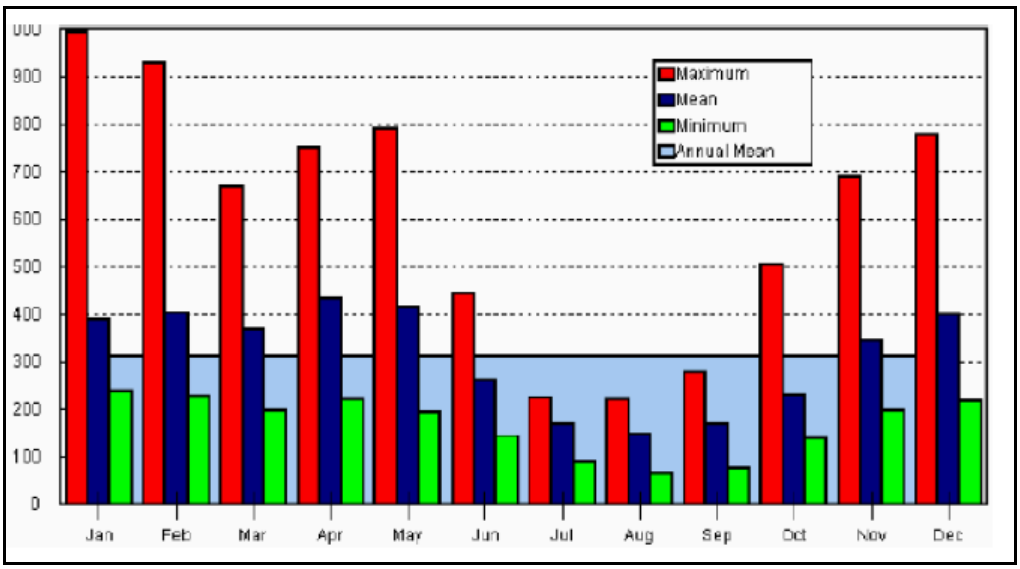

Fig.2.1.18. The average annual discharges of the Drini River at Vau Dejes. (Source: Lahmayer International, 2001)

Following the downstream flow from Vau Dejes, the Drini River joins the Gjadri River on the left, with its catchment basin 199 km2, with average discharge of about 8 m3/s and solid sediment transport estimated 30.000 m3/year. Farther on, on the right, near the village Bahcallek, another tributary joins, namely the Kiri River with catchment basin 263 km2 and average discharge of about 14 m3/s.

Following the downstream flow from Vau Dejes, the Drini River leaves a mountain-ous area, getting into a wide valley in a lowland area, with the riverbed width 170-200 m, and the valley running through 2000 – 3000 m, depending on the terrain. Due to the lowland area and the large water flow, the Drini River flows through a wide bed from Vau Dejes till the village Bahcallek, for a length of 15-16 km.

2.1.7.3 Surface water quality

The water quality of Drini River was regularly monitored and recorded by the former Hydro-meteorological Institute until 1990. The data about the main chemical figures have been recorded since the 1960's. Based on these records, it can be stated that the Drini river waters are lightly alkaline, whereas the nutrient levels are low (tab.2.11).

Tab.2.11.Average data through many years for the Drini River at the BahcallekuBridge

t (ºC)	pH	F.P (mg/l) $CaCO_3$	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K (mg/l)	HCO_3 (mg/l)	CO_3 (mg/l)	Cl (mg/l)	SO4 (mg/l)	SiO_2 (mg/l)	Free CO_2 (mg/l)	Fe (mg/l)
12.0	7.8	4.1138	63.15	26.59	3.96	0.77	165.29	2.5	9.53	62.37	3.98	4.91	2.22

The following table (tab.2.12) presents the average values of the nutrients and other chemical values for the Drini River at the Bahcalleku Bridge, near the city of Shkodra, before it joins the Buna River. Measurements have been taken by the former Hydro-meteorological Institute (SoE Report for 2002. Tirana, Albania).

Tab.2.12. Content of NH_4, NO_2, $NO_3$and P_{total} for Drini River, Bahcalleku Bridge. Year 2001-2002 (mg/l)

River	Station	Temp.C	pH	Dissolve Oxygen,	COD	N-NH_4	N-NO_2	N-NO_3	P-total
Drini	Bahcallek	8.8	7.50	10.80	0.8	0.012	0.0030	0.44	0.013

Source: SoE Report (SOER), Tirana 2003

Whereas, for 2007, Report on the SoE, gives the following data on quality analysis:

Tab.2.13. The average quality data in the Drini River at Bahcallek station in 2007,

t ºC	pH	Conductivity	Total Alkalinity	O_2 dissolved	COD	NBO5	N-NH4	N-NO_2	N-NO3	P total
15,5	8,16	243	120	9,63	0,79	1,06	0,013	0,00	0,170	0,010

Source:SoE, 2007

According to the same source (SoER, 2007) the Biochemical Oxygen Demand (BOD_5) at Bahcalleku station, varies from 0.68 to 1.84 mg/l O_2

The water quality analysis for the Drini river, including the content of the heavy metals in the Drini river waters (tab.2.14), are generally within the required standards for potable water (DCM no.145, of 26.02.1998: “Hygienic- sanitary regulation for the potable water quality monitoring, the design, the construction the use and the supervision of the potable water supply systems”).

Tab.2.14. Content of heavy metals, Drini River, Bahcalleku Bridge, 2001-2002.

Fe (µg/l)	Ni (µg/l)	Cu (µg/l)	Pb (µg/l)	Zn (µg/l)
17.25	2.25	4.25	1.5	1.75

The quality of the Drini river waters, at the Spathari weir and the Gjadri River till its discharge into the Spathari reservoir, has been checked and analyzed by two expeditions in January and February 2009 (Sanxhaku M. et al., March 2009).

The first series of water samples were taken during 22nd and 23rd of January, 2009 in the circumstances of low atmospheric pressure, with transitory rains which started on the 22nd of January. The rainfall during this day was 35 mm at Bushati and 40 mm in Shkodra. The rainy days continued until the 29th of January. The general rainfall in this period was 167 mm in Shkodra. The first expedition took place through rainy days, whereas the second expedition was in good weather.

The chemical and physical values determine the chemical regime and water quality including pH, conductivity, alkalinity, calcium, magnesium, chlorides, phosphates, Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD), etc. The results of the analysis are presented in the following table.

Tab.2.15. Physical-chemical data (GjadriBridge, 23 January 2009)

Sample location	T_w (°C)	pH	Ca^{2+} (mg/l)	Mg^{2+} (mg/l)	Na^{+} (mg/l)	K^{+} (mg/l)	HCO_3^{-} (mg/l)	CO_3^{2-} (mg/l)	Cl^{-} (mg/l)	Total hardness. (mg/l $CaCO_3$/l)	Alkalin. (mg/l $CaCO_3$/l)
Gjadri River: Gjadri Bridge (GJ1)	9.6	7.40	13.44	10.94	4.06	2.06	106.8	ND*	7.20	80.0	87.5
Gjadri River: Gjadri Bridge (GJ2)	9.4	7.59	15.36	10.94	3.49	0.92	100.7	ND*	5.76	85.0	82.5

* ND - Not Detected

Tab.2.16. Physical-chemical data (GjadriBridge, 23 January 2009)

Sample location	Conductivity (s/cm (25°C)	Dissolved Oxygen (mg/l)	Satur. O_2 %	COD (mg/l)	BOD_5 (mg/l)	$N\text{-}NH_4$ (mg/l)	$N\text{-}NO_3$ (mg/l)	$P\text{-}PO_4$ (mg/l)	Ptotal (mg/l)	TSS** (g/l)
Gjadri River: Gjadri Bridge(GJ1)	168.7	10.85	98.4	3.20	0.97	0.09	0.39	0.010	0.022	0.420
Gjadri River: Gjadri Bridge (GJ2)	149.5	11.04	99.6	2.40	0.78	0.05	0.30	0.015	0.027	0.432

** *Total Suspended Solids*

Tab.2.17. Physical-chemical data (Spathari weir, 23 January 2009)

Sample location	T_w (°C)	pH	Ca^{2+} (mg/l)	Mg^{2+} (mg/l)	Na^{+} (mg/l)	K^{+} (mg/l)	HCO_3^{-} (mg/l)	CO_3^{2-} (mg/l)	Cl^{-} (mg/l)	Total hardness(mg/l $CaCO_3$/l)	Alkalin. (mg/l $CaCO_3$/l)
River (Drini+Gjadri): Spathari weir(DR1)	6.8	7.86	26.88	16.40	4.40	2.67	134.2	ND*	7.92	137.5	110.0
River(Drini+Gjadri): Spathari weir(DR2)	7.6	7.79	24.96	8.51	4.26	2.12	131.2	ND*	7.20	100.0	107.5

Tab.2.18. Physical-chemical data (Spathari weir, 23 January 2009)

Sample location	Conductivity (s/cm (25°C)	Dissolved Oxygen (mg/l)	Satur. O_2%	COD (mg/l)	BOD_5 (mg/l)	$N\text{-}NH_4$ (mg/l)	$N\text{-}NO_3$ (mg/l)	$P\text{-}PO_4$ (mg/l)	Ptotal (mg/l)	TSS** (g/l)
Riv(Drini+Gjadri): Spathari weir(DR1)	289.0	11.04	93.4	1.76	0.78	0.01	0.62	0.005	0.022	0.073
River(Drini+Gjadri) Spathari weir(DR2)	244.0	10.85	93.7	1.84	0.97	0.03	0.54	0.005	0.022	0.281

Tab.2.19. Physical-chemical data (Gjadri bridge 1 February 2009)

Sample location	T_w (°C)	pH	Ca^{2+} (mg/l)	Mg^{2+} (mg/l)	Na^{+} (mg/l)	K^{+} (mg/l)	HCO_3^{-} (mg/l)	CO_3^{2-} (mg/l)	Cl^{-} (mg/l)	Total hardness. (mg/l $CaCO_3$/l)	Alkalin. (mg/l $CaCO_3$/l)
GjadriRiver: VauDejes Bridge(GJ1)	7.0	8.26	32.64	8.51	4.11	1.05	170.8	ND*	7.20	120.0	140.0
GjadriRiver: VauDejesBridge (GJ2)	8.0	8.26	29.76	12.15	3.87	1.03	155.6	ND*	7.20	127.5	127.5

Tab.2.20. Physical-chemical data (Gjadri Bridge 1 February 2009)

Sample location	Conductivity (s/cm (25°C)	O_2 dissolved (mg/l)	Satur. O_2%	COD (mg/l)	BOD_5 (mg/l)	N-NH_4 (mg/l)	N-NO_3 (mg/l)	P-PO_4 (mg/l)	Ptotal (mg/l)	TSS** (g/l)
River Gjadri: VauDejes Bridge (GJ1)	191.4	10.85	92.3	1.60	0.97	0.09	0.60	0.006	0.022	0.105
Gjadri river: VauDejes Bridge (GJ2)	224.0	11.04	96.3	1.88	1.16	0.06	0.63	0.004	0.022	0.099

Tab.2.21. Physical-chemical data (Spathari weir, 1 February 2009)

Sample location	T_w (°C)	pH	Ca^{2+} (mg/l)	Mg^{2+} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	HCO_3^- (mg/l)	CO_3^{2-} (mg/l)	Cl^- (mg/l)	Total hardness (mg/l $CaCO_3$/l)	Alkalin. (mg/l $CaCO_3$/l)
River(Drini+Gjadri): Spathari weir(DR1)	8.0	8.0 8	38.4	12.15	4.35	2.51	167.8	ND*	7.20	150.0	137.5
River(Drini+Gjadri): Spathari weir(DR2)	8.5	7.71	35.52	12.76	3.63	0.98	143.4	ND*	6.48	145.0	117.5

Tab.2.22. Physical-chemical data (Spathari weir, 1 February 2009)

Sample location	Conductivity (s/cm (25°C)	Dissolved Oxygen (mg/l)	Satur. O_2%	COD (mg/l)	NBO_5 (mg/l)	N-NH_4 (mg/l)	N-NO_3 (mg/l)	P-PO_4 (mg/l)	Ptotal (mg/l)	TSS** (g/l)
River (Drini+Gjadri): Spathari weir(DR1)	272.0	11.07	97.5	2.40	0.98	0.10	0.71	0.006	0.022	0.061
Riv(Drini+Gjadri): Spathari weir (DR2)	192.2	10.95	98.3	2.40	0.97	0.07	0.46	0.013	0.022	0.087

Tab.2.23. Physical-chemical data (Zadeja Bridge, 23 January, 2009)

Sample location	T_w (°C)	pH	Ca^{2+} (mg/l)	Mg^{2+} (mg/l)	Na^{+} (mg/l)	K^{+} (mg/l)	HCO_3^{-} (mg/l)	CO_3^{2-} (mg/l)	Cl^{-} (mg/l)	Total hardness (mg/l $CaCO_3$/l)	Alkalin. (mg/l $CaCO_3$/l)
River(Drini+Gjadri): Zadeje Bridge-Za1	6.6	7.74	29.4	10.33	4.26	2.32	152.5	ND*	*7.20*	142.5	125.0
River(Drini+Gjadri): Zadeje Bridge -Za2	7.8	7.90	38.4	7.29	3.97	2.19	149.5	ND*	*7.20*	130.0	122.5
River(Drini+Gjadri): Zadeje Bridge -Za3	8.4	7.96	22.08	12.15	3.87	1.77	128.1	ND*	*6.48*	107.5	105.0

Tab.2.24. Physical-chemical data (Zadeja bridge, 23 January, 2009)

Sample location	Conductivity (s/cm (25°C)	Dissolved Oxygen (mg/l)	Satur. O_2 %	COD (mg/l)	BOD_5 (mg/l)	N-NH_4 (mg/l)	N-NO_3 (mg/l)	P-PO_4 (mg/l)	Ptotal (mg/l)	TSS** (g/l)
River (Drini+Gjadri): Zadeje Bridge - Za1	283.0	11.63	97.9	2.08	0.78	0.00	0.66	0.006	0.022	0.064
River (Drini+Gjadri): Zadeje Bridge - Za2	290.0	11.43	100.6	1.76	0.79	0.02	0.84	0.006	0.023	0.124
River (Drini+Gjadri): Zadeje Bridge- Za3	231.0	11.30	95.7	2.00	0.78	0.01	0.71	0.006	0.023	0.295

Regarding the content of the heavy metals in the Drini river waters and in the sediment, the analyses have given the following figures presented in the following tables:

Tab.2.25. Concentration of heavy metals in water (µg/l)

Sample location	Cr	Co	Ni	Cu	Zn	As	Cd	Sn	Hg	Pb
Buna bridge	1.5	0.2	1.9	1.4	1.64	0.6	< 0.1	<	<	0.8
BahcallekuBridge	1.8	0.3	4.1	1.5	< 0.1	1,7	< 0.1	<	<	< 0.1
Sample	3.35	1.92	2.5	8	4.6	2.67	1.61	0.16	0.18	2.58

Tab.2.26. Concentration of heavy metals in sediment (mg/kg dry weight)

Sample location	Cr	Co	Ni	Cu	As	Cd	Sn	Hg	Pb
BahcallekuBridge	159.5	24.0	321.2	25.7	5.7	0.2	<0.5	<0.5	6.0
Buna bridge	92.6	22.7	176.5	38.9	9.6	0.4	<0.5	<0.5	27.3
Reference Sample	16.3	6.88	15.07	88.1	94.5	40.9	0.21	7.15	1078.6

Source: Anila Neziri and Walter Gössler in "Determination of heavy metals in water and sediments of the Drini River, the Buna River and the Shkodra Lake"

The concentration of heavy metals in water and sediments is generally within the limits of the EU standards. The high concentration of the chromium and nickel in the Drini river samples is related to the mineral activity in North Albania and the mineralogical composition of the sediments.

Referring to the river water categorization after the UNECE and the Albanian standard for potable water (STAZH 3904; 1997), the water quality at the Spathari weir, for the indicators analysed, falls in first category of UNECE and comply with the requirements for potable water in general (tab.2.27).

Tab.2.27. River waters categorization based on their quality indicators (mg/l).

Category	Ptotal	NO_3	Dissolved O_2	NBO5	NKO	NH_4
I	< 10	< 5	> 7	< 3	< 3	< 0.1
II	10-25	5-25	7-6	3-5	3-10	0.1-0.5
III	25-50	25-50	6-4	5-9	10-20	0.5-2
IV	50-125	50-80	4-3	9-15	20-30	2-8
V	> 125	> 80	< 3	> 15	> 30	> 8

Source: REAP on the Drini River basin, the area Shkodra Depression and Lezha, UNECE 2006.

2.1.8 Flooding

The flows of the Drini and Gjadri rivers cause large floods on both banks of the Drini River, from the Spathari weir to the confluence of Drini with Buna River. The effect of the Drini River overflowing extends to the lands on both banks of the Buna River too. For the purpose of reducing risks and damage, some protection works have been conducted (fig.2.1.19).

Fig.2.1.19. Embankment downstream the Spathari weir, for protection of the Shelqeti and Stajka fields from the flooding

Such protection works have reduced the deformation area of the Drini riverbed after the Vau Dejes Gorge, and at the same time have affected the intensity of the change to the Drini riverbed.

The historical records confirm frequent flooding from the Drini and the Buna Rivers. According to the Turkish records, in the period 1854-1871, the city of Shkodra was flooded 11 times (Bogdani M., 2003).

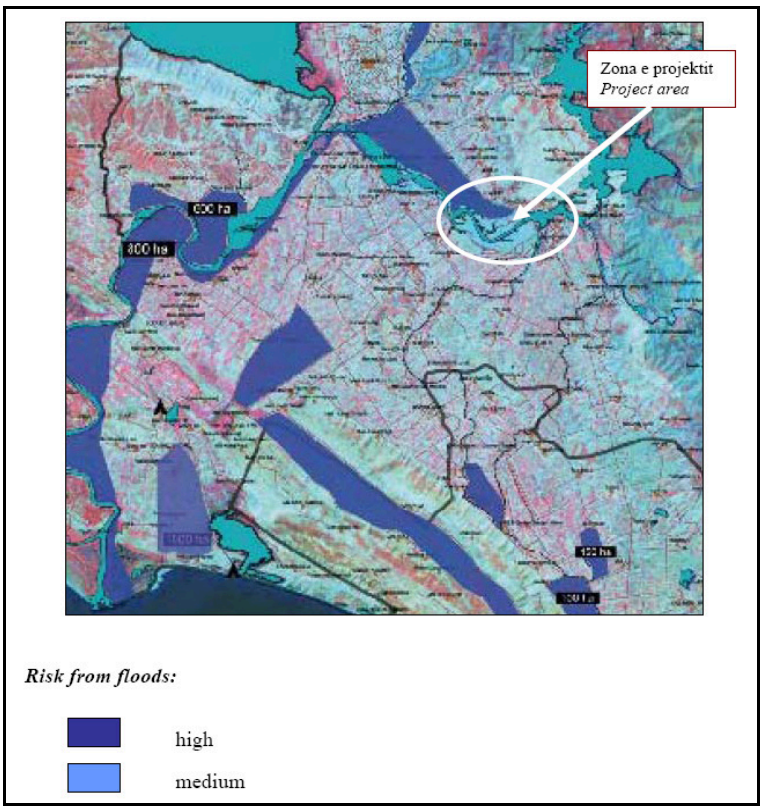

Fig.2.11.20 The map of the flood hazards in the project area. Source: UNECE, REAP, 2006

In the 20th century, we can mention the flooding of the city of Shkodra in 1905. There were floods from the Buna and the Drini rivers in the years 1937, 1952, 1960, 1962-1963 and 1970-1971.

In the 21st century, there were several floods in the study area, such as in 2002 (area Shkodra - Lezhe), February 2004 (area Shkodra - Lezhe), December 2004 and De-cember 2009 - January 2010 (city of Shkodra), etc.

The biggest flood caused by the Drini River, for which there are full records, is that of the winter 1962-1963 (Bogdani M., 2003; Hidmet Publ., 1964). Both Drini and Buna rivers had reached the highest water levels in this period since the late 19th century. The Drini reached 25.9 m asl at Vau Dejes, whereas the Buna River in the city of Shkodra (Buna Bridge) reached 9.65 m asl. The Drini River flow reached 3,310m3/s. The flooded area was vast, including a good part of the Shkodra and Zadrima fields and partly the cities of Shkodra and Lezha. In view of anticipating such catastrophes, the Mjeda - Stajka embankment was built in 1963. Besides, the Mnella embankment was built in the village Mnelle for the Gjadri River, to stop the flow of the big size alluviums (sediments) into the Drini riverbed. After 1964, all the Drini River waters run through Bahcallek before being discharged into the Buna River. In 2003, the intensive heavy rainfalls formed a very high maximum discharge on the Gjadri River, which passed in Mnella reservoir filled with alluviums too, destroying the Mnella dam as well as the embankment on the left of the riverbed. The most part of Gjadri River discharge went south towards the Lezha's Drini River direction. For this reason, even the large space of the Naraci dike, which was provided for the purpose of letting the discharge of the Drini River in the Lezha area, came to an end, and all the Gjadri River waters discharge into the Drini River, downstream the Vau Dejes HPP dam. With the construction of the Spathari weir, in the period of the high rainfalls, and particularly during the time of the maximum discharges, there is a increasing of the Gjadri water level and depositing of the river sediments, also temporarily reducing the depositing of the sediments in the area Spathari - Bahcallek.

Based on the flooded area and its duration, the 1962-1963 flooding has been con-sidered the largest of the 20th century.

The December 2009 - January 2010 flooding, during which the Drini discharge was estimated at about 2,350 m3/s, was studied in details by the POYRY on behalf of Energji Ashta.

The available data on the water level of the January 2010 flooding are recorded up-stream and downstream, and very close to Spathari weir. The measuring instrument is located in the wall on the left bank, about 10-20 m in the direction of the top of the weir. The photos of the relatively large discharges show that the measured levels are in an area of typically low speeds, but, the drawing effect of the weir is possible.

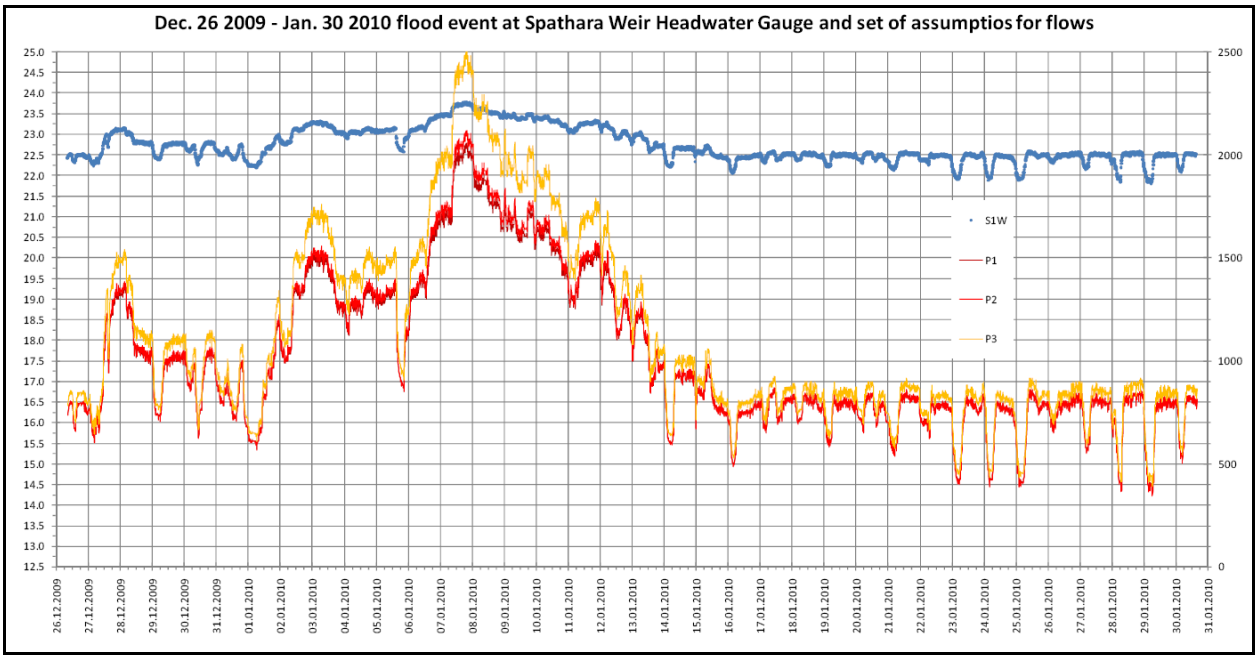

Fig.2.1.21. The Spathari weir, January 2010: the recorded water levels (S1W) and the approximate estimation of the flow on the basis of the hydraulic scale test (P1 to P3)

The picture below depicts the area affected by the flooding of December 2009 - January 2010. According to this study (POYRY, 2010), it can be seen that in the case of exceptional discharges there are considerable large areas of land as well as residential areas flooded on both banks of the Drini River, from the Spathari weir to its discharge into the Buna River. This situation has not worsened due to construc-tion of HPP Ashta.

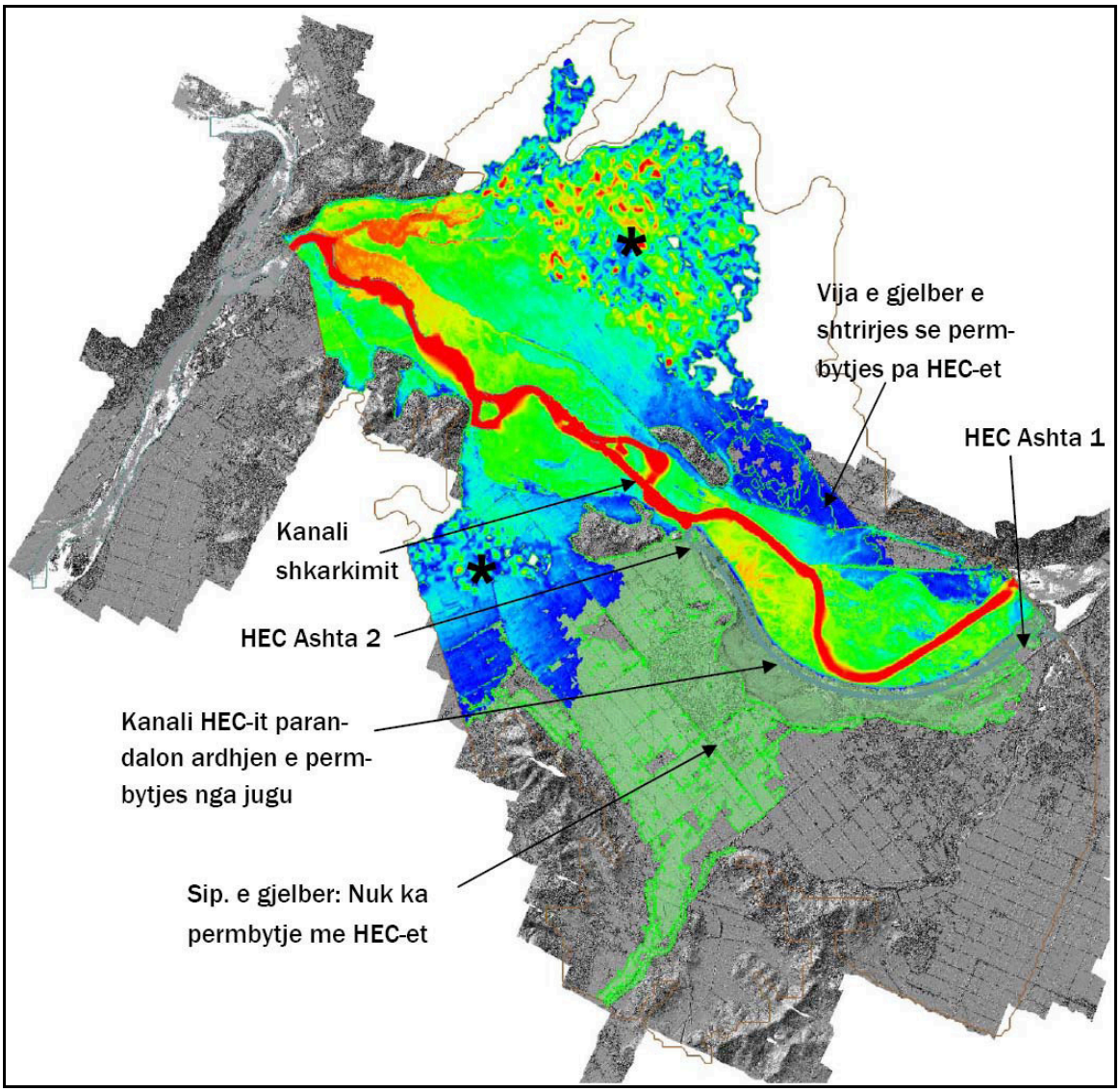

Fig. 2.1.22. The extension of the maximal flooding, with maximal depth after the construction of the HPP (in blue: low; in red: high) and the extension of the flooding prior to the HPP (the light green ar-eas and the green limited areas). The areas with the data of the height mnd SPOT have been marked with *. Here, the biggest changes in depth are based on the vagueness of the data of the height above the sea level.

2.1.9 Erosion and sedimentation

The Drini River, together with the Gjadri and Kiri Rivers, which descend from mountainous areas, transport large amounts of sediments, deposited mainly in the area of Vau i Dejës - Bahcallek, which represents the lower part of the Drini River valley. The large size sediments are found directly after getting into the lower part of this valley. Farther away, while it is flowing downstream to discharge into the Buna River, the sediment size becomes smaller. The riverbed has frequently changed its position due to the large amounts of the deposited sediments and the power of the water flow. The river sediments deposited in the area from Vau Dejes to Bahcallek, have created various continuous obstacles, which have caused shifts of the Drini river flow during the time of the exceptional discharges. The area Vau i Dejës - Kosmaçi, about 5 km long, has been obviously affected, in its plane configuration (horizontal erosion) as well as in depth (vertical erosion).

Before the construction of Vau i Dejës HPP, in 1972 the Drini River left a gorge sec-tion of more than 130 km in length at Mjeda village and emptied to an extended ba-sin. Due to higher flow velocity hardly any bed load was deposited within the gorge, consequently most sediment near the exit of the gorge was coarse-grained (sandy gravel with boulders).

The pattern of Drini River in the project area represents a so called “braided” river. An interlaced network of low sinuosity channels is typical for braided river systems. The erosion is rapid, the discharge sporadic and high and there is little vegetation to hinder runoff. Due to these parameters, the Drini riverbed gets overloaded with sediments.

Due to the changes of parameters mentioned earlier, the Drin River was undergoing shifts in flow regime. The former gravel rich braided river system was turned into a lower energetic flow system with less sediment supply, higher sinuosity, lower cur-rent velocity and higher lateral channel stability (against switching). The discharge is no longer of seasonal dependence but closely associated with the operation of Vau Dejes HPP. Due to lacking sediment supply, it is assumed that an entrenchment of the existing channel has taken place.

In the analysis of the river sediments size change deposited in the area under study, it is noticed that it becomes of finer grain (smaller size) from Spathari weir to the Drini River discharge into the Buna River. In the area Spathari - Bahcallek the aver-age diameter of the bottom sediments is about 45 mm. But, near the Bahcalleku Bridge over the Drini River, the bottom sediments deposits of diameter more than 10 mm represent only 2-4 % of the total amount.

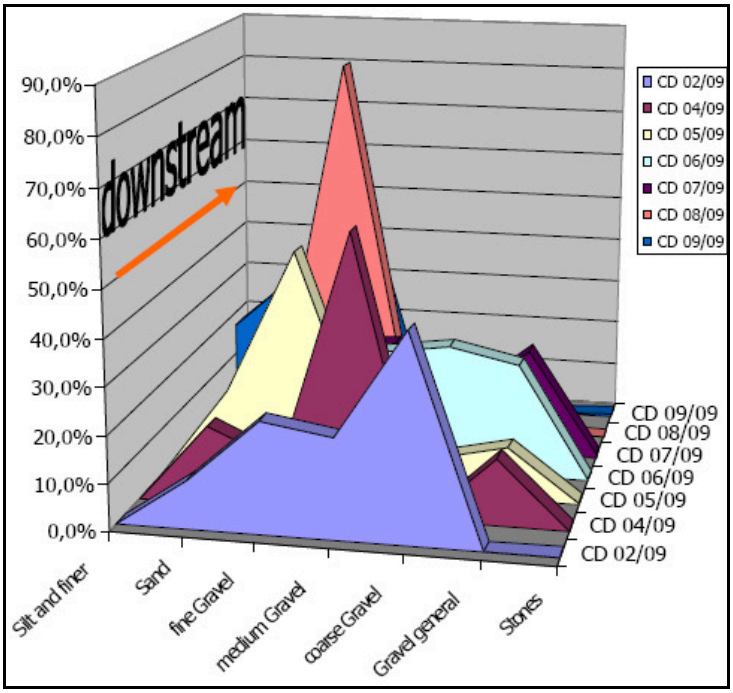

Fig. 2.1.23. Transition of coarse to finer grained sediments (coarse gravel to fine gravel) in down-stream direction of Ashta HPP’s project area (CD2/09 à CD09/09, core classification). Source: Engi-neering-Geology report on Ashta HPP’s ., Jacobs S., 2009.

Prior to the construction of the Vau Dejes HPP in 1970, the bottom solid transport of the Drini River at the Vau Dejes gorge was about 520,000 m3/year. From the Drini riverbed, (in the area Spathari - Buna River) and from the Buna riverbed, there are 510,000 m3/year gravels and sands extracted. Nowadays, the Drini riverbed, in the segment Spathari - Buna River, is supplied with sedimentary material only by the Gjadri and the Kiri Rivers. Hence, even in the project area, the Drini riverbed is being supplied with sediments from the solid discharge of the Gjadri River only.

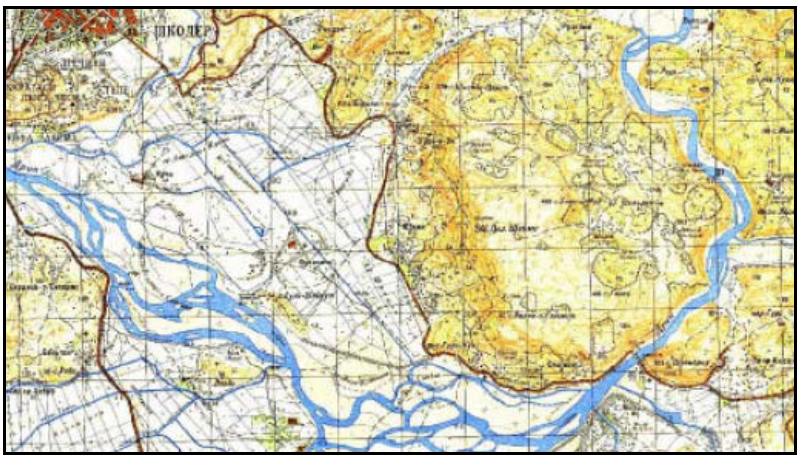

Fig. 2.1.24. Cut out of a topographical map (approx. 1939) of the project area before the construction of Drini River cascade dams (Fierza, Komani and Vau i Dejes dams)

The construction of the HPP's cascade on the Drini River has basically reduced the erosion effect of the Drini riverbed. In the project area, there is the considerable effect of the Vau Dejes HPP dam.After the 1990's, due to the reckless extraction of the Drini riverbed sediments for the supply of the construction industry, there has been a significant amplification of the erosion processes.

In the project area, the erosion is mostly due to the extraction of the sands and grav-els on the Drini river bed. The gravel extraction often neglects the technical require-mentsand in most cases is done unlawfully. Such inert material extraction has caused erosion all along the Drini River, from the Spathari Bridge to its discharge into the Buna River, and farther on, on the banks of the Buna River to the Adriatic Sea coastal area.

As a result of this erosion downstream the Spathari Bridge, the Drini riverbed level has gone down by about 0.50 m between the villages Ganjole and Stajka. The same has happened to both banks of the Drini River. North of the village Stajka, on the left of the Drini river, in the place called "zalli i Ganjollit" where the erosion has advanced up to 10 m deep into the lands of this village. From the place called "zalli i Ganjollit" to the village of Ashta there is deviation of the river flow due to the extraction of gravels and sands, with the eroded land being up to 15 meters wide and deep into the communal lands.

Fig.2.1.25. Left: Extraction of gravel and sand and erosion below the Spathari weir; Middle: A station for the extraction of the inert materials in the place called "Zalli iGanjollit, NE of the village Stajka; and Right: SE-NW view. Open holes on the Drini river bed NW of the village Ashta, near the place where the Ashta HPP waters return into the Drini river. From these holes, gravels have been extracted for use in the construction industry. This view is to be found along the whole length of the Drini riverbed, from the village Mjeda in the East till the confluence with the Buna River in the west. The hill in the centre, above, is on the other side (north) of the Drini riverbed, in the lands of the village.

2.1.10 Atmospheric environment

2.1.10.1 Climatic characteristics

From the climatic aspect, the study zone belongs to the sub-division of Northern Mediterranean Continental climate with hot dry summer and mild wet winters. The average annual temperature is between 14.5 and 16.5 °C, and the average precipitation ranges from 1,750 to 2,070 mm. The climatic characteristics have been established on the basis of the meteorological data from the meteorological stations of Shkodra Airport, Bushati, Mjeda and Vau i Dejes. The climatic elements used in this analysis include more or less all the main elements which determine the climate of a region, like the air temperature, the precipitation, the wind, the humidity and the sunshine.

2.1.10.2 Air temperature

The air temperature is one of the main climatic elements. On the basis of the data from the three mentioned stations, the average annual air temperature ranges from 14.8 to 16.3 °C. The lowest monthly temperatures are in January 5 °C, and the high-est are in July 29.9 °C. The extreme temperatures range from -13 °C to 41.5 °C. In the tables 2.30, 2.31, 2.32, are shown the details of the main parameters for the three meteorological stations, whereas in the figure 2.13 you can see the graphic for the average temperatures.

Tab.2.30. Air temperature, meteorological station of Shkodra A

Parameter	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Annual
Annual average	5.0	6.5	9.5	13.5	18.0	22.0	24.6	24.5	20.9	15.7	10.9	6.9	14.8
Max average	8.5	10.4	13.9	18.1	23.0	27.3	30.4	30.7	26.3	20.4	14.8	10.7	19.6
Min. average	1.4	2.5	5.1	8.9	13.1	16.7	18.7	18.7	15.5	10.9	7.0	3.1	10.1
Max abs.	18.2	21.7	26.0	27.5	34.5	36.2	39.2	40.1	37.6	31.0	24.5	21.7	41.5
Min. abs.	-13.0	-12.4	-4.6	-0.6	3.6	9.1	11.0	11.0	7.2	-0.1	-4.5	-6.6	-13.0

Tab.2.31. Air temperature, meteorological station of Bushati

Parameter	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Annual
Annual average	6.2	8.2	10.3	13.4	18.2	21.6	23.9	23.8	20.4	15.6	11.3	7.3	15.0
Max average	9.5	11.8	14.7	18.0	23.3	26.9	29.9	29.7	25.7	20.5	15.3	11.0	19.7
Min. average	2.8	4.7	5.8	8.8	13	16.3	18.0	17.8	16.0	8.9	7.3	3.6	10.3
Max abs.	18.6	21.8	26.5	27.0	35.2	36.5	39.4	41.0	35.9	30.5	23.8	19.3	41.0
Parameter	-11.0	-7.2	-6.0	0.0	5.4	8.0	10.4	11.7	5.6	0.8	-2.0	-6.3	-11.0

Tab.2.32. Air temperature, meteorological station of Vau Dejes

Parameter	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Annual
Annual average	6.9	8.7	10.8	14.7	19.6	22.8	25.5	25.9	22.4	17.3	12.6	8.2	16.3
Max average	9.7	11.7	14.3	18.5	24.1	27.4	30.3	30.6	26.5	21.0	17.8	11.1	20.1
Min. average	4.2	5.7	7.2	10.8	15.2	18.3	20.8	21.2	18.3	13.6	9.4	5.4	12.5
Max abs.	16.5	19.5	24.0	27.7	36.2	35.3	39.4	39.1	34.7	30.0	23.5	18.0	39.4
Parameter	-7.5	-3.6	-3.4	3.7	5.0	11.5	12.9	14.4	9.5	3.1	0.5	-4.8	-7.5

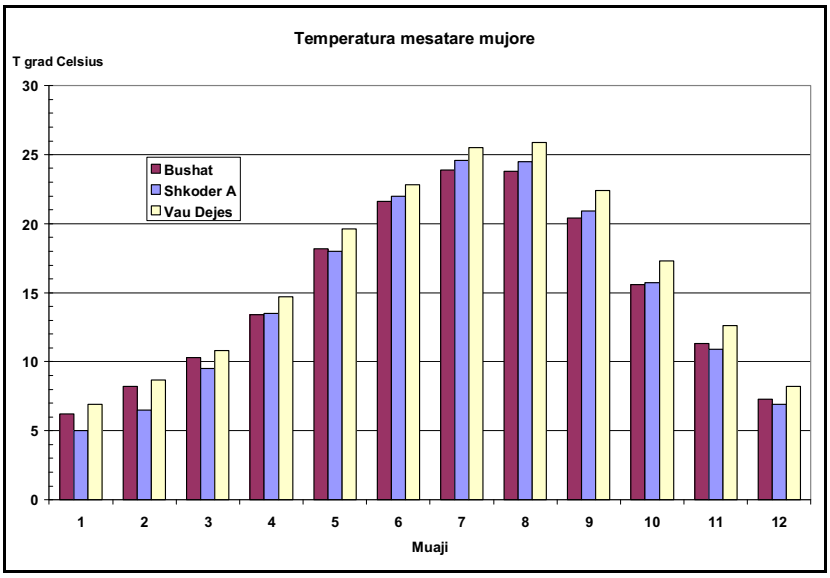

Fig.2.1.26. Annual distribution of the average air temperatures

2.1.10.3 Atmospheric precipitation

The study zone has typical high rainfalls, which reach about 2000 mm of rain in a year. The atmospheric rain parameters considered in the study include average pre-cipitation, number of rainy days, maximal 24-hour precipitation, and snow.

The number of rainy days is high, 100 days, and the 24-hour precipitation is high too, estimated at 300 mm. The detailed data are provided in the tables 2.33, 2,34 and 2.35.

Tab. 2.33. The monthly atmospheric precipitations

Station	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Annual
Shkoder A	243	200	180	174	127	67	42	70	179	231	274	280	2070
Bushat	214	158	139	124	108	67	43	63	131	169	211	216	1640
Mjedë	171	140	139	139	104	80	41	75	133	130	222	203	1577

Tab. 2.34. Average number of rainy days ≥ 1.0 mm

Station	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Annual
Shkoder A	11	10	11	10	7	6	4	5	6	9	12	12	103
Bushat	11	10	10	10	7	6	3	4	6	8	12	11	96
Mjedë	10.4	10	10.2	10.2	7.5	6.4	3.7	4.1	5.7	8.4	11.9	11.3	99.8

Tab. 2.35. The highest 24-hour precipitation

Station	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Annual
Shkoder A	130	121	189	202	131	102	70	206	291	183	186	135	291
Bushat	118	95	97	53	181	120	120	133	301	93	159	99	301

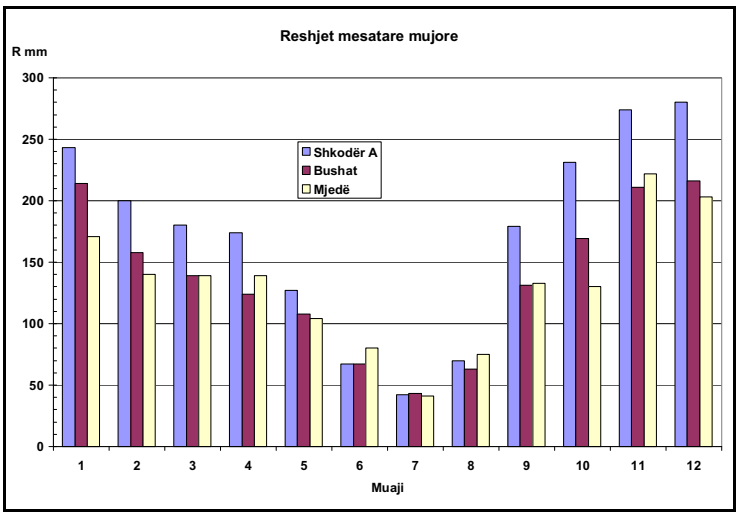

Fig. 2.1.27 Annual distribution of the atmospheric precipitation.

With regard to the snowfall, it should be pointed out that it is a rare event for the study zone. For more details, table 2.36, shows the average number of snowy days for the meteorological station of Shkodra.

Tab. 2.36. Average number of snowy days

Station	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Annual
Shkoder A	1.7	1.3	0.6	-	-	-	-	-	-	-	0.2	0.8	4.6

2.1.10.4 Sunshine

With regard to establishing the sunshine data, we used the data from the Shkodra meteorological station for two parameters, such as the duration of sunshine in hours and the average number of sunny days. The study zone is known for high figures of sunshine, which is typical for the Mediterranean climate. The tables 2.37 and 2.38 show these parameters in detail.

Tab. 2.37. Actual duration of sunshine (hours)

Station	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Annual
Shkoder A	116	117	167	189	248	293	342	316	246	195	111	105	2445

Tab. 2.38. Average number of sunny days

Station	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Annual
Shkoder A	22	22	26	27	30	30	30	31	29	24	24	21	316

2.1.10.5 Relative air humidity

The table 2.39 shows the figures of the average relative humidity in percentage for the Shkodra meteorological station

Tab. 2.39 Average relative air humidity in %

Station	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Annual
Shkoder A	75	72	68	68	67	63	56	56	64	70	76	76	66

2.1.10.6 Wind

There are no significant events in the study zone regarding wind. This is confirmed by the fact that the quietness is at a high level, about 60%. On the basis of the data from the meteorological station of Shkodra, we have established the so-called the rose of winds direction. The table 2.40 shows such data and the respective graphic (fig.2.1.27).

Tab. 2.40 Frequency and speed of the wind, for various directions, Shkodra

Quietness	N		NE		E		SE		S		SW		W		NW	
%	R	sh	r	sh	r	sh	r	sh	r	sh	r	sh	r	sh	r	sh
60.7	0.6	1.5	2.3	4	10.5	4.7	7.1	4.4	5.8	4.8	4.3	3.7	5.2	3.3	3.4	3.4

r –frequency in % s –speed in m/s

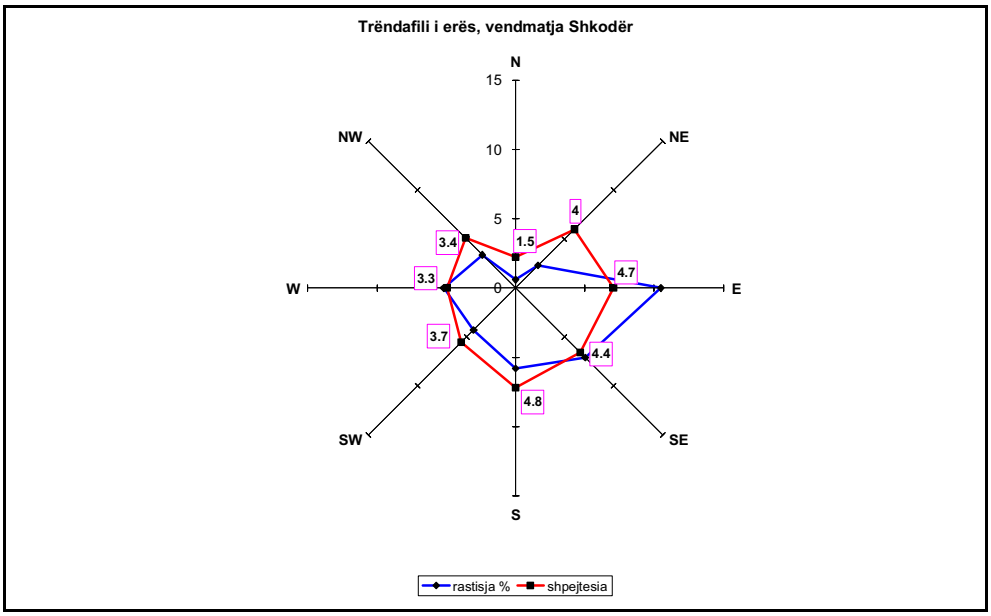

Fig.2.1.27 Rose of winds data, meterological station of Shkodra

2.2 Biological Environment

2.2.1 Biological environment in the Drini-Buna-Shkodra Lake ecosystem

The greater Drini-Buna-Shkodra Lake ecosystem represents a natural resource of instrumental value (for water, fishing, hunting, transportation, healthy climate, sport, tourism, etc.) alternated with a series of different habitats: rocky shores, sandy, gravel, swampy and wetland areas, reeds, willows, space covered with water lilies, river and stream spills, groundwater karst resources etc. These and its physical and chemical characteristics, hydrological and those related to the origin, are reflected on a rich level of biological diversity.

There are more than 120 plants known in the area and this diversity in plants species promotes the diversity of animal species. Multiple species of fish live continuously in the Shkodra Lake or temporarily introduce themselves through the migratory corri-dors such as Buna and other rivers. Approximately 139 species of birds have been found around the lake and its surrounding environments.

The Drini-Buna-Shkodra Lake ecosystem is home to many species recorded in the Red Book of endangered plants and animals in Albania.

Despite the rich biodiversity and high ecological values representing the Drini-Buna-Shkodra Lake ecosystem, part of the upstream of the Drini River, is greatly affected by the existence of several hydropower plants, and according to the Water Frame-work Directive; 2000/60/EC, this is included in the Heavily Modified Water Bodies (HMWB are bodies of water which as a result of physical alterations by human activ-ity are substantially changed in character).

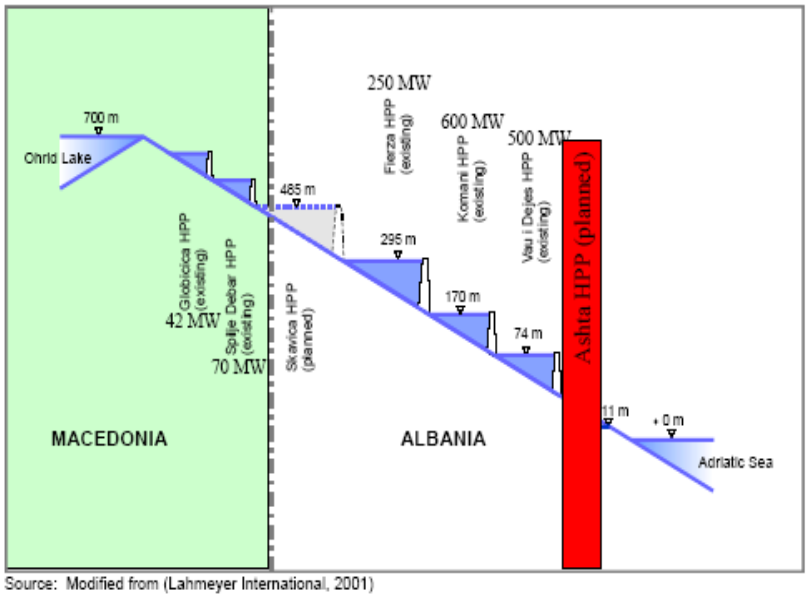

Fig. 2.2.1 Existing and planned hydropower plants on the Drini River cascade

As a consequence, migration routes of fish from the Adriatic Sea to Ohrid lake have been discontinued since the mid twentieth century. None of the hydropower plants erected on the Drini River have any fish-pass channels, or any other form such as fish-ladders, etc. to provide for fish migration.

2.2.2 Protected Areas

2.2.2.1 Wetland/Terrestrial Protected Landscape of Buna River

The closest protected area is the wetland/terrestrial protected landscape which in-cludes the Buna River along with the delta and the island of Franz Joseph, the Veli-poja Reserve, Baks-Rjolli coastal beach, the Domni Swamp, as well as their sur-rounding areas. This holistic part of Buna River and its surrounding wetland areas have been declared “Wetland/terrestrial Protected Landscape” by the DCM Nr. 682, dated 2.11.2005.

2.2.2.2 Ramsar Area Shkodra Lake and Buna River

The water sector of Shkodra Lake and Buna River has the Ramsar area status (49,562 hectares) including the eastern part of Shkodra Lake and Buna River along with its delta on the Adriatic Sea. The Albanian government has declared this area protected under the decision Nr. 683, dated 2.11.2005 “Wetland Complex of Shkodra Lake and Buna River Area, Specially Protected Natural Area, and Its Involvement in the list of Wetlands of International Importance as Habitats of Water Birds.”

2.2.2.3 Managed Natural Reserve of Shkodra Lake.

The riparian area of Shkodra Lake also enjoys the status as a protected area. Under decision Nr. 684, dated 2.11.2005, the Albania government has declared the area near Shkodra Lake “Managed Natural Reserve”.

All three of these protected areas are presented in the following figure. It is to be noted that the proposed area is located a few kilometres away from the border of the protected areas.

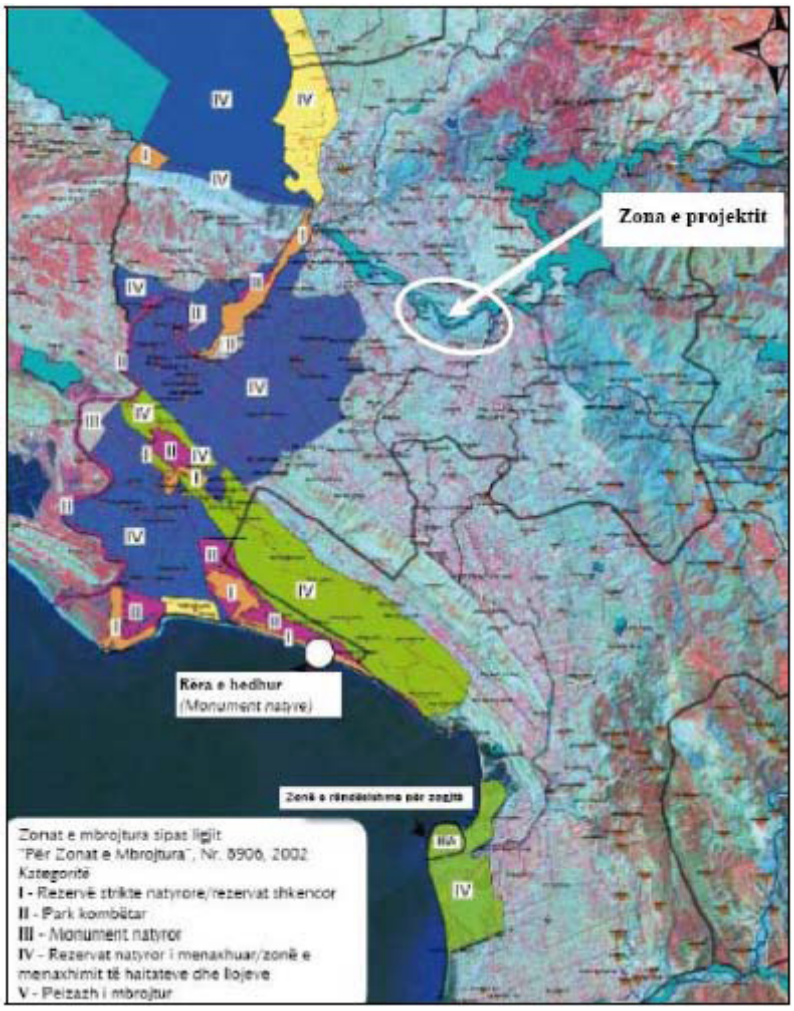

Fig. 2.2.2 Protected areas in the Drini-Buna-Shkodra lake region, and the project area

2.2.3 Ecological characteristics of the proposed project area

Despite the rich biodiversity that distinguishes the managed natural reserve of Shkodra Lake, the project area is not characterized by rich biological diversity. As illustrated from the maps, the project area does not enjoy a protected status. Even the Shkodra lake ecosystem, unlike the construction of the previous version of Bushati HPP which caused extensive damage, is not affected at all from the Ashta HPP construction.

The option designed in the early 1970's envisioned the construction of Bushati HPP, which years later in 2000 was rejected as an option that would have had significant impact on the environment, especially with the changing water regime and the devia-tion of the Drini River flow from its riverbed and confluence with Shkodra Lake and the Buna River. Instead, the construction of Ashta HPP was proposed as an alterna-tive with minimal impact on the environment and which does not change the water regime in the Drini River-Shkodra Lake –Buna River confluence.

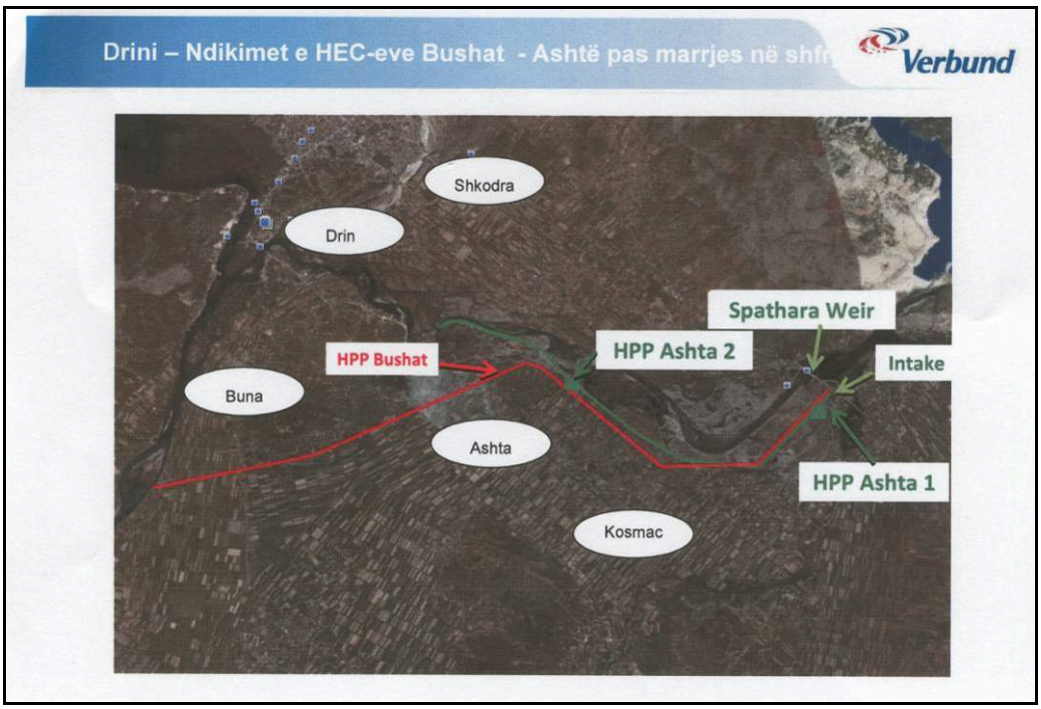

Fig. 2.2.3 Option of Bushati HPP (red) as compared with option of Ashta HPP (green) Source: Verbund

This is the reason that the Spathari weir was constructed in the project area since 1974. Consequently, this weir is existent since the early 1970's and has interrupted fish migration routes. The newly proposed project will use the existing weir .

Fig 2.2.4 Spathari Weir built in the early 1970's

The area influenced directly from the project has been studies as an area with low biological diversity compared to other regions.

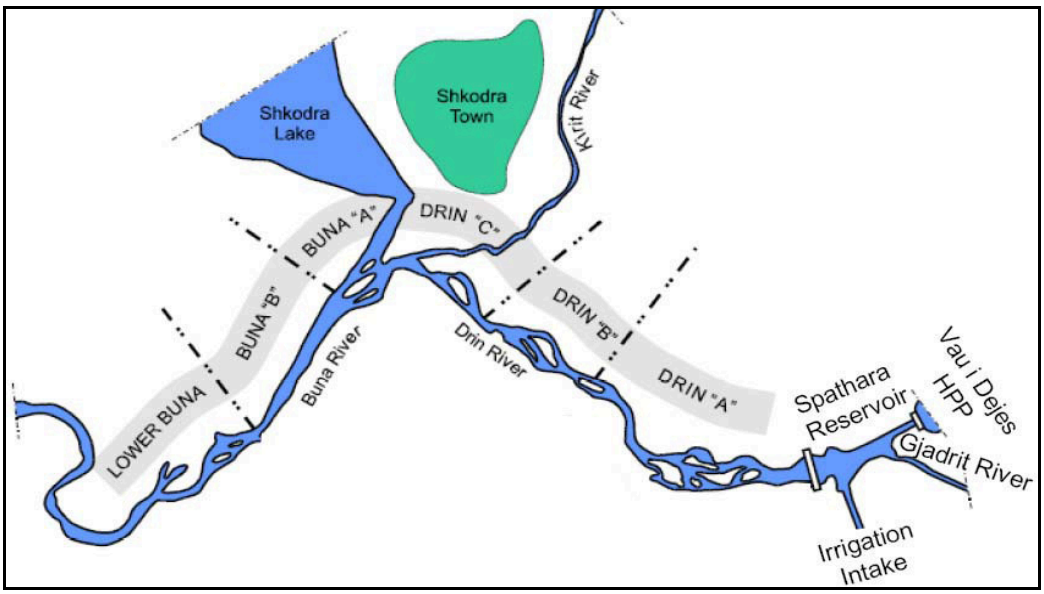

Fig. 2.2.5 The project area located in Section A – low biotic activity (Source: Lahmayer International, 2001; SNC Lavalin , 2008).

This area has lower biodiversity than the surrounding areas because it is mainly sand and gravels with very wide berth and is flooded regularly as illustrated in the map of the analysis of natural values and environmental problems, part of the Local Environmental Action Plan for the COB.

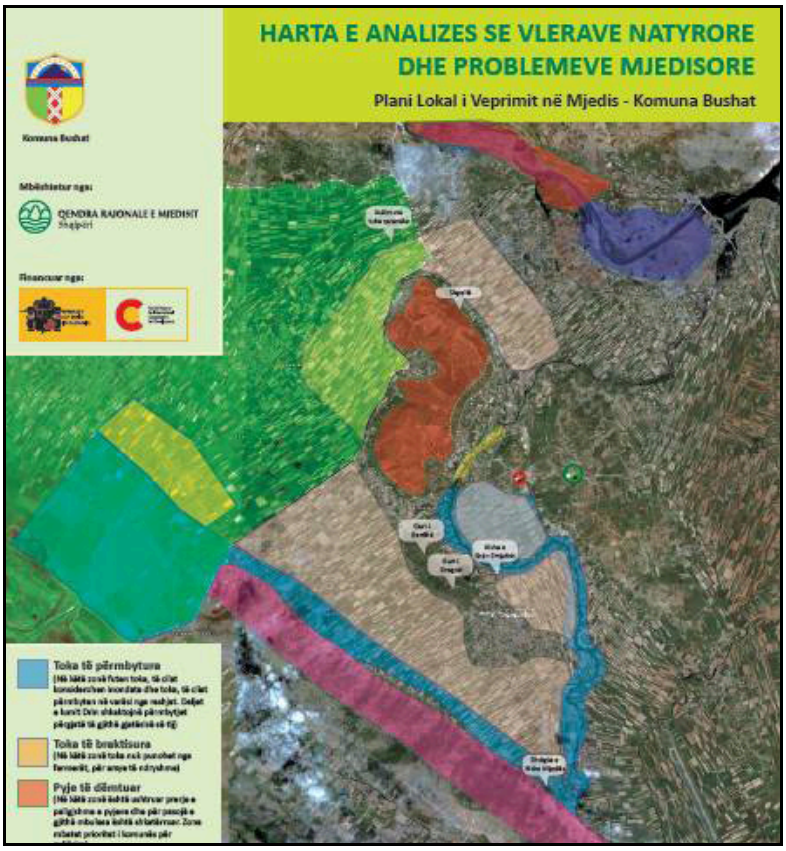

Fig. 2.2.6 Project area falls in flood-prone land (Source: REC, LEAP, Bushati commune, 2008).

2.2.4 Types of Habitats

From the phyto-climatic zone perspective, the construction of Ashta HPP in Drini River falls in the Mediterranean forests and shrubs, which is characterized by the types of habitats and plan communities,

such as vegetation of river beds, wetlands, fresh water, shrubby Mediterranean or different stages of the degradation.

2.2.4.1 Riparian forests with willow and poplar

The main part of the habitats affected is bushes and alluvial forests formation of gritty earth rivers or streams dominated from Salix alba and Alnus glutinosa (classifi-cation according to the “NATURA 2000” – 92A0 Salix alba and Populus alba galler-ies).

The main components of the alluvial forest in the Ashta HPP are species of trees such as Salix alba (at over 90% coverage) and Alnus glutinosa. As associated species the following can be mentioned: Salix purpurea, Hedera helix, Cornus sanguinea, Ruscus aculeatus, Vitex agnus-castus, Rubus ulmifolius, Rosa sempervirens, Vitis vinifera ssp. sylvestris, Ranunculus ficaria, Saponaria officinalis, Symphytum bulbosum, Calamintha grandiflora, Arum italicum, Brachypodium sylvaticum, Dactylis glomerata.

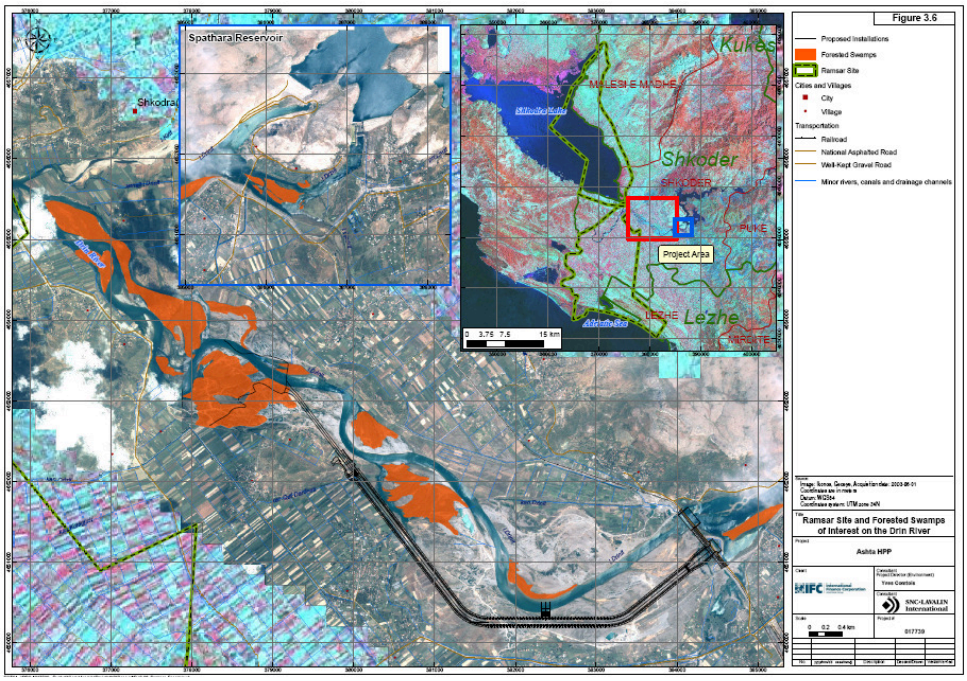

Fig. 2.2.7Riparian vegetation in the project area (Source: SNC Lavalin, 2008).

This type of habitat, currently at a very fragmented stage (5 to 6 small islands along the flow of the Drini River), constitutes the dominant type in the segment from the dam of the Vau Dejes HPP up to the ending planned portion of Ashta. It represents a type of habitat of local importance but one that is constantly threatened by floods of the Drini River. Flooding is also accompanied by erosion of surrounding land, asso-ciated with lifting of plants or trees, while wiping or creating new habitats steadily along its entire length. This explains or prevents the dominant species from gaining a superior status over other types with lower ability for competition or to have the abil-ity of creating mono-dominant associations.

Fig. 2.2.8 Alluvial or riparian forests along the riverbeds dominated by poplar (Salix alba) in the small islands along the Drini riverbed

2.2.4.2 Riverine gravel shrubs

Formations of bushes of rivers or streams are dominated by Tamarix parviflora and Vitex agnuscastus (classification according to the “NATURA 2000” – 92D0 Southern riparian galleries and thickets).

In the riverine gravel habitats of Drini River in the project area, field observations il-lustrate areas dominated by low bushes associations of dominant elements com-posed of Vitex agnuscastus as dominant species in these regions and less so from the Tamarix parviflora along with white willow (Salix alba). Grass is poor and more often Polygonum lapathifolium, Lycopus europaeus, Verbena officinalis, etc. are met. In these areas, one could often also find anthropogenic species such as Rubus ulmi-folius and the invasive one Dittrichia viscosa. The anthropogenic factor interference, pollution and waste disposal, have caused significant damaged to the flora and vegetation of high value since they act, among others, as food and shelter for many animal species.

Fig. 2.2.9 Left: Vitex agnuscastus- dominant species in these environments; and Right: Drini river-sides dominated by Rubusulmi folius, an indicator of habitat degradation

2.2.4.3 Associations of water reeds

Site observations also illustrate the presence of riparian water associations of reedss and other high helophytes (classification according to “EUNIS – C3.2 Water-fringing reed beds and tall helophytes.)

Along the banks of the river, mainly in areas of slow flowing waters, observations show bits of hydro and hygrophilous vegetation, sometimes of small scale and other times in the form of a narrow band dominated mainly by reeds (Phragmites australis). It is an association which is known for a high ecological plasticity, highly tolerant of excessive moisture in the soil and water level fluctuations.

Associated species are represented by: Typha angustifolia, Lythrum salicaria, Cla-dium mariscus, Alisma plantago-aquatica, Sparganum erectum, Equisetum palustris, Glyceria plicata, Lycopus europaeus, Schoenoplectus lacustris, Typha latifolia, etc. The association has monophytic tendencies in environments completely immerged in water or in places of quite water flow.

Fig. 2.2.10 Riparian water association of reeds (Phragmites australis) in proximity to the Spathari weir (left); and Into the pockets of quite water flow, reeds make way for Typha angustifolia (right);

2.2.4.4 Mediterranean maquis

This type of habitat is met only in the north-eastern part of Drini River and is slightly touched by inundation due to the increase in the Spathari reservoir level. It is gener-ally dominated by evergreen woody species, bushes and semi-bushes which can live for extending amounts of time in hot and dry weather. Many are scented, rich in oils, able to reduce water loss and damage from grazing. The main causes of serious vegetation changes (degradation) in this region in the past include abusive logging, inappropriate grazing, fires, and plant cultivation culture. Consequently, soil erosion in most of the terrain has caused the emergence of bedrocks on the surface, thus replacing the evergreen forests.

Most important species are evergreen bushes such as Phillyrea angustifolia, Punica granatum, Pistacia lentiscus, Myrtus communis, Quercus ilex, etc. Deciduous shrubs and bushes such as Spartium junceum, Cercis siliquastrum, Fraxinus ornus, and Cotinus coggygria are also part of maquis.

Fig. 2.2.11 Maquis degraded in the north-eastern part of the Drini River

2.2.4.5 Agricultural Land

Agricultural land is located on the outskirts of villages and urban areas (classification according to “EUNIS – Domestic X25 Gardens of Villages and urban peripheries).

Arable lands and their associated irrigation systems constitute a small area of the habitats present within the study area. The most important crops cultivated in these areas are Corn, Barley, and Alfa alfa. Horticulture in the study area is mostly pre-sented by olive trees, vineyards and other fruit trees.

Fig. 2.2.12 Pieces of land within the islands cultivated with fruit trees and poplar generations

Generally the value of this habitat is low. The vegetation is dominated by common plant species typical of cultivated lands, with low plant species diversity and low value.

2.2.5 Flora species that enjoy protection status

Some of the hydro and hygrophilous species are rare or threatened, and as such are included in the "Red Book of Albanian rare and threatened plants". Most of them are taxon vulnerable and those with low risk level. Five species have been identified from this group of rare and threatened plants (Vangjeli et. al., 1996).

Tab. 3.5 Rare or threatened plants and the threatened status according to the IUCN

Latin name	Albanian name	English name	Family	National status	International status
Butomus umbellatus L.	Bliqen, lule shtërgu, kullojsë	Flowering Rush	BUTOMACEAE	VU (A1b)	-
Cladium mariscus (L.) Pohl	Klad marisk	Sedge, Elk Sedge, Leaf Twig-	CYPERACEAE	VU (A1b)	-
Dryopteris filix-mas (L.) Schot.	Fier mashkull	Common Male-Fern	ASPIDIACEAE	LR(cd)	-
Gladiolus palustris Gaudin	Gladiolë moçalesh	Marsh Swordlily	IRIDACEAE	LR(nt)	-
Sambucus nigra L.	Shtog i zi	Common elder, Boutree	CAPRIFOLIACEAE	VU (A1b)	-

CR- critical risk of extinction(Critically endangered); DD-Deficient Data; EN- endangered; VU- Vulner-able; LRcd- Lower Risk conservation dependent; LRnt – Low Risk nearly threatened; LRlc-Lower Risk less concern

Endangered species located in this area belong to the group of species with a wide realm, and that may be affected by changes in the hydrological conditions of the en-vironment in which they are found. In this project area, their realm represents a very small percentage of their proliferation in the country.

Moreover, plants with high economic or medical value are found here, such as Alnus glutinosa, etc., are in small amount, almost incalculable. Data available and field ob-servations do not show presence of any endemic and sub-endemic species.

2.2.6 Fauna

2.2.6.1 Fish

Even though the Drini River is populated by a relatively high variety of fish, there is noticeable low presence of fish species in the project area. This is explained by the fact that Drini River is part of the Heavily Modified Water Bodies (HMWB) since it has seven dams between Ohrid lake and the Adriatic Sea, including the Spathari weir which is located in the project area. Field surveys noted low biological activity in the project area. Through the electro fishing technique it has been observed that some species are found in both below and above the Spathari weir, but there are also species which are either below or above, which indicates that this weir is a barrier in the free migration of fish and has fragmented habitats.

Tab 3.6.1 List of fish species found below and above the Spathari weir, with the electro fishing method.

Species	Albanian name	English name	ecotype	Upstream Spathari dam	Downstream Spathari dam	Total
Anguilla anguilla	ngjala	European eel	Migratory	5	0	5
Carassius gibelio	karasi prusian	Prussian karp		1	1	2
Rutilus ohridanus	skorta e Ohrit	Ohrid roach		0	7	7
Alburnus scoranza	gjuhca	Bleak		27	23	50
Squalius cephalus	mlyshi	Chub		2	3	5
Perca fluviatilis	sharmaku	Perch		23	19	42
Salaria fluviatilis	barburiqi i lumit	Freshwater blenny		1	2	3
Gambusia holbrooki	barkuleci	Mosquito fish		3	0	3
Cobitis ohridana	mrena e eger e Ohrit	Spined ochrid Loach		1	0	1

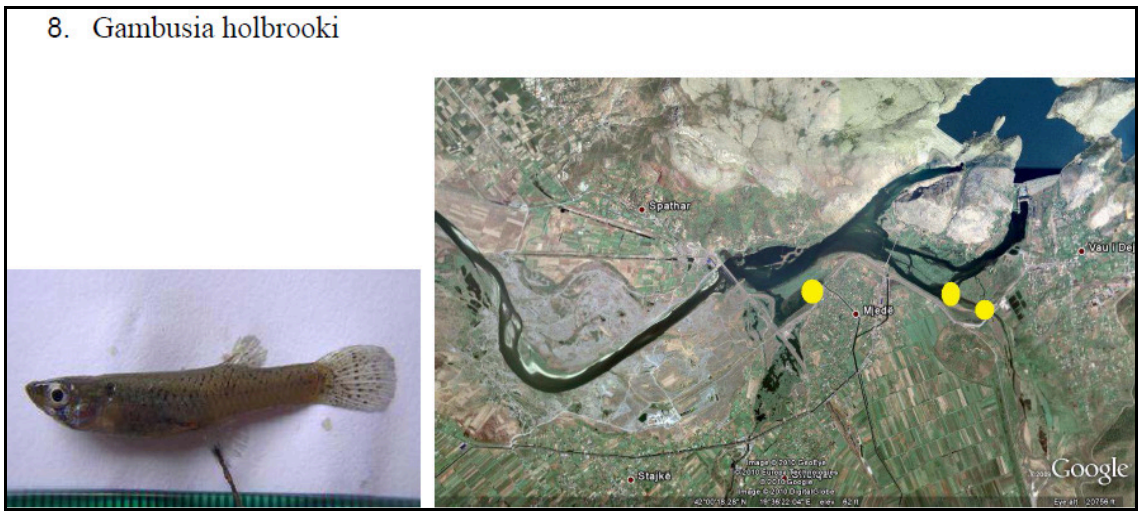

Fig 2.2.13 Example of using electro fishing to show that Gambusia holbrooki species was encountered only upstream of the Spathari weir

2.2.6.2 Amphibians

Drini River and its surrounding wetlands environment such as ponds, swamps, drainage systems and irrigation canals, provide a valuable habitat for a rich presence of amphibians. Field observations and data collected from literature show that in the study area there are 11 species of amphibians, from 16 species of amphibians known in Albania (Tab 3.1.3.3), Most common species of amphibians in the study area are Bufo bufo, Rana balcanica, R. lessonae, R. dalmatina. The full list of am-phibians appear in the Annex 3 to this report.

None of the amphibian species in the study area are endangered globally, but all are listed in the LRIc category according to the IUCN, which means that there is less danger for these species. Only one species of frog, common frog of the Balkans (Rana balcanica) is evaluated with a deteriorating status (VU) at the national level, due to growing pressure for commercial collection, while all other species belong to the list of species with non-endangered status (6 LRnt status species, 4 LRIc status species)

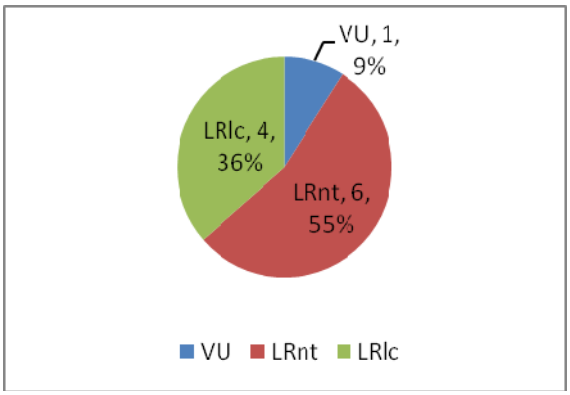

Fig. 2.2.14 Status of endangered amphibians in the study area

2.2.6.3 Reptiles

Drini River and its surrounding environment offer appropriate habitats for the pres-ence of three species of water reptiles and 19 species of land reptiles. Two species of snakes (Natrix natrix, N. tessellate) and one water turtle (Emys orbicularis are as-sociated with freshwater habitats. The majority of the reptiles met in the area are re-lated to dry habitats which include a series of open grassy habitats, shrubs, rocky environment, agricultural land and housing. The full list of reptiles is presented in the Annex to this report.

Two species of reptiles, Natrix tessellate and Podarcis taurica belong the list of glob-ally endangered species, while 11 other species have a globally preservation impor-tance because they are part of the IUCN Red List, in the category (2 species LRnt and 9 species LRlc). 18 species of reptiles belong to the list for preservation of na-tional interest, of which two species (Elaphe quatuorlineate and Elaphe situla) have a deteriorating status (VU). All species of reptiles that are met in the study area have a legally protected status.

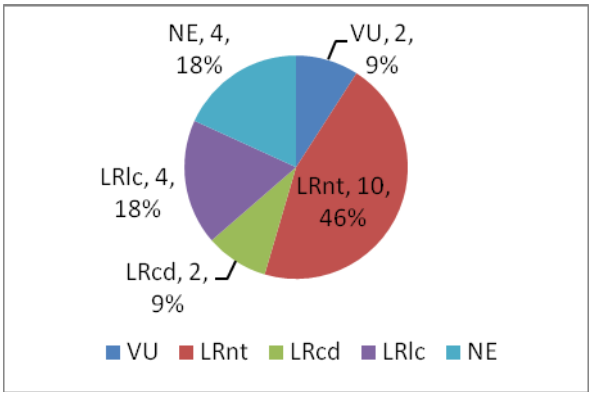

Fig. 2.2.15. Status of endangered Reptiles present in the study area

2.2.6.4 Birds

The area directly affected by the project has low bird presence which is explained by (i) low biological activity in the area, (ii) high human impact in the riverbed, and (iii) presence of the optimal habitats for food and nearby protection (e.g. Shkodra Lake). Nevertheless, this is a transitional area in the Drini River ecosystem in its course af-ter Vau Deja dam until its confluence with Buna river and Shkodra Lake. This broader ecosystem consists of a number of habitats that provide food and shelter for a number of winter or summer birds as well as migratory birds for the spring and fall seasons. This extended ecosystem has a rich ornitofauna: according to the literature and field observations, it consists of 139 species of birds (of approximately 330 known species in Albania), or approximately 42% of the Albanian ornitofauna. A rela-tively high number of aquatic birds are found in the study area (40 species), which can be explained due to the proximity of the study area to Shkodra Lake, wetland of Viluni, and other wetlands areas surrounding it, known for their high ornithological values. Aquatic birds are dominated by the Charadriformes order (15 species) and Ciconiformes order (seven species), while terrestrial birds from the Passeriformes order (81 species) and seizing birds (14 species). The presence of 14 species of seizing birds and of the Pygmy cormorant (Phalacrocorax pygmeus) gives the area a special ornithological importance.

63 species of birds are permanent or resident (R), 36 are wintering birds (W), 35 summer visitors (SV), and five species are migratory (MP). The full list of birds is presented in the Annex to this report.

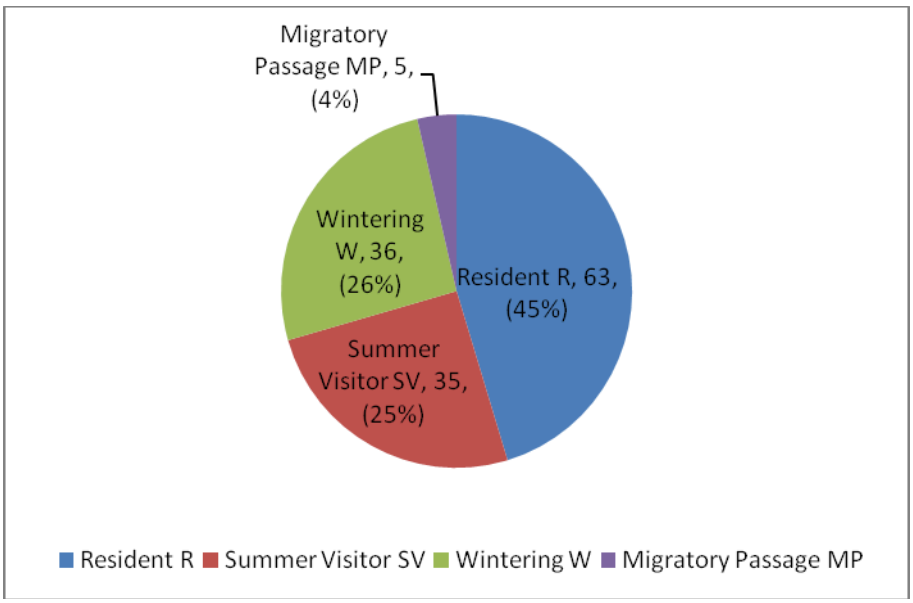

Fig. 2.2.16 Bird classification according to their seasonal or ecotype composition

The richness of birds in the study area is related to the variety of habitats found in the regions such as rivers, streams, lakes and water reservoirs, marshes, alluvial forests, grass and cultivated land, rocks and cliffs.

In the Albanian Red Book of fauna there are 35 species listed, of which 27 are criti-cally endangered (CR), 12 species are endangered (EN), and 11 species are de-grading (VU), while eight species belong to the non-endangered category (2 LRnt species, 2 LRcd species, 1 LRIc specie and 3 species have insufficient knowledge status DD). The Pygmy cormorant (Phalacrocorax pygmeus) is a permanent species in the study area and is found in the upper portion of the Spathari weir, while using the reservoir and islands of riparian trees established within the reservoir.

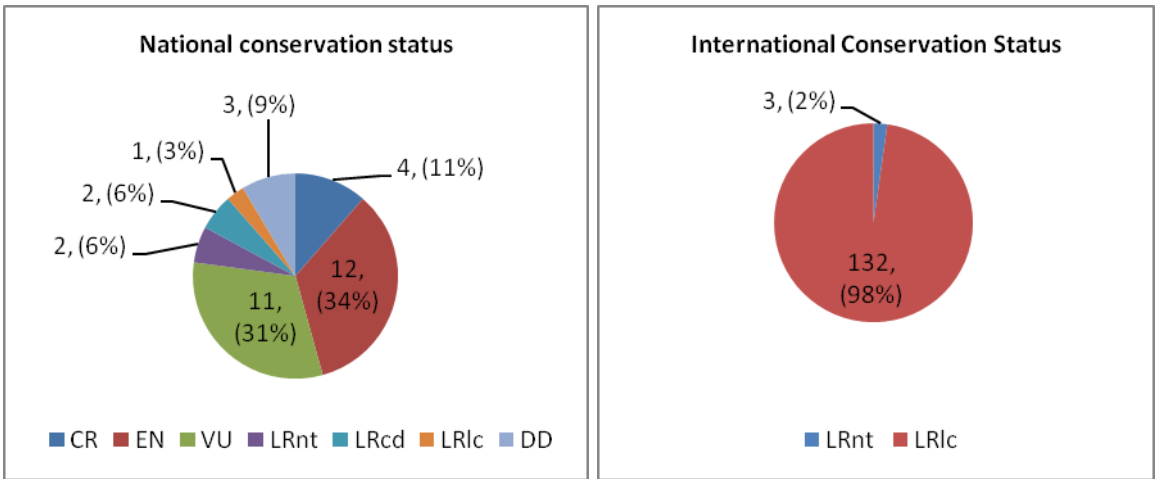

Fig. 2.2.17. Preservation status of birds in the study area

The majority of species (114 of 139 species) are legally protected in Albania. Some of the most common species allowed for hunting are: quail (Coturnix coturnix), turtle dove (Streptopelia turtur), skylark (Alauda arvensis), blackbird (Turdus merula), star-ling (Sturnus vulgaris), and house sparrow (Passer domesticus).

2.2.6.5 Mammals

The mammals of Drini River below the Vau Dejes hydropower plant until its conflu-ence with Buna River and its surrounding area include 35 species, from which 19 have been observed while the presence of 16 other species is based upon the geo-graphical spread of the species and the analysis of appropriate habitats, as

well as the presence of the species in neighbouring areas not far from the study area. The full list of mammals appears in the Annex to this report.

Mammals in the study area are dominated by small mammals (Insectivores and Ro-dents) with 15 species, and bats (Chiroptera) with 14 species. Spathari reservoir creates very favourable conditions for bats which they use for hunting insects and drinking water. Carnivores (Carnivora) are represented with five species among which is important to note the Common otter (Lutra lutra), the jackal (Canis aureus), and the fox (Vulpes vulpes).

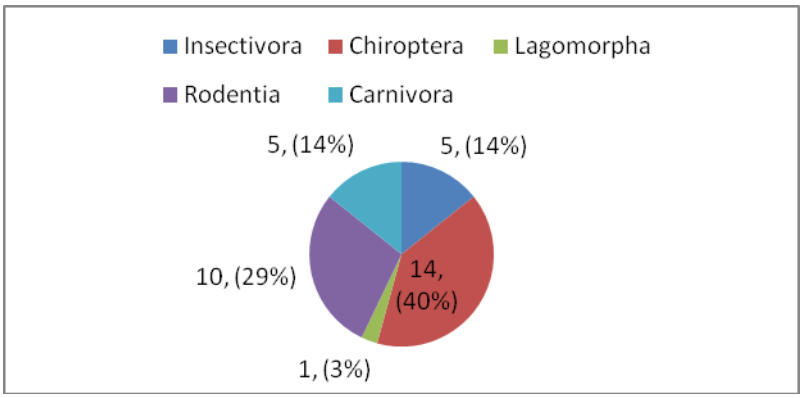

Fig. 2.2.18 Mammal composition of the study area

The presence of Common otter (Lutra lutra) gives the area a special interest for its preservation. The species is present along the bottom of the Drini flow and the res-ervoir created by Spathari weir.

All 35 of the mammal species found in the study area are included in the IUCN Red List. One species has a degrading international status (Myotis capaccinii), two spe-cies are almost endangered (LRnt) and 32 species are not endangered (LRlc). 13 mammal species are of national importance for conservation, two species are of de-teriorating status (VU), four species are almost endangered (LRnt) and five species are of insufficient data (DD). The rest are mammals (22 species) considered on a conservation status (NE).

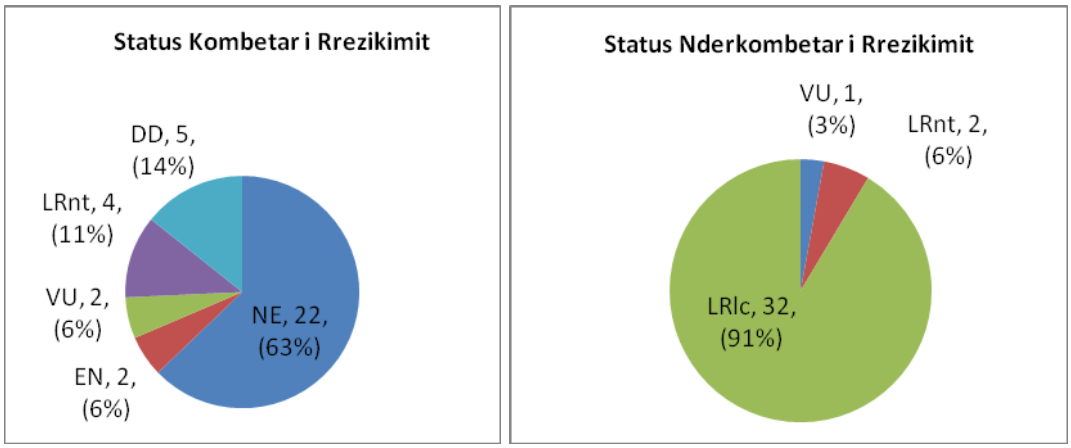

Fig. 2.2.19. Mammal conservation status in the study area

All mammals, with the exception of the wild rabbit (Lepus europaeus), the domestic mouse (Mus musculus domesticus), channel mice (Rattus norvegiculs and R. rattus), and the fox (Vulpe svulpes) are legally protected.

The presence of Common otter (Lutra lutra) on the entire length of Drini River illustrates a healthy aquatic river biome. Dams built along Drini River not only have no adverse impact on the population of this mammal, but rather have increased its chances of finding food and shelter. Human activities such as anxiety, hunting and fishing (including usage of explosives and toxic substances), and exploitations of gravel in the river beds

seems to have been the major factor that determined the status and the distribution of Common otter (Lutra lutra) along the Drini River.

2.3 Socioeconomic environment

2.3.1 Population and its evolution

The COB has a population of 22.762 people and 5.827 families, residing in 14 vil-lages: Bushati, Barbullushi, Rranxa, Stajka, Kosmaci, Ashta, Melgusha, Plezha, Shkjeza, Kukeli, Sumez, Fshati i Ri, Hoten and Konaj. The density and the gender distribution of the population, is given in the following graphic:

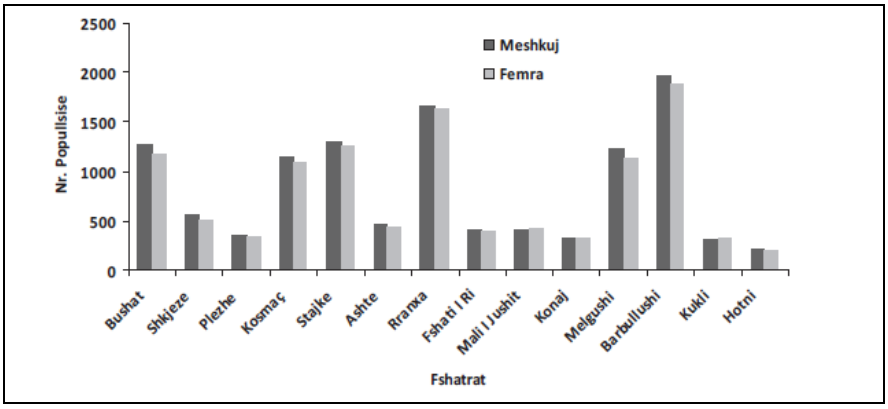

Figure 2.3.1. Gender situation of the population of the commune villages. Source: REC, LEAP, 2008)

The number of people with higher education is more than 250, and the number of the people who have completed the upper secondary education is very high.

2.3.1.1 Population migration

In the last years, the population figures have been almost at the same level, which confirms that the number of people who have moved in has equalled the number of those who moved out. The population is generally homogenous, because, as men-tioned earlier, the number of newcomers is relatively small. The migration was in two different periods. Most part moved in at the time when the HPP's were built (whose land was flooded by the Spathari reservoir in early 1970's), and the rest moved after 1990's. The newcomers have brought cultural diversity and there is harmony among local people in living together.

The COB and the municipality of Vau Dejes have no minorities.

2.3.2 Employment

The main economic direction is agriculture, which is above the average.

The field is very fertile. Small agricultural-animal farms have been established. In addition to the plants (also including greenhouse plants), one can also find grapes and fruit trees. The light and food processing industry consists of two flour factories and a plastic products factory.

There are also small wood-processing mills, a milk-processing mill, as well as mills for processing aluminium, marbles, inert materials, etc.

The commune of Bushati has 38 agronomists, 11 veterinary doctors, 11 veterinary food specialists as well as 27 accountants with a university degree, but only 32 % of them are actually employed and regularly offer their active services for the region development. The higher specialists provide their technical assistance for special agricultural or livestock issues. Whereas the rest of the university-educated special-ists are engaged with their own farms, or involved in other activities or fields. Certain vets for instance, provide their health and breeding services for the farm animals owned by the local people. In view of maintaining the human resources with profes-sional qualification and experience, efforts should be made to transfer this experi-ence

to the younger people. The opening of a secondary school for agriculture could be a positive step in this direction.

The other branches like trade, craftsmanship and services have witnessed good de-velopment lately. In 2007 there were 165 private physical and legal persons; 102 in trade, 27 in production areas, 36 in services, etc. In the village of Melgusha, there is a large fruit and vegetable street market which offers agricultural products even from villages beyond COB.

In 2007, the family incomes in the commune were increased by 6.7 million Albanian Leks, or 46.3% compared to 2004-2005.

Employment is presented in the graphic below:

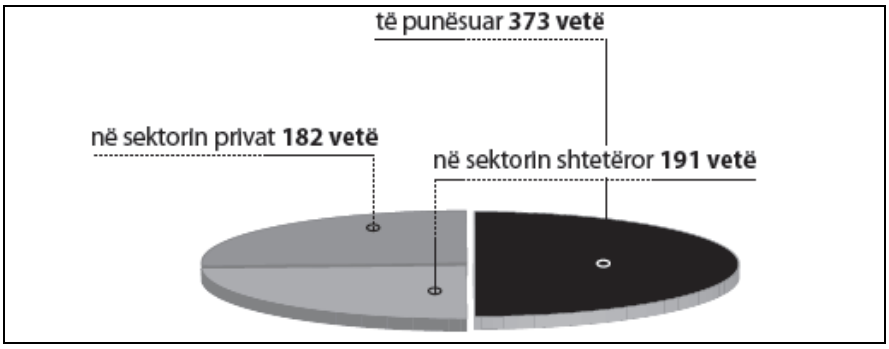

Fig.2.3.2. Employment after each sector, in the commune of Bushati. (Total: 373 people; private sector; 182 people; state sector: 191 people). Source: REC, LEAP, 2008

According to the civil office statistics, in this commune there are 22.762 inhabitants, 5.827 families, with the gender ration being almost balanced, and the average family size of four members. The capable workforce is 60 % of the total population.

Although there is no data about the people who are self employed in the agriculture sector, it should be noted that the manual labour has been generally reduced. Nowadays, the villagers do their land work of ploughing, planting, cultivating, grading etc., by agriculture machinery, whereas the other kind of work (maintenance, con-struction, cleaning, storage, etc.) is done manually.

There are a number of agriculture specialists in the COB, who are partly engaged in counselling services about agriculture issues. Actually, the counselling services have been gradually reduced, and as a consequence, even this kind of work is becoming less lucrative. The counselling services were initially supported by the Ministry of Agriculture by engaging local specialists, but due to re-organization and reduced funds, the level and scale of the engagement of the specialists, have been reduced.

2.3.3 Settlements

The residential buildings are close to each-other in the COB due to the urban yellow line constraint and its proper enforcement. The constructions have generally been under control. The most common ones are the one-floor buildings, which have uni-formized the typology of the buildings in the area. There are exceptions in the vil-lages Bushati, Rranxa and Barbullushi, where you can see 4-floor, 3-floor and 2-floor buildings. These buildings were constructed to shelter the displaced people because of the Drini River cascade HPP's construction. After the 1990's, even housing was affected in the context of the general chaos. Not respecting any urban planning prin-ciple, there were cases when houses were constructed in the middle of a field. In some villages, there were constructions in the centre for services and business ac-tivities, based on no prior planning, which actually suffocated the village centres.

In order to bring the situation to normality and to provide for the much needed open spaces to the common facilities, the authorities began to pull down the unlawful con-struction in some villages (Kosmaci, Rranxa,

etc). This process has been continuing more regularly since the construction inspectorate shifted under the authority of the local power.

2.3.4 Education and environmental education

The COB has 10 kindergartens, thirteen primary schools, eight 9-year schools (basic education), and two high schools with an educational staff of 185 people. 90 stu-dents completed the secondary education in 2005, 105 in 2006 and 114 in 2007. This community is inclined towards education and there have been numerous graduates in a number of professional fields.

There has been more attention and awareness regarding the environmental issues in the recent years. In schools, environmental associations have been active with activities promoting environmental awareness such as removal of waste, planting of new saplings in the school yards, etc. These activities are being encouraged at school in the context of the awareness and promotion contributed by school subjects such as: Green Package, Technological Skills which have been introduced into the basic education curriculum.

With regard to the environmental education and awareness at school, the introduc-tion of the “Green Package” in the basic education curriculum is a step forward with regard to the environmental awareness efforts. Such education should be extended through all the classes in basic education. The introduction in the secondary educa-tion of subjects relating to environmental issues will be of great help too.

2.3.5 Health and health services

The COB has two health services with qualified staff, one in Bushati and another in Barbullush. There are 8 medical doctors and 35 nurses and midwives in this com-mune. The health services run 24 hours, in shifts. It has also got a maternity house with qualified staff, thus satisfying the local needs. Recently, these health centres have been rebuilt and supplied with the necessary professional equipment.

In addition to the two health centres, there are First Aid centres in every village, pro-viding satisfactory ambulatory services to the local population, although they need necessary professional equipment as well as the necessary medicines for emergen-cies. The staffs in the health centres are nurses and midwives who also render counselling services to the local population, including child rising and proper feeding. Such services are really necessary in the villages, particularly for new mothers from low income families.

The health centre in the village of Bushati has a diagnostic laboratory for blood and urine tests, proper to satisfy the needs of the local population of the commune. How-ever, considering the urban needs and modern developments, it needs to be sup-plied with contemporary equipment and proper staff so as to provide quality services to the local population.

There have been rare cases of scabies which has seen a fall since 2005. The cases have been sporadic, mainly in families of low income and hygienic problems. The health education starts with the children at schools by the qualified medical staff, about the ways and means this disease is spread and the measures to be taken by a person to avoid it or to be properly protected. To this end, good service is rendered by the village midwives. In case of signs of an infectious disease, the field midwives inform the local doctor immediately. The infected person or his family is isolated, and treatment is provided. It is also reported to the Department of Public Health (DHP) in Shkodra, who provide their assistance and services for the recovery of the infected people. Population infection is likely to be caused from potable water, especially in the cases of the private wells. These wells were drilled without professional assis-tance, and there are high chances that the potable water could mix with wastewater or cattle urine. For this purpose, brochures have been distributed and placed on pub-lic places, with information about protection measures. Special care is addressed to the very poor families, because they are considered to be high risk targets. Profes-sional teams are sent for field tests and diagnostics and there is regular communica-tion with the DPH in Shkodra.

2.3.6 Land use

The parcelisation of the agricultural land has rendered the use of machinery rather difficult. On the other hand, the continuous migration to urban centres or abroad has left considerable areas of arable land not properly used and laboured.

The above mentioned factors are negatively affecting the crediting for farmers, the marketing of agricultural products, as well as the processing industry. They have also affected foreign investments, which are absent in this area. Quite often local people have invested in housing rather than in agriculture.

The area has favourable climatic conditions, which are essential for healthy produc-tive agricultural activities. There is valuable tradition in agriculture and livestock, which provides a good basis for future perspectives.

2.3.6.1 Agriculture

There are large numbers of small and fragmented farms (1.1 ha on average), at a distance of 1-5 km from the houses, which is a significant handicap for the agricul-tural sector. The smallest farms are in the villages Stajka and Kosmaci, with very little land available per person. In the villages Bushati and Rranxa, the local people have unlawfully taken considerable areas of land, not as provided for by the Law no. 7501 “On the Land“, which are about 140 ha or 28 % at Bushati and 440 ha or 34% at Rranxa village.

The commune has no proper structures to record annual data for the planting and farm animal raising, but the data that follows has been taken from the annual re-cords of agriculture for 2006- 2007 on the basis of the surveys with the local farmers in all the villages of the commune.

Tab.4.1. Structure of crops and production (2006-2007)

No	Plant	Area		productivity	production
		Ha	%	Kv/ha	kv
1.	Wheat	550	9	41	22500
2.	Maize	1030	17	72	74160
3.	Vegetables	420	7	350	147000
4.	Fodder	2850	47	410	1168500
5.	Fruit trees, grapevine,	511	8	-	
6.	Meadows	707	12	155	109585
7.	Total	6068	100	-	

Source: Commune of Bushati, 2009

The above table provides for estimating the production from the agricultural land in this zone. The productivity is not high, because the costs are high due to small plot size. Consequently, the profits are low.

For example, the watermelon production in 2006 brought good profits for the farm-ers, but this year the farmers who planted it were not satisfied because the produc-tion was much higher than the request, which actually brought the prices down.

Considering the efforts for the rehabilitation of the irrigation channels in the com-mune’s intensive zone of 3.000 ha, as well as the economic value during 2007, we can notice an upward tendency for maize cultivation.

The above table shows that fodder production takes up nearly half of the arable land of the farms, which confirms that the local people are being oriented to the agricul-tural-livestock pattern. The fodder is mostly needed for the cattle, mainly the cows, which are raised for the milk production to satisfy family needs as well as for the market.

Milk has remained the only farm product whose price has remained the same. It brings income to more than half of the local families. As for the fruit trees, the grapes and olive trees, despite the financial support provided by the state, the enlargement of the cultivated areas has been insignificant. This is linked to the lack of the markets and the lack of the processing industry.

The farmers are encountering difficulties regarding the use of machinery. In the last 20 years, a considerable number of tractors and other machinery have been imported. Nevertheless, the farmers lack modern mechanization. The mechanized machinery owners levy high fees on lending such machinery for ploughing, planting, harvesting, and other land labouring. The data shows that there is one tractor for 50 hectares. The local people are also facing other problems like floods, unlawful land possession, unreliable markets. Dry land and land used for fodder occupy about 60% of the land. Despite the fact that such area is for the livestock raised by the farmers themselves, the mechanization level still remains low.

At commune level, about 80% of the farmers purchase seeds and pesticides. The largest input for the farms is in pesticides. In the lands planted with maize and with irrigation possibilities, the farmers are using high doses and full agro-fund of pesti-cides, with nitrates and superphosphates of 8-10 kv/ha, whereas, in the land planted with wheat, the agro-fund is lower, at 4-6 kv/ha. The fodder situation is similar.

There are numerous problems which hinder progress in the development of agricul-ture and agro-industry. Listed here:

Uncertainty and unclarity with land ownership titles which have led to land owner-ship conflicts, particularly regarding the massive unlawful occupation of land;

Small agricultural plot size does not allow for much support from government in agriculture programs, although there has been earlier provision through ambitious projects in irrigation, road infrastructure, etc.;

Wide farming diversity, which is due to the food insecurity as well as the consider-able market challenges and other difficulties in the agricultural marketing; and

A new generation less interested in agriculture. This might present problems re-garding the heritage of tradition in this field, and may affect the sustainable develop-ments in agriculture, particularly the sustainable use of the agricultural land. The new generation is more inclined towards emigration.

2.3.6.2 Livestock

Livestock is amongst the main sources of economic activity in the COB, which is at a level above the average. The land is fertile and the farms are small, oriented towards agriculture and farm animals. There are 9,075 cattle, 7,045 sheep and goats, 4,485 pigs, 900 horses, 62,500 birds (hens, turkeys, ducks, and gooses). Each family has a small number of farm animals, which is also linked to the limited area of land. As a result, there is little demand for workforce on the farm.

2.3.6.3 Forestry and meadows

The COB has 1,436 ha of land, as part of the forestry which is administered by the Department of Forestry in Shkodra, including:

Lowlands – 342 ha of gravelly land (on the Drini River banks);

Hills (the Zefjana hills - 226 ha, Plezha hills - 45 ha and Shkjeza hills - 21 ha); and

Mountainous area (Mount Jushi with an area of 802 ha).

The gravelly area used to have poplar trees, which were totally damaged during the transition period. There are some new samplings in certain areas, mainly willow, but it is being damaged because of the transport of the construction aggregates from the river. Part of this territory belongs to the Ashta HPP project area.

The hilly areas in Zefjane (about 16 parcels) with 226 ha were covered by pine trees in the most part (190 ha), but they were either burnt or cut down during the transition years. Some believe that once the commune becomes the authority in charge over forestry issues, pine and other trees which are adaptable to the local conditions may be planted again.

In the mountainous area, mainly in the villages Mali Jushit (Mount Jushi) and Kukeli, the natural and spontaneous forestation has been predominant with local typical trees like oak, juniper, hornbeam, wild pomegranate, ash, etc. This zone was dam-aged before the 1990's and the trees were eradicated for use as firewood. Only an area of 62 ha, planted back in 1985-1990, was preserved from damages, although there have been no efforts regarding maintenance and cleaning.

Tab.4.2. Species of wild and domestic fauna, and natural and cultivated flora

Category	Cultivated plants	Domestic fauna	Wild fauna (birds)	Wild fauna (mammals)
1	Wheat	Rabbits	ducks	foxes
2	Maize	Hens	geese	Rabbits
3	alfa alfa	Ducks	Woodcock	Wolves
4	vegetables	geese	Passerine	Badger
5	fruit tress	Doves	Seagull	Weasel

Among the common wild birds in the project area one could mention falcons, crows, common starling, seagulls, sparrow, turtledove, owl, bat, mountain eagle, etc. Like-wise, common species of fauna include foxes, wild rabbits, wolves, jackals, badgers, weasels, hedgehog, turtles, etc. Drini Riveralso hosts ducks, geese, egrets, water snakes, frogs, water turtles, etc.

The damage done to the forest, is also affecting the wild fauna and flora. Some species have been subjected to unlawful hunting techniques, both during and disrespecting the hunting season.

2.3.6.4 Hunting

Hunters' Association "Jakup Bajri" is based in COB. The association has 126 mem-bers and there are 750 hunting rifles in the commune, not counting potential weap-ons in unlawful possession. The association is trying to keep hunting under control and that the hunting fee is properly paid. Hunting occurs in groups, in particular in the lowland, Mali Jushit (Mount Jushi), Zefjana, Bushati hills, Plezha, Shkjeza, and along the Drini riverbank (Stajka-Kosmaci area).

The commune has had group of foreign hunters, who have been active even outside the hunting season. In order to prevent such activities and to protect the local fauna, legal improvements are needed as well as provision for better law enforcement ca-pabilities. The provisions for membership in hunters' association, declaring hunting activity and destination, will also help the hunters to be better acquainted with the zone and the protected areas as well. Potential hunters would have to pay a hunting fee and will be issued a hunting authorization by the commune. Furthermore, all those in unlawful possession of hunting guns will have to be identified and held re-sponsible too. In certain zones, the local fauna is under the threat, hence a 3-year ban for hunting could be considered. This period might serve for the recovery of the fauna and for the investment for population of new species. It may begin with Mount Jushi and be extended to the Gjanaj Swamp, close to Velipoje afterwards.

2.3.6.5 Fishing

The unlawful fishing in the Drini River by using explosives and electrical power, has impoverished the fish abundance in the river.

Regarding fish cultivation, there are considerable water reserves in rivers, channels and collectors. It should be admitted that this natural treasure has not been properly exploited, with the exception of perhaps a few cases in family context.

Fig. 2.3.3. A Service Complex (trout cultivation, hostelry, bar, restaurant, aquarium) near the Spathari weir,

In the waters pertaining to the COB, there are fishes like carp, eel, Prussian carp, jack, etc. The river water is constantly flowing, and there are good opportunities for fish cultivation. Nevertheless, such entrepreneurship needs technical and financial support.

2.3.7 Industry

Although there are a large number of businesses in the commune (about 290), the industrial activities have been very few, compared to the opportunities provided by the natural resources and the geographical position. Some of these activities are aluminium works, dairy processing, wood processing, production of construction ag-gregates, plastic productions, corn mills, etc.

The commune has natural resources to further develop the production of limestone as raw material for the production of lime, cement and ballast. The clay reserves provide opportunities for the production of tiles and bricks.. There is also good poten-tial for the production of other traditional products and craftsmanship.

Finally, the local natural potentials are a considerable basis for further developing the agricultural and livestock production and tourism.

2.3.8 Infrastructure and services

2.3.8.1 Water supply

The commune provides the water supply for the villages of Bushati, Shkjeza, Ranxa, Mali Jushit, (Mount Jushi), Melgusha, Barbullushi, Kukeli and Hoten. Each village ensures its water supply within its own territory. In the above-mentioned villages, the water supply runs on mechanical leverage and electric pumping. In the recent years, the potable water supply saw significant improvements, thanks to the support rendered by the Austrian Government. A project has helped with the infrastructure construction, the improvement of various water supply aspects, such as the distributed amount and the control over the figures. Furthermore, the project helped with the improvement of the economic-financial figures.

Tab.4.3. Technical data about the water-suppliers in the Commune of Bushati

No.	Village	Number of actual local people covered by the system	Pump capacity		Needs (m^3)	Actual annual production (m^3)	Number of local people being applied
			1 hour	8 hour			
1.	Bushati	2450	53	15500	135000	10000	740
2.	Shkjeza	1060	21	61000	58000	3000	224
3.	Rranxa	330	54	158000	181000	15000	840
4.	Mali Jushit	1600	21	61000	88000	5000	270
5.	Melgushae	2300	21	61000	126000	4000	154
6.	Barbullush	3800	60	175000	210000	25000	2020
7.	Kukel	600	11	32000	33000	1500	109
8.	Hoten	400	6	17000	22000	1500	100
Commune		15500		720000	853000	65000	4457

It should be noted that water supply line has been provided only to the villages where the local people have not managed to provide water supply by themselves. A considerable number of families in some villages like Ashta, Kosmaci and Stajka, have conducted drilling on their own, opening private wells as the zone is rich in groundwater.

The average depth of these wells is 10-12 meters. In some areas, the water is found at 5-6 meters, but for hygienic reasons, the water is taken from deeper layers. In or-der to test the water quality, the commune authorities are considering doing tests, in view of health concerns for the local people.

Recently, the projects for the potable water supply have been finalized for the vil-lages of Ashta, Kosmaci and Stajka. The procurement has been finalized for the vil-lage Ashta only, but not for the other two villages, due to the lack of funds.

2.3.8.2 Sewerage

There are no sewage and sewerage systems in the COB, except a limited area in the Bushati village. The construction of the sewerage networks is a necessity in the COB. Each family uses individual septic holes for the waste waters. In such circum-stances, the wastewaters may come up to the surface sometimes, making the sur-rounding an inappropriate place for living.

The septic holes constitute a serious threat for the ground waters, which, as mentioned earlier, are a potable water resource. This is why water testing for all cases of water drilling has been set as a priority for the commune.

According to different surveys in local villages, the sewage management solutions should be different. Studies are required to determine the most effective environ-mental and economic solutions.

2.3.8.3 Road network

There are a number of national roads passing through the commune. The place called Krye Bushati is a crossroad for:

Road Krye Bushati – Shkodra

Road Krye Bushati – Lezha

Road Krye Bushati – Mjeda

Road Krye Bushati – Torovica

The communal road Bushati-Kosmaci-Stajka–Shelqet, 5.3 km long, runs through villages that are close to the project area. The roads between Kosmaci and Ashta (2.5 km) and the one between Stajka and Kosmaci (3.5 km) are both in a poor shape. The project for the rehabilitation of these roads has already been presented, but there is no financing provided yet.

These roads have been maintained by the Services Office, which, for the responsi-bilities it holds, owns a 10-ton self-unloading truck and a digger. So far, these roads have been refilled with gravel, and have been cleaned of bushes and waste.

The road maintenance is not effective, since holes are formed in the gravel refilling during rainy weather. The roads to the villages Stajka and Kosmaci have been as-phalted. Roads to a few other villages are going to be asphalted soon.

Tab.4.4. Communal and rural roads within the Bushati commune territory

No.	Rural road name	Rural road Length in km
1.	Bifurcation road Bushat-Qafe(Gorge) Kurtine-Melgusha-highway	4.5
2.	Bifurcation road Bushat-Shkjeza-Koderloc	3.3
3.	Bifurcation road Bushat-Shkjeza	1.8
4.	Plezha-Shkjeza	1.2
5.	Plezha-Stajka	3.3
6.	Kosmaci-Ashta	4
7.	Kosmaci-National Road	1.8
8.	Bifurcation road National Road-Ashta-Lagja Lukaj (Ashta)	4
9.	Rranxa-Konaj	3
10.	Bifurcation road National Road-Mali Jushit-Sumez-Barbullush	3.6
11.	Bifurcation road National Road Fshati i Ri-Hoten-Kukel	7.8
12.	Bifurcation road National Road-embankment-Ura e Gjolulit	2.8
13.	Barbullush-Hoten (two tracks)	5.5
14.	Barbullush-Mabe-highway (three tracks)	5
15.	Stajka-Shelqet	1.5
16.	Bifurcation road Road Vau Dejes-Kosmaci-Cemeteries	2.5
17.	Bifurcation road National Road. Fshati Ri-National Road -Velipoje	3
18.	Bifurcation road Rranxa-Lagja Cunaj-Lagja Velaj (Melgushae)	2.8
19.	Road Barbullush-meadows Kukel	2.8
20.	National road. Kukel Cenetr-Brinja e Malit	1.8
21.	Road Barbullush-Dobroje-Guradec	1.3
22.	Bifurcation of national road Barbullush-Lugu i vogel	2.5
23.	Road RRanxa-Mundia-Barbullush	4.1
24.	Road Lagja Cunaj-(Rranxa)-Bullakle Trush	3.5
25.	Road Mundia-Sumes	1
26.	Bifurcation road Shkjeza-highway	1.2

27.	Konaj-highway	5.2
	TOTAL	84.8 km

2.3.8.4 Power supply

There have been significant improvements in the power supply, particularly after the new power substation of Bushati was built. Nevertheless, the rural areas in general have a less regular power supply than the large urban areas.

2.3.9 State of environment

2.3.9.1 Air quality

The project track lies in a rural area, without any economic or social activities that may affect the air quality. The nearest city is Shkodra, which is 7 km from the project area. The data from the air monitoring (SoER, 1999 – 2002, Tirana 2005) shows that the typical air polluting substances SO2 and NOx are at acceptable levels (DCM. No. 803, of 04.12.2003; "On air quality standards"), whereas with regard to suspended particulate matters, the city of Shkodra - like all the Albanian main cities - is above the acceptable levels. The main reasons include increased traffic on the unpaved roads, numerous constructions in the city not pursuant to the environmental provi-sions, unadequate quality of fuels particularly that of diesel since most of the vehi-cles run on diesel.

Although there is no historic data from the monitoring of the air quality for the project area, it is believed to be at acceptable levels as provided by the Albanian legislation, including the suspended particulate matters. This is understandable, bearing in mind that there are no industrial activities, little traffic of vehicles, and very few constructions in the project area.

The measurements from the institutions charged with environmental monitoring, as provided for by the DCM, compared with the Albanian ones and the WHO recom-mendations, published in the Report on Environment for 2005, are as follows for the city of Shkodra;

Tab. Data on air quality, Shkodra, 2005.

Pollutant	Unit (µg/m^3)	Albanian norm (µg/m^3)	WHO norm (µg/m^3)
LNP	231	140	80
PM10	111	70	50
SO2	11	60	50
NO2	28	60	40
O3	98	120	110
Pb	0,31	1	0,5

In 2007 the monitoring data show a clear picture regarding the polluting substances above the acceptable levels in our country, and the WHO recommendations as it may be seen in the table below:

Tab. . Data on air quality, Shkodra, in 2007

Pollutant	Unit (µg/m^3)	Albanian norm (µg/m^3)	WHO norm (µg/m^3)
LNP	212	140	80
PM10	101	70	50
SO2	11	60	50
NO2	22	60	40
O3	93	120	110
Pb	0,28	1	0,5

Source: PHI, IHM

We can notice some improvement in the air quality concerning the suspended particulate matters and PM10. We believe it is due to the recent investments in the city of Shkodra in the road infrastructure, with the asphalted roads and streets, which has positively affected the environment, since it has brought down the dust levels. There is still a concern about the levels of the polluting substances in the air, as long as these are above the allowed standards.

The graph below is taken from the Report on Environment for 2007, and reflects the levels of the suspended particulate matter, comparing Shkodra city with other cities of the country, as well as with the EU standards.

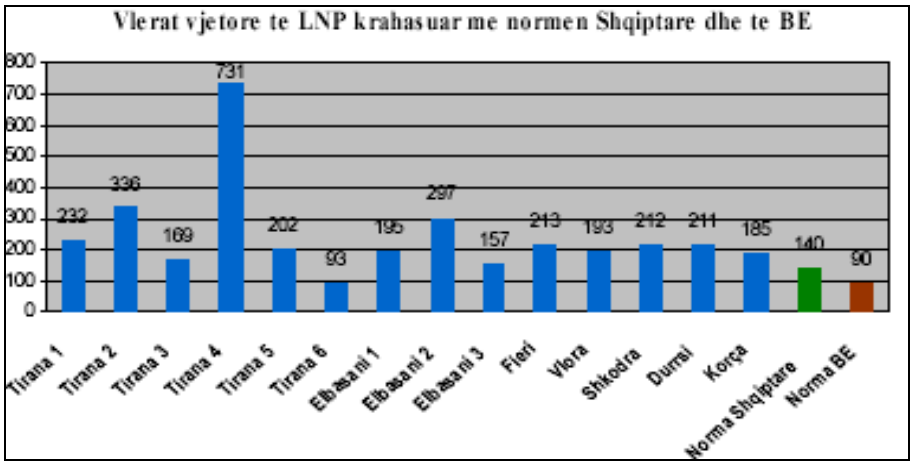

Fig. 2.3.4. Concentration of Suspended particulate matter in air, in some Albanian cities

Since there are no heavy industries and no activities that may have a significant ef-fect on the air quality as compared to Shkodra, air quality in the project area is within the acceptable standards, including the level of suspended particulate matter.

2.3.9.2 Noise

The project area is far from the urban areas and those of industrial activities. This is the reason why noise levels are not affected by vehicles, heavy trucks or machinery, and not even by power generators. There is no regular monitoring of noise. Still, considering actual economic activities and traffic intensity in the project zone, it has been estimated that the noises are at the acceptable levels for residential areas.

The noise monitoring was conducted by the PHI for 7 cities in Albania. Apart from Tirana and Durres, with noises above the acceptable levels, all the other cities - Shkodra included - have lower levels, due to the intensity of the economic activities. The cities of Tirana and Durres had noise levels of 70dB (A) or higher

during the day, while at night, they droped to 40 dB (A). The other cities - Shkodra included - have noise levels 62 – 65 dB (A) during the day, and 30 – 34 dB (A) at night.

Despite the fact that the law on noise levels entered into force in 2007, Albania still lacks proper standards for the noise levels at various places. The MoEFWA and the MH issued the Ordinance No. 8 of 27.11.2007 "On maximal levels for noises in the environment". This by-law which was based on the WHO recommendations, provides that the acceptable levels shall be up to 50 -55 dB outside the residential buildings, 35 dB (A) inside, and 30 dB (A) at night. Comparing the data recorded in monitoring of Shkodra city, it seems that the noise level is generally acceptable during the night, while the level is about 15 dB (A) higher than the standards during the day.

Tab. Noise monitoring data in Shkodra

Measuring place	Average value at day	Average value at night
1. Crossroad at entrance	68 dB (A)	40 dB (A)
2. Opposite the University	69 dB (A)	43 dB (A)
3. Opposite the Mosque	71 dB (A)	44 dB (A)
4. Wholesale market	72 dB (A)	40 dB (A)
Ordinance MEFWM&MH	70 dB (A)	
WHO		30*

Source: SoER, 2007

The measurements taken during the day, while this report was being written, in the villages of Shelqet, Stajka and Kozmac have provided noise levels between 46,3 and 64,4 dB (A).

2.3.9.3 Urban Solid Waste

Like elsewhere in the country, the COB has a worrying situation in urban waste management. The urban waste of the villages along the Drini River has been thrown in the riverbanks, thus posing a threat for the river, as well as the ground waters, which is the source of potable water for the local population in the projectarea.

An appropriate site for the disposal of urban waste has been identified and deter-mined recently. The commune owns a vehicle and containers for the collection of the urban waste for the villages within the projectarea. There is a 3-ton vehicle for the transport of the urban waste to the disposal site, and three workers as staff, which is insufficient considering the daily amount of the urban waste in the commune – there are 15 ton of waste per day and about 5500 ton per year.

A sanitary landfill for urban waste disposal for the Prefectures of Shkodra and Lezha has recently been constructed in the COB. The new landfill was inaugurated in 2011 and is being operated by a serious German company in the field. It is expected to apply contemporary technology for the urban waste processing, thus respecting the environmental standards.

Fig. 2.3.5. A view of sanitary landfill in the village Plezha, commune of Bushati

(Photo taken from the national roadShkodra-Lezha)

2.3.9.4 Hazardous waste

There are no activities that could create hazardous waste in the COB. Still, consider-ing the closeness of the residential areas to the surface waters such and that the soil pollution by the hazardous waste may be a threat to the quality of groundwater, there is need for due attention, commitment and monitoring of the environmental and local authorities, and for environmental management of activities that may generate such category of waste.

There are some gas stations, pharmacies, animal pharmacies, medical services, car repair shops, etc., which generate waste that may be classified as hazardous, such as fuels, car oil, chemicals, medications, body parts or bloody bandages, etc. Finding solutions for hazardous waste has become necessary, not only for the purpose of law enforcement concerning the hazardous waste, but also for the fact that villages have their potable water supplied from drilling individual wells. Local authorities, as well as those responsible for environment issues, must take appropriate measures for safe administration of such waste.

2.3.9.5 Archaeological/historical/cultural heritage

The territory of the commune was inhabited since the ancient times. The archaeological data, the toponymy, as well as the archives of Albania, Venice, Turkey, or the folk tales, confirm the ancient status of this area. The history of this place goes back to the 1st or 2nd century. There is mention of the settlement of the Mari swamp, which is believed to have been in the Illyrian trybe, between the cities Scodra (Shkodra) and Lis (Lezha). The names of the villages, their origin, are explained on the basis of the toponymy, as well as on the folk tales of the local people. The cultural heritage is present with bridges, roads, monumental graves, residential houses, etc., as well as religious buildings such as mosques, churches, etc. Such places belong to the ancient history, continued in the Medieval times, and there are a few remnants left in the present.

Historical/cultural heritage

There is evidence for the ancient settlement dating back to the 1st or 2nd century in the Mari Swamp, a settlement with buildings, standing on wood pillars rising above the water, and with wood boards as floor. The buildings were common in those times and were often built on water (rivers, lakes), as protection from the beasts. The cemeteries on the Mundi hills witness the rituals of burning the corpses of the peo-ple. As evidence from the medieval times, one can notice the graves of the Turkish pashas (rulers or army commanders of Turkish Empire), which are now found in the Drini riverbed. In the ancient times, there used to be a road starting from the two sta-tions: from Lezha and from Shkodra; and both met at Vau i Dejes. From this junction point, the road runs towards Pukë, Vau Spas, and Kosova. There is no information or data about when it was built. The first bifurcation was Shkoder-Vau Dejes, and the second was Lezha-Vau Dejës-

Pukë-Kosovë. The second one ran from Lezhe through Zadrime, and met the one coming from Shkodra to Vau Dejes.

One of the oldest and largest palaces was that of Bushatli family. The palace of Mehmet Pashë Bushatli had many rooms, halls, canteens, cellars. The large bath-room near the Palace of Bushatli is well known. There was a fountain in the castle as well.

Religious objects

The valuable heritage in COB is a significant part of the national heritage. Some of the religious objects in the territory of Bushati commune include the Saint Shtjefen church, one of the largest in Arberia (old name for Albania in medieval ages), the churches of Saint Rrok, Saint Nicols and Saint Georges, as well as the mosques of Bushati, Melgusha and Kosmaci villages.

In addition to the buildings, there are other objects like the monumental graves of the Turkish Pasha, work tools, weapons, clay soil pottery, etc. In the ruins of Bushati, the archaeologists have found coins belonging to the rule of the Illyrian trybe King Gent. The ornaments are of great value too and the area has a rich tradition in folk cos-tumes as well.

Bushati is home to well known personalities in various fields of culture, such as art-ists, writers, sportsmen, singers and writers. The village Kukel was the birthplace (in 1906) and residence of the great Albanian poet Ndre Mjeda. It was in the time he resided in this village, that he wrote the well-known poems “Liria” (“Liberty”), “Andrra e jetes”, (“The life dream”), and a good part of his creations.

2.3.10 Tourism

There is not much tourism activity in the commune, while this commune offers oppor-tunities to use certain sites for tourism, including daily tourism. The forest of Mount Zefjane may become a clean-air natural park, with a complex of services, under the management of the localauthorities. Besides, a promenade and a botanic park along the Drini River may attract lots of visitors for its particular flora and fauna. This bo-tanic park may also serve as natural laboratory for schools, where students might observe the ecology of the area.

A large stadium may attract sports fans. A hippodrome may encourage horse-racing, which used to be a popular sport in the past. The church of Saint Shtjefen (in Barbul-lush village), which is one of the oldest in Albania, and an old cave (in Bushati vil-lage) where archaeological objects have been found, might further provide good starting opportunities for cultural tourism.

3 Development alternatives

3.1 Current situation in the power sector

Until the 1980's, Albania used to be a country exporting electric power, but the situa-tion changed during the 1990's. In the early 1990's there was a migration of people from villages towards the cities, and consequently a change in the power consump-tion patterns concerning heating and the means of transport. Hence, we have wit-nessed an extraordinary increase in consumption of electric power during the last 10 years.

The power capacity already in place is 1.6 GW, 90% of which is based on hydro. The rest is mainly produced by the TPPs, which run on oil.

The hydropower is mainly produced by the three main HPP's, which are all located on the Drini River cascade, namely Koman HPP – 600 MW, Fierza HPP – 500 MW and Vau Dejes HPP – 250 MW. There are also several small HPPs with a capacity up to 20 MW. Vlora TPP based on oil commenced production in 2010, but while it might relieve some of the country's need for imports, it is not going to put an end to it.

There has been a constant increase of the household and business consumption, which was often accompanied with the failure to collect the bills as well as illegal links to the power supply that further aggravated the situation. In 1998, the import was 300 GWh and in 2002 it increased to 2200 GWh. Albania was not capable of meeting the needs through imports, not only because of financial reasons, but also due to the fact that the necessary capacities for the power transfer and import were missing. At the time, the power cuts to household consumers became very common.

The process of a power sector reform started in the mid 1990's, with the assistance from the World Bank. The first changes became obvious in 2001, with the implemen-tation of a new Action Plan approved by the Government and the donors. The power losses began to be reduced, the power prices went up, and so did the payments of the power bills.

A general law with regulatory provisions was passed in 1995, and the Energy Regu-latory Entity (ERE) was established in 1996. There were a number of legal initiatives taken in 1996, opening the way to the privatization process in the country's power sector.

In August 1995, the Albanian Parliament passed the law on Electric Power, which opened the way to the privatization and the participation of the independent power suppliers. Later on, a law on the privatization of the Electric Powerwas passed, en-couraging the power sector privatization process. The Albanian Electric Power Cor-poration was transformed into a shareholder company.

Further to this legal reform, the Parliament also passed a law providing that at least 30% of the stocks from the power sector privatization were to be sold through a massive privatization program and 30% of the stocks had to be in store for strategic investors.

Thanks to the measures taken, the Albanian Power Corporation (APC) was restruc-tured, and, in 2004, it succeeded in having 93% of the consumers' bills paid, com-pared with 61% in 2000. Besides, the technical and non-technical power losses de-creased from 43% to 37% for the same time period, and a year later it went down to 33% of the general power. The procedures for the privatization of the Power Distribu-tion Operator started in 2008 and were completed in 2009.

Despite these achievements, the demands for power imports continued to increase because of the lack of new capacities for the power production.

The local power production, in average hydrological conditions, is 4,200 GWh, whereas the demands for power are increasingly higher. The demand for electric power was estimated at 8000 GWh, in 2010.

As the World Bank has pointed out (World Bank Country Assistance Strategy to Albania) “the insecure power situation remains the major threat to the continuity of the macro-economic stability, the sustainable development and the reduction of poverty”

3.2 The Energy Strategy

3.2.1 The National Energy Policy

The National Strategy for Energy, prepared in 2003, is amongst the fundamental po-litical document which determines directions for the development of the country’s energy sector. It includes provisions for both management as well as increase in the production.

On the basis of the findings in the field of the use of energy, the strategy determines the national goals and objectives in this priority sector for the country’s economic and social development, aiming towards a competitive power sector, thus setting the fol-lowing objectives:

to ensure the power supply, and in particular, the electric power supply, and

to provide for the rational use of power, by paying due attention to environmental protection, in view of the country’s efforts for sustainable development.

The evaluation and the analysis for the power sector development in the future, has been made on the basis of two scenarios, namely the passive and active one.

The passive scenario emphasizes the necessity of the strict implementation of the Document on the Electric Power Policies for the short-term period, as a preliminary condition to avoid the collapse of the power system.

In the active scenario, in addition to the strict implementation of the Document on the Electric Power Policies, there are additional measures to be taken until 2015, through enhanced effectiveness and introduction of alternative resources in the power system. As a result, the hydro-power system is likely to be transformed into a sector that will be supporting the economic development.

The active scenario has some clear advantages as compared to the passive one. Three out of the seven priority power resources are those which currently provide the main power contribution,which are oil, hydro (including the electric power import), as well as firewood (biomass).

Unlike the passive scenario, the active one contains a significant increase of the so-lar power, whose production is estimated to increase almost 1000 times by 2015.

There will be a more rational exploitation of the fossil fuels for burning, and as a result, the active scenario will see a reduction in the emission of carbon dioxides and the sulphur gas. Hence, even in view of environment protection, the active scenario has advantages over the passive one.

With regard to the total cost for the provision of the power supply from the power re-sources after the active scenario, there will be a financial saving of abould 2 billion USD, providing for the same economic development, emitting 30-35% less polluting elements into the atmosphere.

Based on the above arguments, the Action Plan for the implementation of the Na-tional Strategy for Energy, with a view to developing the Albanian power system, has been drafted based on the active scenario.

The Action Plan for the implementation of this strategy also includes the building of the Thermo-Power Plants to run on gas and liquid burning fuels, for the purpose of enhancing the generating capacities of electric power.

With regard to the HPPs, as evaluated in the WB study, the most likely new HPPs are the following:

Bushati HPP (84 MW) (later amended to Ashta HPP based on high environmental concerns of the previous design) and Skavica HPP on the Drini River (with 2 op-tions);

Kaludhi HPP (75 MW), Dragot-Tepelena HPP (130 MW) and Kalivaçi HPP (100 MW) on the Vjosa River; and

Bratila HPP (115 MW) and Banja HPP (80 MW) on the Devolli River.

The strategy emphasizes the need to diversity the power resources in the country such as fossil fuels resources (oil, gas, and coal), renewable resources (hydro, solar and wind), geothermal resources, as well as those from urban and other organic waste.

Albania has a large potential for hydro power, but only about 35% has been ex-ploited so far. The hydropower capacity already in place until 2002 was 1446 MW. The average production from hydro resources was 4162 GWh. The annual produc-tion may reach 10 TWh.

The studies conducted so far show that there are considerable reserves from the Drini Zi, Vjosa and Devolli Rivers. There are feasibility studies in process for these rivers and others, about projects for the construction of HPPs ranging from 80 – 350 MW.

The small HPPs on the small rivers and mountainous torrents constitute additional considerable hydro power resource. Their power reserves in total are estimated at 100 -120 MW.

It should also be pointed out that that the Albanian Government is pursuing very ef-fective policies regarding the encouragement and development of small HPPs. As a result of the improvement of the legal framework and the investment procedures for these hydropower plants, there have been increasing offers. Up until 1998, there were 83 small HPP's with their capacity ranging from 50 to 1200 kW. During the last three years, the Albanian Government has signed concessions for the construction of more than 200 small HPPs to dozens of private companies, out of which about 40 HPPs are currently under construction.

The expectation and the planning for future developments in the power production sector, place high priority on hydro power as the main resource, followed by that of the fossil fuels.

3.2.2 The Renewable energy in Albania

The draft Sectorial Strategy for Energy 2007 – 2020 prepared by the National Agency of Natural Resources, places a special emphasis on the renewable power resources. This document points out the increasing interest in the renewable re-sources all over the world, because the fossil fuels like oil, gas and coal are in limited reserves, their resources (oil in particular) are mainly concentrated in the Middle East, which is a region of high instability. These are some of the main reasons why the developed countries are paying an increasing attention to the renewable re-sources.

There has been a keen interest in the exploitation of solar power, with good poten-tials in the Fier, Vlore, Durres, Sarande, etc., as areas of high levels of sunshine.

The favourable conditions for the wind power exploitation demand good knowledge of certain other parameters such as average speed, windy hours per year, probability of wind occurrence for various sites, maximal speeds, etc. Such data will serve for deeper research in this field. However, certain attractive areas have already been identified such as Shkodra (Velipoje), Lezhe (Ishull Shengjin, Tale, and Balldre), Dur-res (Ishem, P.Romano), Fier (Karavasta, Hoxhara 1, and Hoxhara 2), Vlore (Akerni), Tepelene, Sarande.

The geothermal power has not been seriously considered for Albania, although there are certain geothermal sites for favourable exploitation. Three geothermal sites have been identified:

the Ardenica geothermal zone, mainly at the seaside, where the water is 32-38°C, and a flow of 15-18 l/s.;

the Kruje geothermal zone, with the largest geothermal capacities in the country, of about 5.9x108 - 5.1x109 GJ; and

the Peshkopi geothermal zone in north-east of the country, with a few thermal springs, close to each other, with their water temperature 43.5°C and a flow of 14-17 l/s.

The biomass is another renewable power resource, which is found all over the coun-try. In addition to the firewood, which is still being exploited unsustainably, there are considerable resources from the bushes and the urban waste. As for the biomass from the agricultural plants, it cannot be exploited, because such agricultural waste is used as animal fodder or shelter during the winter. Whereas the livestock waste is not to be considered due to the fact that there is an inconsiderable number of do-mestic animals and those animals are not flocked together on farms.

Some of the positive effects are as follows:

Providing incentives for the use of national economic resources to private entrepre-neurs to construct or rehabilitate power plants that exploit renewable resources. Most part of the investment (about 50-60%) is investments in civil construction, which will provide for the employment of labour force in the various rural areas. In these cases, there is only the need for electro-mechanical equipment to be imported;

Providing incentives for the use of local and national renewable resources, instead of the imported electric power, or power coming from the thermo-power plants;

Providing electric power supply with low environmental impacts, without emission of pollutants or greenhouse gases. While the imported electric power or the additional supply of electric power will be produced by the TPPs, the power plants that use the renewable resources will supply power at minimal environmental effects;

Reducing loss of power, since decentralized production of electric power, closer to the customers, reduces losses from power transfer or distribution within the country's electric power network;

The incentives would improve the electric power supply for the remote villages. The power supply for the remote areas is actually improper in many regions in the coun-try. The consumers in such areas experience power cuts because of the deficient network and the high cost of power supply, as well as the voltage below the accept-able standards. The power plants planned to be built using renewable resources, are expected to improve the power supply at local level.

Besides, it is going to have general effects on the country economy as a result of the plants using renewable resources of power. It should be noted that the private entre-preneurs who will build small HPPs will have to be trained with regard to the man-agement of electric power generation plants.

3.3 Strategy for tourism development

The strategy for the tourism development, submitted by the Ministry of Tourism and Territory Planning in 2003, together with its Action Plan, has no particular references for the tourism development in the project zone.

The zone close to the project area has particular cultural and natural values that pro-vide for sustainable tourism. This broader area including the Drini River, the Buna River and the Shkodra Lake are a beautiful leandscape and rich ecosystem with high tourism values. The biological variety of flora and fauna, have given this zone the status of a protected area at national and international level (Ramsar site). The po-tential development of ecotourism in this zone of wide variety of water resources, mountains, hills, forests, meadows and even lagoons and beaches, will not only serve the purpose of protecting them and promoting sustainable development in these natural treasures, but will also help the local people to improve their prosperity.

3.4 Strategy for Biodiversity

The Biodiversity strategy was drafted in 1999. The analysis of the biodiversity situa-tion at the national level indicated several priority problems to be undertaken in this field.

The strategy is followed by the Action Plan, which provides priorities for the activities to be conducted. Among others, this plan recommends that the status of a protected area should be granted to 62 areas in the country. None of the newly proposed pro-tected areas is within the project area.

3.5 Local environmental plans

3.5.1 Regional Environmental Action Plan (REAP) for the Drini River basinin the Shkodra – Lezha area

The REAP for the Drini River basin in the area Shkodra – Lezha (UNECE, 2006), which was drafted in 2006, gives an analysis of the social, economic and environmental situation in the areas of Shkodra and Lezha. It includes 20 administrative units, three of which are cities and towns, and the rest are communes. The analysis also examines the geology, the hydrologic situation, and the biodiversity with special emphasis on the protected areas, since the Shkodra-Lezha region is rich in natural values.

The analysis identifies the problems, their causes and effects, and provides priorities.

Some of the recommendations presented by this plan are the following:

investing for infrastructure development through the construction of roads, the reha-bilitation of the potable water supply, the improvement of the power supply and the elimination of the factors that cause flooding;

encouraging industrial enterprises in view of enhancing the local production and improving conditions to attract local and foreign investments;

improving access to the lagoons through road constructions, as an opportunity to-wards tourism development;

establishing lodging capacities for daily visitors, in areas enriched with natural val-ues; and

developing the system for the collection and administration of the urban waste as well as the wastewater treatment.

The Local Environmental Action Plan (LEAP) for the commune of Bushati, 2008

The LEAP for the COB (REC, 2008) was prepared by taking into consideration and harmonizing with other strategic documents prepared and approved for this zone.

The LEAP identifies the natural values in this commune, with an area of 100 km2 and a population of 25,000 inhabitants. Some interesting findings include are the following:

the species rich natural habitats (part of the commune territory has been proclaimed protected area);

two rivers flow through the commune (the Drini River and that of Drin i Lezhes);

very fertile lands;

very rich groundwaters;

a wide variety of medicinal plants;

good opportunities for agricultural and livestock production, to be supported by the very good experience of this community; and

as mineral treasures, one could find clay, gravels and sands.

The LEAP offers a general assessment of the commune situation, considering its climate, the changes in the demographic structure, the territory planning and the sustainable development for its resources. Further on, it prescribes the economic activities with a focus on the agriculture and the measures for the land protection.

The chapter on the environment and health issuesdeals with challenges in air qual-ity, urban waste management, hygiene and health services. There is also a presen-tation of the achievements in the education sector, as well as the tourism potential and values of the commune.

On the basis of this assessment, there are problems identified in specific fields. The Action Plan has been drafted, and its implementation is scheduled for a period of 15 years. The main activities envisaged by this LEAP relate to the development of the land-use plan, development of infrastructureincluding potable water supply and wastewater channelling, environmental administration of urban waste, improvement of the drainage system, providing protective measures against erosion, reforestation, etc.

3.6 Project alternatives

3.6.1 Zero Alternative

The area where the Ashta HPP has been planned to be built, is north of the villages Mjeda, Stajka, Kozmaci and Ashta. The territory on which the HPP components (such as the intake structure, the powerhouses of the Ashta 1 and Ashta 2 HPP's, the channel taking the Drini River water out of the Ashta 1 and Ashta 2 HPP) will be built, is mainly sand and gravel lands, part of the Drini riverbed, which are generally flooded in the times of the maximum Drini discharges. In such cases, which have been rather frequent in the recent decades, even the arable lands of the villages Kosmac and Ashta are flooded as well.

Up until the 1990's, the project area used to be forest land, under the administration of the Forest Service Department of Shkodra. In the early 1990's and the years that followed, the whole forest area of 350 ha by the Drini River banks, was ruined by the unlawful cut of woods, turning this area into a desert-like land, and it also includes the Ashta HPP project area. In this territory, mainly part of the Drini riverbed, the lo-cal people both legally and illegally extract about 500.000 m3/year gravels used for construction. This amount is equal to the solid matter that was carried by the Drini River prior to the construction of the Vau Dejes HPP in the 1970's.

Another worrysome activity in this zone is the unlawful fishing by explosives and electric power, which has brought a significant decrease in the diversity and the amount of fish in this segment of the Drini River.

In addition to the above, the unlawful dumping of urban waste and other waste from the construction activities into the Drini River constitutes a threat to the quality of the groundwaters. The latter are the resource for the potable water supply to the villages located along the Drini River banks.

Most of the above mentioned activities with negative social and environmental im-pacts are due to the improper implementation and enforcement of environmental legislation.

The project area, and in particular the villages Kozmaci and Ashta, were flooded by the Drini River in the massive floods which covered the cities of Shkodra and Lezha too. The situation is believed to get worse and the flooding is expected to further ex-tend to the villages Mjeda, Shelqeti and Stajka, unless measures are taken to repair the existing protective embankments in the Mjeda-Stajka area, which was built about 40 years ago. Furthermore, the construction of the Ashta HPP will provide protection, because the Ashta 1 – Ashta 2 channel is going to serve as embankment, thus avoiding the costs for the repair of the existing embankment, damaged through the course of time.

The villages close to the project area, as well as other villages nearby, do experience frequent and prolonged power cuts.

In the case of the alternative which excludes the construction of the Ashta HPP, the environmental, social and economic problems will continue to have a deteriorating effect on the quality of life for the local people, and, to a larger extent, this will be felt to the Shkodra region and even farther.

3.6.2 Bushati HPP alternative

The option planned in the early 1970's envisioned the construction of Bushati HPP, which years later in 2000 was rejected as an option that would have had significant impact on the environment (Lahmayer International, 2001; SNC Lavalin, 2008), es-pecially with the changing water regime and the deviation of the Drini River flow from its riverbed and confluence with Shkodra Lake and the Buna River.

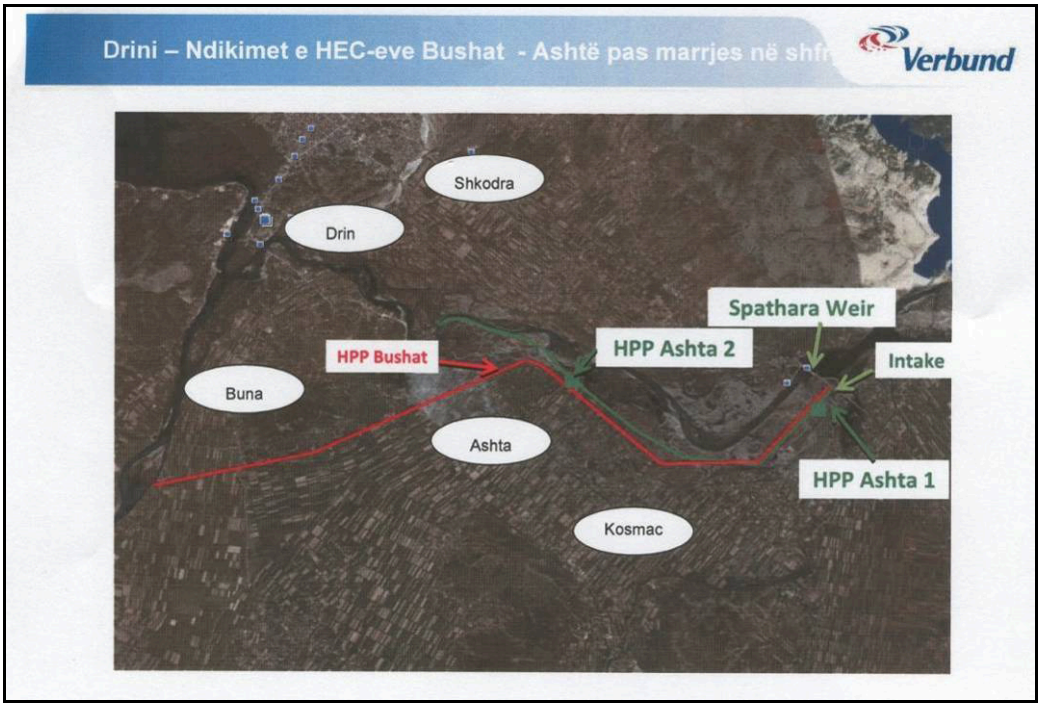

Fig. 3.6.1 Option of Bushati HPP (red) as compared with option of Ashta HPP (green) Source: Ver-bund

For this purpose, the Spathari weir was erected in the project area in the early 1970's. The headrace for the HPP would start from this reservoir.Therefore, this weir is existent since the early 1970's and has interrupted fish migration and fragmented habitats.

3.6.3 Ashta HPP alternative

Despite the rich biodiversity that distinguishes, the broader ecosystem surrounding Shkodra Lake, the Ashta HPP project area is not characterized by rich biological di-versity. As illustrated from the maps, the project track and the area which will be flooded from the increase in the level of Spathari reservoir does not have any pro-tected status. Even the Shkodra lake ecosystem, unlike the construction of the pre-vious version of Bushati HPP which caused extensive damage, is not affected from the Ashta HPP construction.

The construction of Ashta HPP was proposed as an alternative with minimal envi-ronmental impacts and which does not change the water regime in the Drini River-Shkodra Lake –Buna River confluence.

The proposed Ashta HPP project will use the existing Spathari weir and does not forecast the construction of a new weir which may further fragment the habitats.

Fig 3.6.2 Spathari Weir built in the early 1970's

The area influenced directly from the project has been studies as an area with low biological diversity compared to other regions.

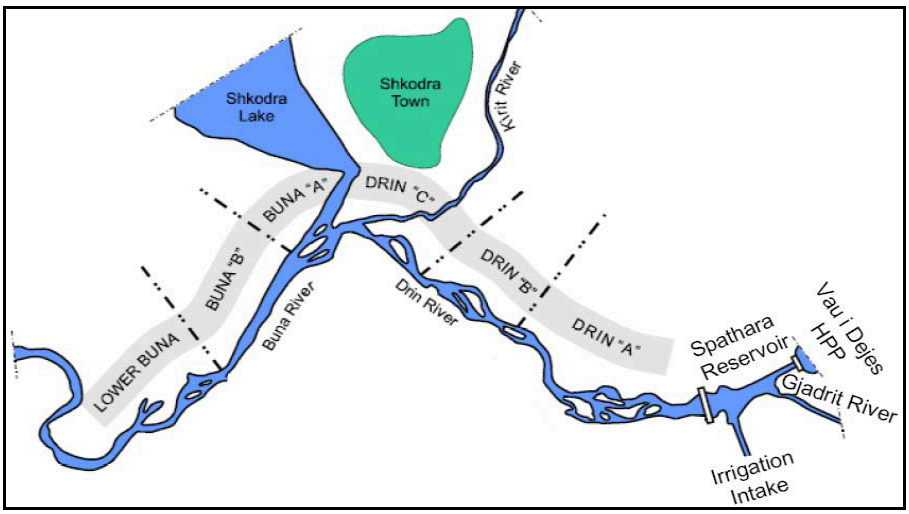

Fig. 3.6.3 The project area located in Section A – low biotic activity (Source: Lahmayer International, 2001).

This area has lower biodiversity than surrounding areas because it is mainly gritty earth with very wide berth and floods regularly as illustrated in the map of the analy-sis of natural values and environmental problems, part of the LEAP for the Bushati commune (REC, 2008).

3.6.4 Comparison of alternatives

There are two alternatives considered for Ashta HPP construction, namely Bushati HPP, elaborated in early 1970's (fig.3.6.1), and Ashta HPP.

Compared with the Bushati HPP alternative, the Ashta HPP project has several advantages (Lahmayer International, 2001; SNC Lavalin, 2008), including:

the area of arable land directly affected by this new project is less than7 ha. This area of land will be inundated due to the rise of water surface altitude in the Spathari reservoir. The Energji Ashta company will pay compensation to the land owners for the loss of land, as envisaged by the Albanian legislation;

will not inundate any residential or business buildings, etc.;

will not change the existing hydrological regime of the river in the highly important complex Drin-Buna-Shkodra Lake;

has the shortest length channel and affects only a segment of the Drini riverbed (Spathari-Ashta, 5 km long), whose biodiversity is much poorer than the rest of the riverbed;

does not affect any Protected Area or objects of the archeological/historical/cultural heritage;

does not affect the Shkodra Lake and the Buna River ecosystems;

do not have transboundary impacts. The project will be located at a distance of at least 10 km from the Buna River and the Shkodra Lake, which are transboundary surface waters;

does not interrupt migration routes for fishes since those routes have been interrupted back in the 70-ies with the construction of Vau Dejes Dam (upstream) and Spathari weir (downstream) only at a distance of 2 km from one-another; and

does not have negative impacts on the erosion on the coastal area at the Buna River mouth and its nearby coastline.

3.6.5 Project description

3.6.5.1 Technical Description

Intake

After commissioning of HPP Vau I Dejas, works for an intake structure at Spathara were started to use the leftover potential of Drin River. For several reasons the pro-ject was stopped and those structures nowadays are used as a bridge for traffic and railway.

The dam is a zoned earth fill dam with a maximum height of approx 8m. Top of the dam is on elevation 28.00 m asl, crest width is 13.20 m. On the upstream side the inclination is 1:2.5 (V:H), the downstream side is sloped 1:2 (V:H). The upstream face is covered with a rip rap layer up to the top of the dam.

The existing Intake will be amended upstream with two wing walls on the left and right bank. The existing bay between the piers will be filled up. The existing coffer-dam will be partly removed and adapted to a hydraulic advantageous form on both sides.

Within the existing Spathara reservoir minor adaption works have to take place to allow operation of the Ashta power plant system.

As the sill of the existing intake is located deeper than the existing riverbed upstream it is necessary to excavate a smooth descent with a length of approximately 350 m as well as partly removing the tip of the sediment island on the left side. The exca-vated material will be used for landfills within the project area.

All trees lower than the future water line will be cleared at the marked islands.

Rubberdam

The Spathara weir and its weir is part of the existing power plant Vau i Dejës, secur-ing the tailwater level of the plant 3 km upstream. The structure is nowadays also used as a railway- and traffic-bridge.

The existing storage basin is regulated actually by the Spathara weir with fixed sill, which has to be amended by a gated structure. A new sill will be constructed up-stream of the existing weir-gate structure, bearing a rubber dam at its top in order to raise the water level to 23.0 m asl as defined in the concession agreement.

The discharge capacity of the existing weir, as well as the projected rubberdam were verified by a hydraulic model test to proof the safe passing of floods. The actual stor-age level differs between app. 21.25 – 23.00 m asl depending from the out-flow of Vau Dejës (cf. Fig. 3.6.4).

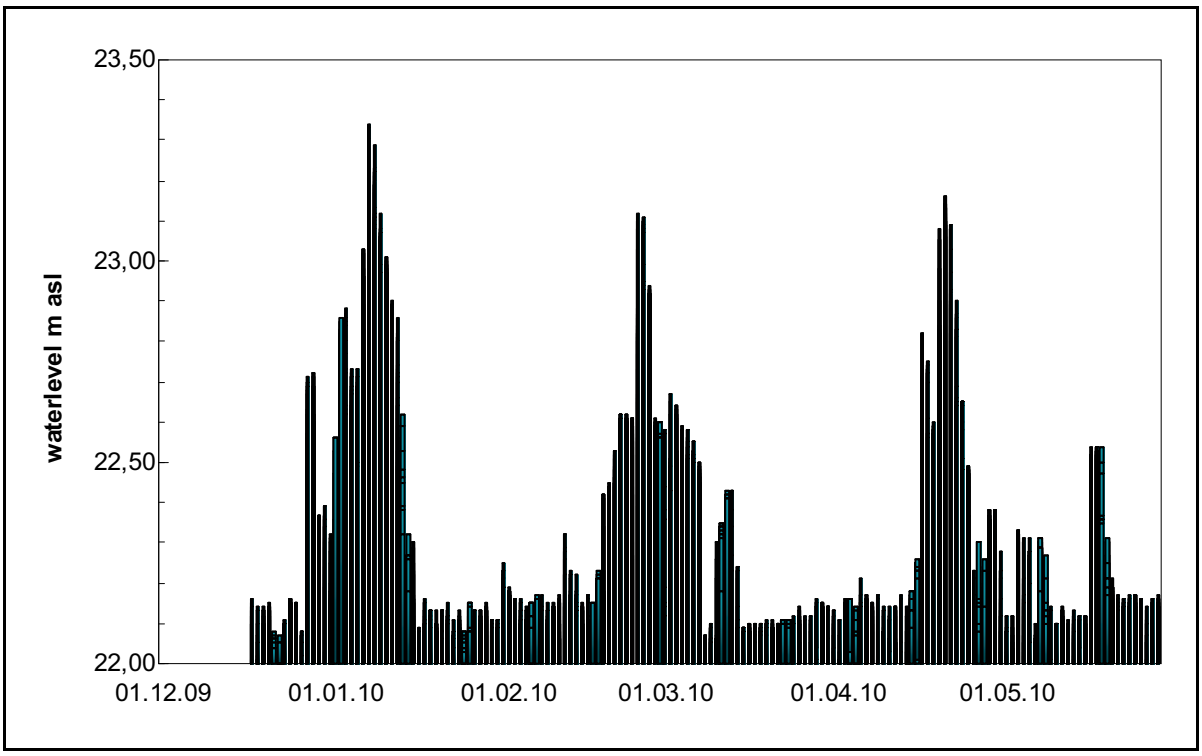

Fig. 3.6.4 Spathara weir – water levels

The rubberdam will consist of 4 spans covering the whole existing structure with a length of 248 m. The main components of the rubber dam are:

Weir body with plate and piers of reinforced concrete

operation building on left side of weir including shaft system for control and regula-tion

Rubber body

pumps, pipes and valves for filling or emptying

PLC (programmable logic controller) for automatic control

Stop-log system for maintenance

The water filled system has been chosen in order to ensure stable and smooth regu-lation of reservoir as well as safe self-deflation in case of blackout or emergencies. The rubber dam has an automatically self-controlled system which starts deflating, if water levels in the reservoir raise above prescriptive limits. This system works only on the principle of communicating vessels (gravity driven drain valve) to provide highest security (cf. Fig. 3.6.5). With a 4-span construction variable controllability of reservoir level within a range of a few centimeters can be guaranteed. The system is operated without any lubricants and has minimized energy consumption to ensure environmental-friendly operation at maximum lifetime of the rubberdam.

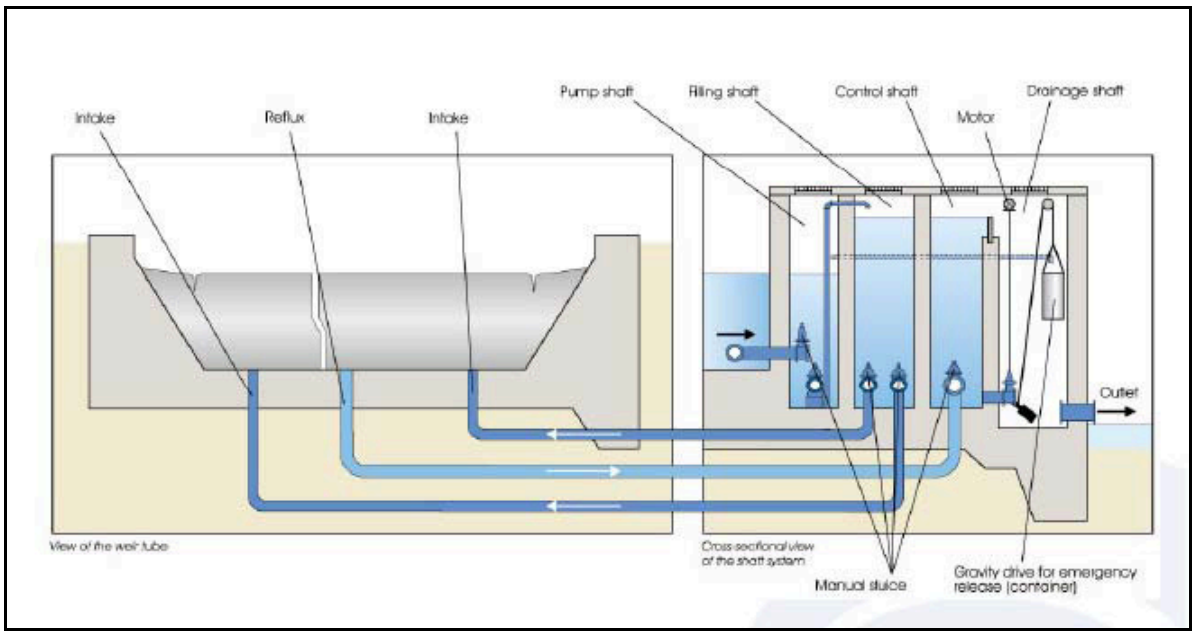

Fig. 3.6.5 Rubberdam - operating principle

The installation of a rubber dam ahead of the existing weir structure is resulting in modifications of the upstream bottom geometry and thus affecting the discharge be-havior of the spillway. Therefore physical model tests were carried out to evaluate changes in discharge capacity for the new weir geometry. A focus was laid on the case of high floods. It was verified, that in case of high floods the modifications do not cause an unacceptable rise of the reservoir level.

The new construction will be a self supporting structure. That means, no loads will be transmitted to the existing weir. Foundation of the Rubber Dam will be at 20.70 m asl, the material has to be synthetic rubber, manufactured integrally in one piece. It has to be resistant against UV-radiation and abrasion and has to be bulletproof.

Head Race Channel Ashta 1

From the above mentioned intake structure the head race channel for Ashta 1, a double trapezoidal shaped channel with a bottom width increasing from 105 m to 125 m (width of powerhouse) and a length of 205 m, follows. The berm is situated 50 cm above normal operating level (respective 23.50 m asl) the crest is on a flood free level of 28.0 m asl. The earth filled dam is sloped 1:2 (V:H) and fully sealed with ben-tonite mats.

On the right embankment, following the wing wall, the exit of the fish ladder is situ-ated.

Powerhouse Ashta 1

General

Intensive redesigning of the concession Project has optimized the energy production and cost effectiveness for harnessing the concerned River Drin for two stages of ex-tension in such a way, whereas the first part starts at the existing structures of Spathara weir and the second one, connected via a channel (see also chapter 0), is situated near the village Ashtë. Both powerhouses are equipped with HydroMatrix® turbines. Design flow for Ashta 1 will be 560 m³/s, for Ashta 2 530 m³/s. The differ-ence in discharge, 30 m³/s, will be diverted into the riverbed as residual outflow.

Electromechanical principles

Each of the 45 turbine-generator (TG) units (Fig. 3.6.6) consists of a turbine runner, a distributor cone with fixed stay vanes and a generator. The distributor cone is inte-grated into a steel fabricated frame structure forming a module. The turbines will be fixed bladed propeller units.

Generators will be of the synchronous HydroMatrix® type with the generator rotor being directly driven by the turbine runner and equipped with permanent magnets for excitation. These special permanent magnet (PM) generators eliminate the need for an electrical excitation system, as the required magnetic field is obtained from per-manent magnets, which are mounted on the surface of the rotor. The rated voltage of the stator winding is 3.3 kV.

The generator will be enclosed in a watertight steel fabricated housing which is connected to the Module. Each TG-Unit can be lowered and lifted between steel fabricated guiding rails by using a lifting beam mounted onto the hook of the gantry crane. The guiding rails lead from the elevation of the draft tube entrance up to the top elevation of the retaining wall.

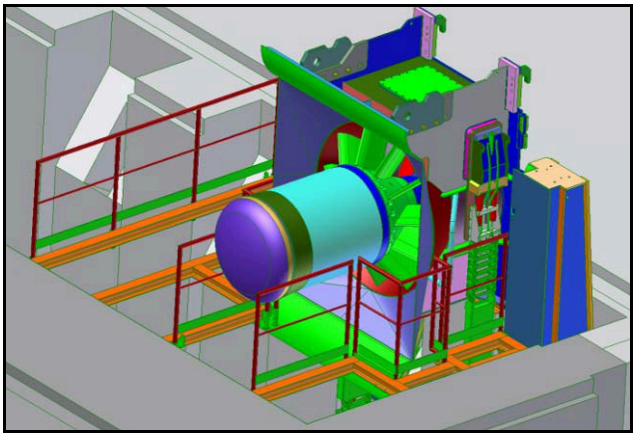

Fig. 3.6.6 TG-unit in maintenence position

Electrical parameters	Ashta1	Ashta 2
Generator Output at max. gross head	524.2kVA	994.5kVA
Power factor approx.	0.975	0.975
Voltage	3.3kV	3.3kV
Voltage variation	+l-10%	+l-10%
Frequency50 Hz50 Hz		
Frequency at runaway speed	103,5Hz	117,5Hz
No. of poles	20	16
Synchronous speed	300rpm	375rpm

Mechanical parameters	Ashta1	Ashta 2
Runner	3 blades	4 blades
runner material	CuAl10Fe5Ni5-C	CuAl10Fe5Ni5-C
runaway Speed	640rpm	880rpm
electrical power at maximum head	534.0kW	1003.8kW

Hydro Power Plant (HPP) Ashta 1

As described above the powerhouse Ashta 1 is located downstream of the existing intake (42°00’ N, 19°36’ E).

Its foundation is in sandy gravels. The stability analysis for against sliding, earth-quake and uplift of all determining construction units were carried out. To fulfil all re-quirements out of the structural analysis the plant is founded on 9 rows of 25 rein-forced bore piles each, diameter 90 cm.

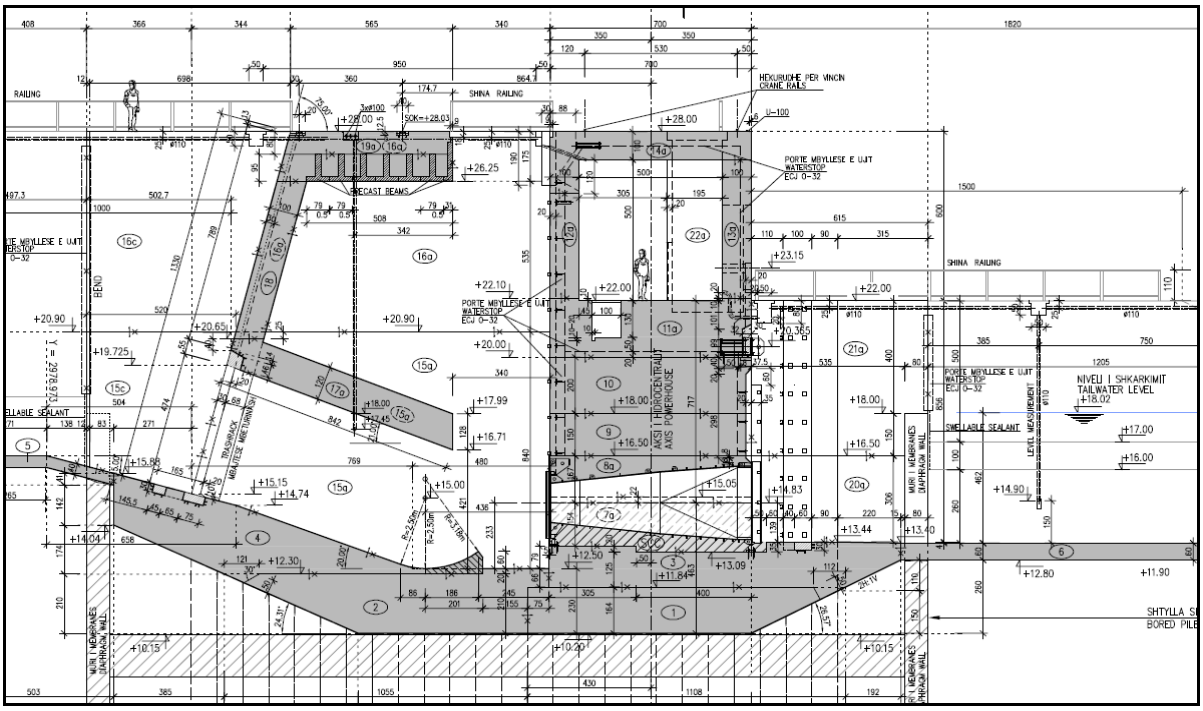

Fig. 3.6.7 Section through powerhouse Ashta 1

The length of the power structure is 125 m and is divided in 9 blocks with 5 units each. Between every 5 units of the TG-units a partition wall is foreseen upstream connected with a platform for the trash rack cleaning machine and for lowering of portal stop logs. Downstream there is a short wall for setting the downstream stop logs with the portal crane.

Inside the power structure the HV-cubicles, the protection and control equipment, the equipment for the hydraulic drives and the power transformers are situated in a rec-tangular gallery above the draft tubes.

The cable gallery conducts the cables of the transformers over the 20kV switchgear in the service building to the switchyard, which is located at a flood free elevation near the service building at the dam road on the left side of the intake channel.

The interconnection of Ashta 1 with the Albanian grid is done by an 110kV line to the 110kV line coming from Vau I Dejës on the right embankment of the Drin owned by OST (Transmission System Operator).

Situated next to the switchyard a service building is erected which houses additional electrical equipment (i.e. 20kV switch, battery, emergency diesel, etc.) as well as in the first floor office and control room.

The water level upstream in the basin and the channel is normally 23.0 m asl, the crest of the power structure is set with 28.00 m asl. In order to grant reasonable safety margins during emergency high floods the dam crest of the headrace channel is set until power house Ashta 1 at 28.00m asl. The maximum tailwater level will be 18.02 m asl in case of normal operation; the bottom level in the tailrace starts from 13.40m asl inclines to 12.30m asl afterwards an inclination of 0.01% took place. The bottom in the headrace channel (Intake) is fixed in the area of the existing rail-way/road bridge with their foundation at 16.50m asl, and will be lowered after a total length of approx. 204m in front of the power structure down to 12.50m asl. The tur-bine axis will be at an elevation of 14.83m asl.

Tailrace channel (TRC) Ashta 1

The tailrace channel of HPP Ashta 1 has a length of 769 m without a base slope. The bottom is at 13,40 m asl, width decreases from 125 m to 85 m. The earth-filled dam is sloped 1:2 (V:H) and has a crest width of

4m, whereas the left crest is used as connection between the two powerhouses. For that reason the crest will bear a macadam-layer.

Approximately 50 m downstream of the powerhouse on the left side the structure for residual discharge is situated. Through a regulated gate up to 30 m³/s can be dis-charged into the old riverbed. The Water level within the channel ranges from 17.70 to 18.02 m asl (depending on the actual discharge).

Headrace Channel (HRC) Ashta 2

The headrace channel Ashta 2 is following the tailrace channel Ashta 1. On a length of 4454 m the channel has a constant base slope of 0,412‰. The embankment is sloped 1:2 (V:H). The right embankment (facing Drin) is protected with heavy rip-rap to protect the earth-filled dam against erosion in case of floods. In order to minimize effects to the groundwater and to minimize losses of water along the channel a ben-tonite mat is tightening the whole channel. To allow communication between groundwater and channel the sealing is interrupted on the bottom. Approximately 40 m of it are not tightened. The bentonite mats are protected against mechanical stress and buoyancy with a layer of crushed gravel (grain size > 2 cm). The landside of the dam will be covered with 10 cm of topsoil to get turf within a few months in order to protect the embankment against erosion from heavy rainfalls. To collect seepages from the HRC a drainage channel is situated on the very left side of the cross-section with a width starting from 2 m near Ashta 1 up to 2,5 m bottom with, estuary below Ashta 2.

Within the last 213 m the cross section is widened from 85 m to 125 m (width of powerhouse Ashta 2).

Emergency spillway

In the unlikely event that at the same time all gates at Ashta 2 close while TG-units at Ashta 1 reach runaway speed hydro peak effects occur within the channel. To dis-charge the water properly an emergency spillway is foreseen on the right side up-stream Ashta 2 powerhouse. On a length of 375 m the crest lowered to a level of 18 m asl (approx. 1.8 m). To avoid erosion and therefore damages to the embankment this part is secured with heavy rip-rap poured with concrete.

Hydro Power Plant (HPP) Ashta 2

The second Hydro Power Plant is located at the Eastern slope of a rocky hill, in the North of village Kosmac, east of the village Ashta.

Due to geology, unlike as Ashta 1, the building is founded on solid rock. The princi-ple layout is same to Ashta 1, although an extra trash rack isn’t necessary and thus not foreseen.

Ashta 2 is operated at a constant headwater level of 17.70 m asl, whereas the tail-water differs due to the actual discharge.

Ashta 2 can be reached through the road on the crest of the dam (trucks) as well as through a street coming from Kosmac (automobiles). Like in Ashta 1 a small service building and a switchyard are foreseen. The layout has also taken the location of the local infrastructure (e.g. cemetery, villages and existing roads) into consideration.

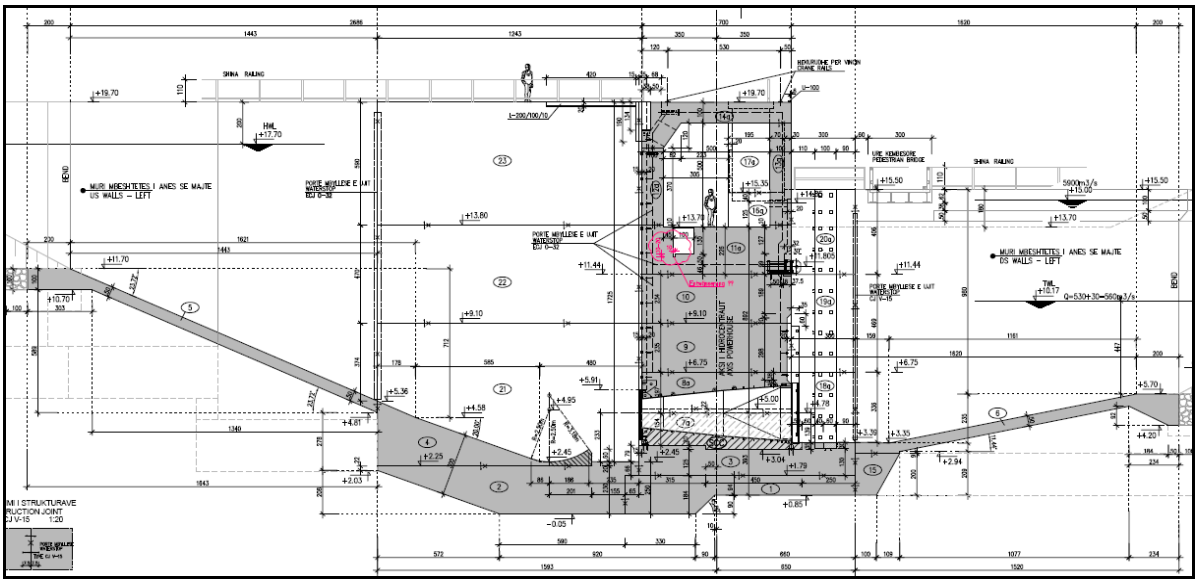

Fig. 3.6.8 Section through powerhouse Ashta 2

Tailrace Channel Ashta 2 and deepening of riverbed

Following the powerhouse Ashta 2 a 800 m long tailwater channel is erected, whereas the existing, natural left bank is used where possible and the right side is designed as a dam, secured with heavy rip rap.

Subsequently on a length of approx. 2 km the riverbed is deepened where neces-sary. As Drin River has strong tendencies for shifting material, design of that part has to follow closely the present situation.

Construction process

The concrete works will be finished by end of 2011. Afterwards electrical equipment within the powerhouse, service building as well as the switchyard will be installed during 2012. During summer 2012 all river deepening works will be carried out, so that commissioning for Ashta 2 can start within autumn 2012. Ashta 1 commissioning process will start already in spring 2012.

Main masses (approximate values)

Excavation	2,2 Mio. m³
Fills	1,3 Mio. m³
Concrete	85.000m³
Reinforcement	6.000t
bentonite mats (sealing)	330.000m2

Operation and maintenance

The operation and maintenance concept is in progress at the time of release of this report. To ensure proper operation, by means of the concession agreement as well as for all relevant Albanian laws, a permanent technical and commercial team will be installed.

The team will consist of (in brackets place of action):

station manager	(Ashta)

maintenance and operation manager	(Ashta)
operators	(Ashta)
maintenance mechanical & electrical	(Ashta)
finance manager	(Tirana)
public affairs manager	(Tirana)
accounting and controlling manager	(Tirana)

The exact number of employees will be defined until start of operation.

4 Main impacts and mitigation measures

4.1 During Construction stage

4.1.1 Sources of environmental impacts

The construction of Ashta HPP will take 40 months. During this period there will be on average 100-150 workers employed. The main parts of the HPPinclude the intake, the Ashta 1 powerhouse, the emergency spillway, the fish-pass, the intake for Ashta 2, about 5 km long, the Ashta 2 powerhouse, the power stations, the drainage channel along the main channel, etc.

Two construction sites will be built, one near the Spathari weir and the other between the villages Stajka and Kosmaci. About 5,000,000 m3 of gravel will be moved during construction works. The gravel will be mainly used for the construction of the 5-km long Ashta 2 headrace channel and other HPPs' structures as well. During the 40-month period, the HPP construction will involve 177,000 truck drives (425 per day on average) within the project territory and 9,250 trucks (25 per day on average), out-side the project territory. Workers and staff will work 6 days a week, from 07:00 to 20:00.

4.1.2 Landscape

The Ashta HPPs structures include the intake, the two powerhouses, and the head-race 5 km long and 85 m wide, which will grow in 40 months until they have their fi-nal shape. The construction site for the 40 months will be on an area, south to the Drini River, north of the villages Stajka, Kosmaci and Ashta. It will be 10 km long and there will be earth digging, filling, channel digging, construction works, etc.

During the construction period, the landscape will be gradually changing, with the HPP structures being erected towards completion.

The possible environmental impacts include:

gravel extraction for the HPP construction which will create holes;

bushes being cleared away and thrown away recklessly;

heavy traffic of transport vehicles on the Drini riverbed and communal roads; and -construction of the Ashta HPPs in a quiet zone with little traffic and no heavy traffic of vehicles.

These impacts should be mitigated through:

Hole refilling with materials generated by digging in the area where powerhouses Ashta 1 and 2 will be build up and form the island area where about 9,000 m3 of soil will be excavated;

Collecting the clearcut vegetation at one or more sites, with caution not to throw that into the river but disposing it in the landfill;

Collecting and taking away the excavated materials in the course of digging works;

Gravel and sand to be sold to the construction companies; and

Any other disposal solution must be approved by the COB and the REA in Shkodra.

4.1.3 Tectonics and seismicity

The Ashta HPPs' project area is mainly located on Quaternary Zadrima Depression where the thickness of alluvial gravel and sand deposits vary from 30-40 up to 70-80 m.

The powerhouse of Ashta 1 HPP and the headrace channel are resting on the Qua-ternary alluvial deposits, composed of sandy gravels.

The powerhouse of Ashta 2 HPP is located at the Ashta hill, composed of Paleogene flysch deposits, represented by intercalations of sandstones, siltstones and mud-stones. These Paleogene (Pg) flysch formations are considered as bedrock, which, to the east up to the powerhouse of Ashta 1 HPP, underlies the Quaternary alluvial gravel deposits (S. Jacobs, 2009).

In the north of Spathari weir, there is an active tectonic fault (Aliaj et al., 2001) of Post-Pliocene period (fig. 2.1.8), which may awake from possible earthquakes in this zone and damage the weir (Aliaj et al., 2009; and NAP, 1985).

According to the map of Seismic Regionalization of Albania (Sulstarova et al., 1980), the area from Vau Dejes to Buna River is situated on the Lezha–Ulqini seismic source zone, characterized by a seismic intensity of VIII degree MSK-1964 (fig. 2.1.13), for an average soil category (2nd Soil Category, according to the technical condition KTP-N.2-89), and IX degree MSK-1964 (of 70% probability), for stiff soils. The expected magnitude is Mmax = 7.2 (Aliaj et al., 2007).

According to the report on the evaluation of seismic hazard in the project area (Aliaj Sh., et al., 2009), and to the geological data and studies (S. Jacobs, 2009), the project area lies on Quaternary alluvial gravel deposits, which are classified as a soil of 3rd Category (according to the technical condition (ASA. KTP-N.2-89, 1989). Only a small part of the project area, where will be built Ashta 2 powerhouse, lies on the flysch formations, which are classified as soil of 2nd Category (according to the technical condition KTP-N.2-89).

According to the International Building Code (2003), the Ashta 2 powerhouse loca-tion is classified as rock of class B, while the Ashta 1 powerhouse, the Spathari weir and the channel between Ashta 1 and Ashta 2 powerhouses as stiff soil of class D (Aliaj Sh., et al., 2009).

Tab. Site Classes Defined in the International Building Code, 2003

Site Class	Soil Profile Name	Shear Wave Velocity Vs, 30 (m/s)	Standard Penetration Resistance, N (blows/30 cm)
A	Hard rock	>1500	N/A
B	Rock	760 < Vs ≤ 1500	N/A
C	Very dense soil and soft	360 < Vs ≤ 760	N>50
D	Stiff soil profile	180 ≤ Vs ≤ 360	15 ≤ N ≤ 50
E	Soft soil profile	<180	N<15
F	Soil requiring site		

N/A= Not applicable

The table below shows the two diverse seismic hazard estimates, provided using different Ground Motion Prediction Equations (Aliaj Sh., et al., 2009).

Tab. Seismic hazard parameters for Ashta HPPs' sites location (probability 10% / 50 years)

Location	Northing	Easting	Site Class*	PGA [g]	PGV [cm/s]	Sa(0.3) [g]	Sa(1.0) [g]
Ashta 1	42.002 N	19.600 E	C	0.509	59.55	0.827	0.348

Location	Northing	Easting	Site Class*	PGA [g]	PGV [cm/s]	Sa(0.3) [g]	Sa(1.0) [g]
CD 05/08**	41.995 N	19.585E	C	0.509	59.55	0.827	0.348
Ashta 2	42.012 N	19.551 E	B	0.565	46.33	0.896	0.219

*International Building Code, 2003

**CD 05/08 is situated between Ashta 1 and Ashta 2 powerhouses;

4.1.3.1 Possible environmental impacts:

Seismic hazards, represented by soil liquefaction, fissures and soil subsidence phe-nomena, may cause: damage to concrete structures (Ashta HPPs powerhouses, Spathari weir, headrace and tailrace channels), hazards which threaten the life of the builders, and increase the costs due to the repair works.

4.1.3.2 Mitigation measures:

Taking into account, during design and implementation, of the seismic hazard pa-rameters recommended from the Seismic hazard evaluation study (Aliaj Sh., et al., 2009);

drainage channels should be considered to be built at the feet of the structures. Such channels should be maintained during the construction period;

because the construction site is in a zone of high seismic risk (Mmax = 7.2, Io = IX degrees (MSK-64), it is necessary to design the proper geometric configuration of the object and its foundations, as well as the proper construction hardware;

appropriate technical solutions should be worked out for the constructions, under the level of the water table;

due attention should be paid for the technical safety measures for emergency exits in case of earthquake; and

precaution measures should be taken for the health care of the workers and staff, also considering injuries in case of possible earthquakes.

4.1.4 Land use and soil

The general area of land that will be taken up by the Ashta HPP is about 400 ha. 85.3% is state property, 12.9% belongs to the communes Bushati and Vau Dejes, and 1.8% or less than 7 ha, is private ownership.

Most part of the land to be inundated by the Ashta HPP is the Drini riverbed and the Gjadri riverbed. Eventually, the Spathari reservoir level will rise from21.5 m to 23.0 m, and as a result, its area will increase by 0.1 km2 from 1.708 km2 to 1.809 km2.

The state and communal land makes up more than 98% of the land, with less than 2% under private ownership.

Generally speaking, the project does not extend to arable land, with the exception of a small area, which will be inundated from the rise of the Spathari reservoir level by 1.5m, in the villages Vau Dejes, Spathari, Narac and Lac.

The channel track and the Ashta 2 powerhouse, run very close to an area of arable land in the village Kosmaci, north-west of the village. It should be noted that this is just a few hundred square meters.

The land in Ashta 2 powerhouse is Distric cambisol (CMdy).The most important value which shows the potential soil quality is granulometry. From this point of view, the topsoil of this piece of land (some hundred metres square only) is classified as Silty-Loam.

4.1.4.1 Possible impact:

There might be temporary damage to the soil fertility values, caused by transport vehicles and the placement of the provisional objects in the Ashta 2 construction site during construction, and/or from the accidental leaking of oils and lubricants. This area may have temporary changes of the soil structure. As a result there will be a change in the values of soil permeability and infiltration.

4.1.4.2 Mitigation measures:

In view of avoiding and/or mitigation the above mentioned negative impact, the fol-lowing mitigation measures are recommended:

the soil excavated during the construction of the Ashta 2 powerhouse, which are silty-loam, could be used for refilling the holes caused in the course of the unlawful extraction of gravels prior to the project;

the movement of the vehicles should be monitored and unnecessary transport should be avoided. The buffer area should be reduced at its best, so as not to dam-age arable land;

the place for storing reserve fuels, for the parking and the site for car services, should be cautiously determined; and

the soil polluted by fuels, oils, or other polluting substances should be taken away, and deposited at the site determined by the COB and the REA in Shkodra.

4.1.5 Groundwaters

4.1.5.1 Possible sources of impact on the amount and quality of the groundwater and the potable water supply for the commune.

The drilling performed by the ALTEA Geostudio 2000 (ALTEA Geostudio, 2009), on behalf of the Energji Ashta, at the HPP channel track, showed that up to the depth of 30 m, the wells meet only the Quaternary deposits which are water permeable (gravels and/or sands), which belong to the waterbearing complex of the unconsoli-dated deposits of high permeability. It is only at the Ashta 2 powerhouse location, that the drillings traverse flysch formations, which belong to the waterbearing com-plex of low permeability.

On both banks of the Drini River, the villages have their potable water resources from the groundwater of the water-bearing complex of the Quaternary unconsolidated deposits of high permeability represented by the alluvial gravels of Drini riverbed. The water supply is provided by hydrogeological wells, as well as pri-vate water wells.

The project might affect the quality and the amount of the groundwater due to possi-ble pollution by the project implementation activities and construction works.

4.1.5.2 Possible impact and mitigation measures

Possible impacts and mitigation measures

The construction works sites lie on the recharge area of the groundwaters. For this reason, despite the fact that the hydrogeological and private water wells for the vil-lages on the left of the Drini River flow are far from the HPP structures, the activities of the digging machinery, the transport and the concrete works, may affect

the groundwater. This might be reflected on the water quality of the wells which provide the water supply for the villages south of the project area;

The rise of the water level in the Spathari reservoir will inundate the small islands in the reservoir and their vegetation, if left intact. As a result of the decomposed organic matter, the surface waters might be polluted, which will be extended to the ground-water, because the Drini River serves as recharge area for the groundwaters of the waterbearing complex of the Quaternary gravel deposits on both sides of the project area; and

the project is not believed to have an impact on the amount of the groundwaters.

Mitigation measures

During the construction period, maximal care should be taken to prevent the pollu-tion of the groundwaters by the hazardous substances like oils, fuels, etc. In case of accidental leaking of such substances, the polluted earth has to be removed to the disposal site of the hazardous waste. Such site will be designed in cooperation with the COB and the REA in Shkodra; and

Cutting down trees and bushes, and clearing the vegetation on the small islands within the Spathari reservoir that will be inundated due to the rise of the water level, which will thus reduce the chances of the pollution of the groundwater by the sub-stances generated from the decomposition of the submerged vegetation.

4.1.6 Surface waters

It should be noted that during the construction phase, the impact will be at acceptable levels, because the construction activities will lie along the riverbed. Interventions if any will be limited, as the Spathari reservoir is an existing reservoir created about 40 years ago. The irrigation and drainage systems in the project area would not be affected.

Here follows a short summary of the possible impacts and the appropriate mitigation measures:

4.1.6.1 Possible impact:

The rise of the water level in the Spathari reservoir by 1.5 m will extend its area by 99 ha. Most of the area that will be inundated belongs to the Gjadri River, whereas the vegetation-covered area (the arable land and the area on the islands within the reservoir) is about 27 ha. 20 ha belong to the islands and 7 ha to agricultural land in private ownership. On one of the islands that will be inundated (the one closer to the water intake) about 9,000 m3 of earth will be excavated and will be used for the con-struction works, especially to cover the southern escarpment of the Ashta 1 - Ashta 2 headrace channel. This will later be covered by native vegetation, e.g. grass and bushes.

This amount of earth works, and in particular lowering the level of water intake at the reservoir from 19 m asl to 16.5 m asl will cause a temporary rise in the water muddi-ness of the Drini River, which means an increase of solid sediments discharges in the Drini River.

4.1.6.2 Mitigation measures:

the construction of temporary protection works to facilitate the building of the Ashta HPP channel (5 km long) in order to avoid the erosion along the northern side of this channel in the occasion of higher river flow. For this reason, it is recommended to construct this channel mainly during dry period when the river flow is at minimum levels; and

cutting down trees and bushes, and in general clearing away the vegetation on the islands and the banks of the Spathari reservoir which will be inundated, so as to re-duce the impact of the decomposed organic matter on the quality of the reservoir water and further on the Drini River.

4.1.7 Flooding

During the construction phase, further aggravation of the flooding by the Drini River is expected because the existing works, which serve as protection from the floods, will be in place until the construction of the HPP headrace channel.

During the construction period, there will be a ban on the extraction of the construction aggregates (gravels and sands) on the left of the Drini River flow, from the Spathari weir to Ashta 2 powerhouse, which will reduce one of the causes to the flooding of the villages Shelqezi, Stajka, Kozmaci and Ashta.

In conclusion, the flood risk will be no greater than prior the Ashta HPP construction. This risk will actually decrease as construction makes progress and the Ashta HPP headrace channel will be built, because the latter is going to serve as protection weir for the territory south of the project area.

During the extraordinary flooding of 2010-2011, when a large area of land was flooded in the district of Shkodra, the villages south to the project area were not af-fected, thanks to the initial works for the construction of the headrace channel be-tween Ashta 1 and Ashta 2 powerhouses. This channel served as protection weir against the flooding.

Hence, during the construction of the Ashta HPP, there will be a positive trend re-garding the protection from the flood hazards in the territory south to the project area, in the villages Shelqezi, Stajka, Kozmaci and Ashta.

4.1.8 Erosion and sedimentation

It is expected a temporary rise of erosion in the case of extraordinary discharge of the Drini River. Besides, the excavation works in the Drini Riverbed and the Spathari reservoir, will increase the amount of the suspended solid discharges.

This amount of sediments, and in particular, the lower level of water intaking from the reservoir from 19 m asl to 16.5m asl will cause a temporary rise in the water muddi-ness of the Drini River. Through the Drini River, a larger amount of suspended solid discharges will be flown into the lower flow of the river and the Buna River, and from there it will be discharged into the coastal area.

It is clear that, during the construction stage of Ashta HPP:

there will be no negative impact relating to the coastal area. On the contrary, it has been estimated to bring some positive impact, due to the larger amount of the sus-pended solid discharge from the Drini River, and farther on from the Buna River;

there will be positive impact regarding the floor of the Spathari reservoir, not to be filled up by the solid discharge from the GjadriRiver, because, the construction works will bring it to a lower level from19 m asl to16.5 m asl; and

temporary negative impact regarding the quality of the Drini River waters due to the increase in the water muddiness, which is a direct result from the construction works.

4.1.9 Other physical effects during construction stage

4.1.9.1 Air pollution

During the Ashta HPP construction period, dusts will be quite common throughout the project area. Intensity will vary depending on the season, the type of soil and the kind of work. Dust will be more intensive in the period of initial digging, in places where the surface layer consists of alluvium deposits, mainly silts and clays. Particu-larly in summer, in dry weather digging, the dust will be affecting the air of the con-struction works area.

Another source of dust will be the transport trucks running within the territory of the project area. It has been estimated that a small number of vehicles will be driving on the national or communal roads; this is for the transport of stones and the machiner-ies to be installed in the HPP. Almost all transport of gravel and sand, and soil will be done within the project area.

The means of transport and other machineries to be used for the construction works, will also be a source of discharge of polluting gases into the air, as it is common for the vehicles running on diesel.

Heavy trucks will be used for transport. It has been estimated that in the peak of the construction works; which is in the months 17th – 18th, there will be 850 truck runs per day or 425 trips. By considering the average distance, we estimate a consump-tion of 810 litres of diesel per day for all trucks. The average consumption will be 400 – 500 l of fuel per day.

The construction works will involve vehicles and machineries like excavators, dig-gers, cranes, scraper, etc.Considering their daily workload, we estimate a maximal consumption of 400 l/day.

The average consumption of fuel during the period of the construction works will be 1000 l/day, and the maximal one is estimated at 1400 l/day.

The gases discharged into the air, that are common for vehicles running on diesel, like NOx, CH4, VOC; CO; SO2, etc.

The average daily amount of gas discharge from the trucks and the other machiner-ies involved in the Ashta HPP construction works will be as follows:

29.79 Kg NOx; 0.18 kg CH4; 4.7 kg NMVOC (volatile non-methane organic composi-tion); 14.03 Kg CO ; 0.09 Kg N2O; 3.6 Kg SO2.

In the case of the maximal levels of (trucks and machineries) gas discharges into the air, we estimate respectively as follows:

41.71 Kg NOx; 0.26 kg CH4; 6.58 kg NMVOC (volatile non-methane organic compo-sition); 19.65 Kg CO ; 0.13 Kg N2O; 5.04 Kg SO2.

The daily discharges from the vehicles in the city of Shkodra, in 2002 were as follows:

1346.7 Kg NOx; 21.91 kg CH4; 667.7 kg NMVOC (volatile non-methane organic composition); 2927.3 Kg CO ; 12.57 Kg N2O; 311.9 Kg SO2 (Selfo L. 2002).

Tab. 7.1. Gas discharges during the Ashta HPPs' construction stage

Nr		NOx Kg/day	CH4 Kg/ day	NMVOC Kg/ day	CO Kg/ day	N2O Kg/ day	SO2 Kg/ day
1	Average daily discharges	29.79	0.18	4.7 kg	14.03	0.09	3.6
2	Maximal daily discharges	41.71	0.26	6.58	19.65	0.13	5.04
3	Average daily discharges in	1346.7	21.91	667.7	2927.3	12.57	311.9

*Baseline Budget for Coastal Districts of Albania prepared for UNEP/MAP in the frame of Strategic Action Plan. Tirana 2003

From the data presented above, by comparing the daily gas discharges in the project area, to the amount of gases discharged into the area of the city of Shkodra of about 1000 ha, the air pollution by the gases discharged from vehicles, results to be at lower levels for equal area.

We would like to point out that the project area is 600 m from the nearest residential areas and 400 m from the nearest house. Based on the wind rose for the city of Shkodra (fig.2.1.27) - (as there are no such measurements for the project zone -, the prevalent direction of the gases and dusts produced from the construction works, will be mainly eastwards and secondly south-eastwards.

Mitigation measures

In view of reducing the gas discharges to minimal levels, particularly the sulphur gases, the diesel will be the kind with content 50 and 10 ppm sulphur. This puts it at the acceptable standards for EU regarding the sulphur content for this kind of fuel.

In dry weather, with highest possibilities for dust from the movement of trucks, it is recommended to splash the roads with water, so as to minimize the level of dust in the project zone and their impact on the villages/houses nearest to the project area.

Besides, in both sites that will be established for the HPP construction, there will be gravel barriers set up with a double environmental purpose and effect, to reduce the dust to the villages near the project area and to reduce the noise made by the ma-chineries, the equipment and the vehicles running in the construction sites.

In view of a better control of the environmental situation, with regard to the environ-mental standards for the air in the rural areas, there will be air quality monitoring in the villages Ashta, Kosmaci, StajkaandMjeda, which may be affected by the project works.

4.1.9.2 Noise

The noise will be present through the whole period of 40 months for the HPP con-struction.

The noise will come mainly from the transport vehicles, which are going to be gener-ally heavy trucks and various machineries like excavators, diggers, scrapers, cranes, etc.

In the table are the vehicles and machineries that will be used in the construction works, and the respective noise level generated by each.

Tab.7.2. Vehicles and machineries in the construction works and their noise levels.

No.	Kind/model	Noise level dB(A)	Number of vehicles/machineries
1	Digger	111	6
2	Excavator	108	10
3	Roller truck	112	4
4	Vibrating roller truck	116	4
5	Driller	118	4
6	Dozer	113	2
7	Other machineries	103	15
8	Truck on gravel road	64	Max.850 per day (within the project area)

9	Truck on asphalt road	61	Max.50 per day (outside the project area)

Taking into account that the trucks and machineries in the above table will be work-ing on a large area, the specific level of noise will be 64 dBA/ m2.

Regarding the noise generated by the vehicles, it is estimated that the specific level of noises will be 84 dB (A) in the project area, and 68 dBA on the asphalted roads.The works will be 6 days a week, during 07 – 20, thus avoiding works at night and on Sunday.

The Albanian Law No. 9774, dated 12.7.2007; "On evaluation and administration of noises in the environment", at article 10 provides that the measures for protection from noises apply depending on the time when noises are generated. For this pur-pose, the 24 hours are divided as follows:

- the day lasts 13 hours, from 06^{00} to 19^{00};
- the evening lasts 4 hours, from 19^{00} to 23^{00}; and
- the night lasts 7 hours, from 23^{00} to 06^{00}.

The above confirms that the timetable for the project work is in compliance with the provisions in the law mentioned above. The limits for the acceptable noise levels in the residential areas, are provided for in the joint Ordinance of the MoEFWA and the MH, no.8, of 27.11.2007 "On the limits for noises in specific environments", pre-sented in the table below

Tab.7.3. Noise levels depending on the environment,

Environment	Critical impact on health	LA_{eq} (dBA)	Basic time (hours)	LAmax Fast (dB)
Residential area				
Outside residential building	Serious annoyance during the day and the evening	55	16	-
	Moderate annoyance during the day and the evening	50	16	-
Inside residential buildings	Talks clearly heard, and annoyance during the day and the evening	35	16	-
Inside sleeping room	Sleep disturbed at night	30	8	-
Outside sleeping room	Disturbed sleep, open window (measured outside)	45	8	-
Area of social-economic activity				

Industrial, trade zone, street traffic (inner and outer environment)	Hearing damage	70	24	110
Urban environment				
inside and outside public environment,	Hearing damage	85	1	110

Explanatory notes:

-LA_{eq} (dBA) = equivalent to a level measured at scale A

-time unit (hour) = time in which measurement is taken

-LAmax Fast (dB) = Measured level at scale A in “Fast” mode (fast)

1 = the lowest possible.

2 = maximum impact stress (LAmax, fast) measured 100 mm from the ear.

3 = outer quiet zones must be protected, and the ratio of incoming/outgoing noises with natural **fonia** must be as low as possible.

4 = under the headphones, adjusted to the values of free field.

In the table below, there are more detailed levels of noises during day and night hours, with reference to the German standards for road traffic and the World Bank and the WHO guidelines (WHO, 1999):

Tab.7.4. The acceptable standards of noises after the German and international or-ganizations

Area	World Bank (general limits)		WHO (general limits)		Germany (road traffic)	
	day	night	day	night	day	night
residential	55[c]	45[c]	55	30[e]	59	49
mixed	70[d]	70[d]	70[d]	70[d]	64	54

Explanatory notes:

a) in cities with a population over 100.000

b) residential and trade areas

c) residential, institutional, educational

d) industrial, trade

e) residential area, inside home (sleep disturbances)

Mitigation measures

In order to further reduce to acceptable levels the noise in the residential areas closer to the project zone (villages: Stajka, Kosmaci and Ashta), on the construction sites generating noises, there will be gravel barriers to serve as buffer or absorber for the residential areas, the nearest being at least 400 m from the construction site.

This is going to have the same effect to prevent the dusts from moving over to the residential areas.

Work times must be complied with, and there must be no working after 8.00pm.

By taking such measures, the noise levels for day's hours will be at acceptable stan-dards, whereas, as mentioned earlier, there will be no work being done during night hours.

The estimated noise levels in the residential areas near the construction site result from the data obtained by modelling noise levels for working conditions involving the machinery and the vehicles specified in the table mentioned earlier.

Below is the figure which presents the map of the noise levels distribution in the pro-ject area and the outskirts of the residential areas.

By modelling the noise levels generated by the vehicles and machineries that will be used for the construction of the HPP structures, it turns out that the average noise values in the residential areas nearest the project area will be at the level 35 – 45 dB (A).

Comparing it with the allowed standards as provided in joint Ordinance of the MoEFWA and the MH; No.8, of 27.11.2007 "On the limits for noises in specific envi-ronments", of 50 - 55 dB (A), the noise values will be lower.

With reference to the limits recommended by the World Bank and the World Health Organization (WHO) and the German standards, the acceptable levels during day hours in the residential areas and their surroundings, range between 55 – 59 dBA.

4.1.9.3 Wastewaters

The construction will be done on two construction sites, which will have the main machineries for construction, concrete production and other construction machiner-ies as well as the administration offices. The polluted waters will be generated by the human activities mainly. There will be about 100-150 workers contracted for the work.

The wastewaters will be treated in compact biological treatment plant, which the company will build up in the initial phase of the construction. This will be running till the end of the construction period. This treatment plant will provide waste water treatment in the compliance with the urban waste waters discharge in the surface waters, pursuant to the DCM no. 177, dated 31.03.2005.

Tab.7.5. The requirements for the discharges from the urban waste waters process-ing plant

Parameters	concentration	Reference method for measurement
1	2	3
Bio-chemical needs for Oxygen (NBO-5) at 20o with no nitrification	25 mg/l O2	Homogenized sample, unfiltered, not-decanted. Determining the Oxygen not dissolved, prior to and after 5 days, in incubator, at 20o C, in complete darkness.
Chemical need for Oxygen	125mg/l O2	Homogenized sample, unfiltered non-decanted. Oxidizing with bichromate potassium (digestion method, in 2 hours)
Total matter under suspension	35mg/l ≥ 10 000 pe.	Filtering a representing sample through a filter membrane (0,45mm, gravimetric method). Drying at 105 o and weight.
Total matter under suspension	60mg/l (2 000 - 10 000 pe)	Centrifuge of a representing sample (for at least 5 minutes with acceleration, from 2 800 – 3200 g), drying until 105 o and weight measured.

Source: DCM no. 177, of 31.03.2005

4.1.9.4 Solid waste

The HPP construction activities do not generate solid waste, which would demand special attention in view of environmental protection.

Solid waste may be created by various wrapping or packaging: metal, wood, carton or plastic wrapping, from the various machineries, equipments or devices that will be installed and used during the HPP construction works.

Another kind of solid waste will be created from the food waste of the construction workers and administration staff.

Depending on the kind, such waste may be collected by specialized subjects for waste recycling, such as metal, wood, carton, glass and plastic waste, or else, they can be collected at the specified site for urban waste at the village Plezha, that will start to operate prior to the beginning of the HPP construction works. For this pur-pose, the entrepreneur must cooperate with the commune of Bushati authorities concerning the installation of the containers in the HPP construction sites, the proper removal of the solid waste from the construction site and their transport to the speci-fied urban waste disposalsite of Plezha, pursuant to the Law No.9010, dated 13.2.2003 “On environmental administration of solid waste”.

4.1.9.5 Hazardous waste

Even with regard to the hazardous waste, the construction activities do not involve processes that generate hazardous waste. As provided in the Law No. 9537, dated 18.05.2006 “On the administration of hazardous waste”, in the context on the HPP construction activities, the following will be considered hazardous waste: used lubri-cant oils, paints, solvents and their wrapping, worn out tires, batteries, etc.

The liquid waste classified as hazardous waste, must be protected in special places, with the floor coated with boards or concreteto ensure against possible leaking into ground and may pollute ground-waters. The site must be fenced.

All such materials should be registered, inventoried and monitored. Such inventoriza-tion will be updated while the project implementation goes on. Any potential source for pollution must be properly evaluated, and measures should be specified to avoid leaking as well as measures to reduce the discharges of hazardous waste in the en-vironment by using the best available practices. The liquid hazardous waste must be kept in special containers.

Generally speaking, all hazardous waste have to be removed, collected and taken away by licensed companies, to disposal sites designed by the REA.

4.1.10 Biological environment

The construction of dams on rivers, apart of positive effects for the human society such as increasing amount of electricity produced, transportation facilitation, increased flooding protection, increase in the amount of avaliable water for different purposes (agriculture or for drinking water for the population), are also associated with costs in the biological environment. Construction impacts from the Ashta hydropower plant on biodiversity, judging from the hyrdopower plant installed power and the height of the dam (which is an existing one), belong to a very small scale. Nevertheless, in all cases this is associated with loss in habitats, interruption or fragmentation of ecosystems and reduced biodiversity, reduced floristic wealth, chanes in floristic composition and functioning of ecosystems. Drini River is now affected in almost half of its length from the construction of three hydropower plants.

The majority of the negative impacts on biodiversity belong to the construction phase. The construction of the Ashta hydropower plant is associated with work level of a large scale and extented duration, activation of a large number of workers and machines, construction of a temporary nature such as settlements for workers and storage of building materials, parking of heavy machinery, new temporary roads etc.

Construction of the Ashta hydropower plant will be accompanied with raised levels of the Spathari reservoir. Possible principle impacts on the environment from the construction of this hydropower plant include:

4.1.10.1 During the construction phase

Activity: Construction of the Ashta HPPs headrace channel and raised levels in the Spathari Reservoir

Possible impacts:

Damages or swamps vegetation along the river banks, reduction of biodiversity, loss of habitats and restrictions on the realm of typical riverbed species. Flooding of some small islands created by sediments in the Spathari reservoir with a surface area up to 20 hectars. Nevertheless, most of the area affected from flooding does not represent a pristine area in a botanical viewpoint, but an area with a large anthropogenic interference factor (a number of villages along the Drini River valley), resulting in the formation of forests and bushes with high levels of degradation. Similar formations, in better conditions, may be found in all areas not affected by flooding. Most losses may occur during the construction phase and gradualy be recovered by the ecosystem in time, and

Fragment the river ecosystem, isolate upstream populations to those downstream and interrupt migration routes. Changes in the aquatic environment such as water quality, water temperature, flow velocity and their inflows; reservoir surface tempera-ture may rise as a result of slower moving waters and waters with low levels of dis-solved oxygen (DO) damage aquatic habitats.

Preventative measures and mitigation of impacts on the environment:

Rehabilitation and compensation measures to ensure restauration and ecological balance must return green space lost by the construction of the dam and the reservoir created in between:

Afforestation or creation of new vegetation of defense along the river created to avoid eroision and the establishment of “water filters (alluvial forests act as water filters) with suitable plant species, resistent, to treflect the native characteristics and wholesome previous habitats such as Platanus orientalis, Populus alba, Salix alba, Salix purpurea, Salix amplexicaulis, Salix elaeagnos subsp. angustifolia, Alnus glutinosa, Alnus incana etc.

Afforestation or the creation of green space on the surfaces not flooded by the increase in the level of the Spathari reservoir, high slopes with native species would protect adequately the reservoir from solid flows or erosion.

Cleaning or cutting of forest trees or shrubs before flooding by the increase in the level of the Spathari reservoir to avoid the effects of lack of oxygen and high concentration of methyl mercury resulting from the decomposition of organic matter (trees and shrubs flooded by the reservoir) and thus harm fish and other aquatic biomes; and

Environmental monitoring of base components and particularly of the main parame-ters of water quality (dissolved oxygen and biochemical oxygen, chlorophyll, clear-ness, temperature and mercury concentration) and sediments. Some of these pa-rameters should continue to be measured at all times during the operation of the hy-dropower plant.

<u>Activity</u>:Construction of a temporary site such as settlements for workers and storage of building materials, parking of heavy machinery, new temporary roads, etc.

Possible Impacts:

Loss and damage of natural habitats and vegetation and loss in biodiversity, loss of endangered species; and

Erosion and resulting loss and damage to natural habitats and vegetation.

Spread of invasive species of detrimental effects on native flora and high levels of difficulty of their control. Construction for the Ashta HPP will be associated with crea-tion of new habitats, environments more favourable for the infiltration of invasive species, weeds etc.

Preventative measures and mitigation of impacts on the environment:

Minimization of territories occupied from temporary construction and selection of temporary construction sites with lower values from a floristic and biodiversity perspective. The construction project should predict the rehabilitation and reclamation process of native species.

Mitigation of erosion effects through afforestation after work completion.

Effective control or monitoring to prevent and if in cases of spread their elemintation through tweaks or chemical methods for the invasive species.

<u>Activity</u>: Transportation of materials and machinery associated with accidental spills or fuel leaks, chemicals, and fumes or dust released that may have negative impacts on the state of the ecosystem.

Potential environmental impacts:

Damage to natural habitats and vegetation, loss of biodiversity particulary the aquatic ones.

Preventive measures and mitigatin of the environmental impacts:

Collection and recycling of oils and lubricants.

Precautionary measures to avoid accidental spills or fuel leaks, creation of sedimentation basins, construction of gutters and collectors/containers to prevent leaks/spills of chemicals and poisoning of waters and their pertaining fauna; and

Continuous drenching of areas lacking vegetation to avoid fumes from machinery movements, work time reduction or effective preventive measures such as drenching of roads used by machinery, application of water-use technologies in excavation work etc.

Activity: increased risk from potential fires

Potential environmental impacts:

Loss and habitat damage and natural vegetation, loss in biodiversity; and

Creation of new habitats that favour harmful invasive species for their natural vege-tation or vectors of infectious diseases.

Preventive measures and mitigation of the environmental impacts:

Establishment of a monitoring system for protection against fires and control for the non-proliferation of invasive species.

4.2 Socio- economic environment

The Ashta HPPs' construction does not involve expropriation of public or private buildings.

Besides, the area of land (about 400 ha) on which the Ashta HPP structures will be built, is 98.2 % state or communal property, mainly the Drini and Gjadri River bed-rock, whereas a small part (less than 7 ha or 1.8%) is agricultural land under private ownership, which will be compensated by the company pursuant to the relevant legal provisions (DCM on expropriation for public interests and transfer to the state inter-est, of real estate and private property for purposes of construction, exploitation and maintenance, in the framework of the new Ashta HPP project in the prefecture of Shkodra). Pursuant to this legal act of the Government, the land owners will be com-pensated in cash by the Energji Ashta Ltd. which will build the HPPs. The expropria-tion will be completed within 2010-2011.

First of all, the construction and the exploitation of a new HPP, in the difficult circum-stances of the country regarding the power supply, will be a great help and will im-prove the existing situation, will reduce power imports, and will be producing in envi-ronmentally friendly conditions.

With regard to the local context, the COB will be the direct beneficiary in the eco-nomic aspects. During the 40-month construction period, there will be 100-150 work-ers hired for the construction works, which is a considerable number, taking into ac-count that this benefit goes first to the local people of the villages nearest the project area.

Besides, the commune will also benefit the local taxes paid by Energji Ashta.

From the viewpoint of the central and local aspects, benefits will also go to the local construction companies which will be sub-contracted by the Energji Ashta. The HPP construction will provide favourable conditions and will encourage new businesses, new trading activities or services, for the workers hired for the HPP construction.

A negative element during the HPP construction, with regard to the socio-economic aspects, could be the damage to any communal roads as a consequence of the heavy transport in the framework of the HPP construction.

Activity: Damage to the roads and heavy traffic of heavy vehicles.

Mitigation measures:

Agreement between the builder and the commune authorities regarding the mainte-nance of the roads which will be used by the heavy vehicles in the context of the HPP construction; and

Road rehabilitation during and after the completion of the construction works for the HPP.

4.3 During the HPPs' operation phase

4.3.1 Landscape

As it can be seen from the project design in the orthophoto attached to this report, the headrace channel will be running very close to the existing Drini River bedrock, on a area which as described in the environmental baseline and project location part, has been an area environmentally affected form illegal activities like: deforestation, extraction of gravel and sand, fishing with dynamite and electric current and dump-site for urban, construction and other waste. Big holes have been created, which to-gether with the urban waste thrown around and along the river and the lack of vege-tation, give the impression of an environmentally ruined area, without values or land-scape attraction.

Potential environmental impacts:

Within the Spathari reservoir, as a result of the rise of the water level, most of the existing islands will be inundated. The reservoir banks are very close to the buildings of the villages Vau Dejes and Spathari. Probably, there will be a visually different landscape and part of the visual variety and attraction may be lost after the disap-pearance of the small islands within the reservoir, also considering that they are covered by vegetation.

With regard to the visual effects, the most important object will be the 5-km channel, with the Drini River water running through the Spathari weir into the Ashta 2 power-house. As a matter of fact, because of the size of this channel of 85 m wide and the cross-sectional trapezoidal shape, it will look like a river, with its water reflection width at more than 100 m.

Mitigation measures:

In order to make up for the loss of vegetation on the existing small islands within the Spathari reservoir, and to provide for new environments of landscape attraction, with natural and economic values, Energji Ashta will contribute to build a communal park near the Drini River banks (LEAP, Commune of Bushati. 2008, p.11). The area planned for rehabilitation, between the HPP channel on one side, and the villages Shelqeti, Kosmaci and Ashta on the other side, is mainly a gravelly area with many holes and little vegetation.

Based on Albanian legislation all trees cut for project needs must be compensated through planting new trees in an area agreed with responsible local authorities. The construction by Energji Ashta of a park in the COB will serve as encouragement to the local government, to intensify its efforts regarding the provision of entertainment and relaxation elements in this environment.

In addition, it is not foreseen that the Ashta HPP channel will have significant nega-tive visual impacts compared to the existing landscape. The southern escarpment of the channel will be running close to the villages Stajka, Kosmaci and Ashta, and will be planted with native species of grass, trees and bushes, that are common in the project area, such as willow, tamarisk (tamarix sp), etc.

4.3.2 Earthquakes

According to the report on the evaluation of seismic hazard in the project area (Aliaj Sh., et al., 2009), and to the geological data and studies (S. Jacobs, 2009), the pro-ject area lies on Quaternary alluvial gravel deposits, which are classified as a soil of 3rd Category (according to the technical condition KTP-N.2-89). Only a small part of the project area, where Ashta 2 powerhouse will be built, lies on the flysch forma-tions, which are classified as soil of 2nd Category (according to the technical condi-tion KTP-N.2-89).

According to the International Building Code, 2003, the Ashta 2 powerhouse location is classified as rock of class B, while the Ashta 1 powerhouse, the Spathari weir and the channel between Ashta 1 and Ashta 2 powerhouses as stiff soil of class D (Aliaj Sh., et al., 2009).

As the construction will be on the Drini River bedrock, the groundwater level will be that of the river surface. Hence, the foundations of the HPP structures, such as the headrace channel, the tailrace, the Ashta 1 HPP powerhouse, will always be below the level of the groundwater, which brings the risk of soil subsidence because of the weight of the structures, as well as the hazards in case of any eventual earthquake.

North of the Spathari weir is an active tectonic fault, of Post-Pliocene period (fig.2.1.8), which may become active in case of possible earthquake and may dam-age this weir (Tectonic map of Albania, Aliaj Sh. et al, 2000).

Possible impacts on environment:

The seismic hazards, represented by soil liquefaction, fissures and soil subsidence phenomena, may cause:

Damage to concrete structures (Ashta HPPs powerhouses, Spathari weir, headrace and tailrace channels) and costs for damage repair;

hazards to threaten the lives of the Ashta HPP workers and staff; and

flooding in case of damage to the Spathari weir on the area downstream to this weir, which constitutes a threat to the lives of the local people, agriculture, livestock and the urban-industrial infrastructure.

Mitigation measures shall seek:

to maintain the drainage channels at the feet of the HPP structures;

to protect the foundations near the drainage channels from erosion;

to observe and monitor the foundations in order to avoid subsidence from the soil liquefaction. In case there are signs of subsidence, measures need to be taken to consolidate the foundations;

to take safety measures, including emergency exits in case of earthquake;

to take preventative measures for the health care of the workers and staff, in case of injuries or possible earthquake;

to prepare the plan for the HPP supervision, also defining the protective measures; and

to prepare the emergency plan for the HPP and to anticipate the necessary protective measures.

4.3.3 Soil

After the construction is completed and the Ashta 1 and Ashta 2 HPPs will start to operate, the developer, who also happens to bring together project design, imple-mentation and operation, must take the necessary

measures to avoid and/or reduce the negative impacts from or in the course of the construction works. The entrepre-neur must take measure for the rehabilitation of damages to the agricultural land, such as:

repairing physical damage near the channel due to the dump of the earth; with prior simple chemical and physical tests;

improving values of volume weight, because of possible soilcompression, by apply-ing a system of soil labouring/ploughing first at 1 m deep and later through layer works. This measure helps with the physical water values, such as soil permeability and infiltration; and

improving the soil structure values and the nutrients, by applying a clear schema of soil ploughing and fertilizing, depending on the scale of damage.

Later on, in the course of the HPP operation, no impact is expected to occur to the nearby soils.

4.3.4 Groundwaters

Considering the hydrogeological settings, the whole Drini River bed, affected by the Ashta HPP project, serves as recharge area for the groundwaters of the waterbear-ing complex of Quaternary gravels.

The villages on both banks of the DriniRiver have their potable water supply from the groundwaters of this waterbearing complex, represented by alluvial gravel of Drini River. The supply has been realized through hydrogeological wells and private water wells. Most of the private water wells take their water from a waterbearing layer at a depth of 10-12 m, whereas the hydrogeological wells take their water from deeper layers.

A minimal discharge of 30 m3/s (ecological water release) into the Drini riverbed, will help to minimize the alteration and will provide for maintaining the groundwaters in the recharge area in the circumstances of the hydrodynamic equilibrium. Besides, the fact that the channel from Ashta 1 to Ashta 2 will be permeable will provide for the maintenance of the conditions of this equilibrium.

Hence, it is not foreseen any negative impact of the HPP on the groundwaters during the operation phase.

4.3.5 Surface waters

After the construction is completed and the Ashta HPP starts operating, the Spathari reservoir - built about 40 years ago - will serve as compensation basin. In the frame-work of the project, the reservoir area will extend by about 5%; from 1.7 km2 to 1.8 km2. The general volume of the reservoir water will be about 5.5 million m3 and the average depth 2.9 m.

The time of the water stay in the reservoir during the normal HPP operation (for 560 m3 will be only 2,6 hours, but considering the annual average discharge of the Drini River into Vau Dejes (310 m3), it will be 4.8 hours.

Due to the fact that after leaving the Vau Dejes HPP the Drini River is very wide, the construction of the Ashta 1 tailrace channel, which runs north of Shelqeti-Kozmaci-Ashta villages, will serve as embankment to stop the water spreading to and flooding wider territories.

Part of the water discharged into the Ashta HPP channel, will be used for the irriga-tion of the land on its left, which will provide for sustainable agricultural development in the study area.

Not all the Drini River waters will be discharged into the intake of the Ashta HPP. A minimal quantity of water will continue to flow on the existing river bed, which is nec-essary to provide for the continuity and survival of the biological environment on the riverbed. This amount of water, called “ecological water release” will be about 30 m3/s.

The project includes the construction of a bifurcation channel, right after Ashta 2 powerhouse, in order to encourage the increase of water quantity in the riverbed segment between the Ashta 1 and Ashta 2 powerhouses (about 5 km long).

4.3.6 Flooding

Due to the fact that, after leaving the Vau Dejes HPP, the Drini River is very wide, the construction of the Ashta 1 tailrace channel, which runs north of the area Shelqeti-Kozmaci-Ashta villages will serve as embankment to prevent the Drini River water flooding nearby.

Also, because of rising above the height of the Drini River bed, this big channel will also serve as embankment, thus preventing the river waters from spreading to wider territory. Hence, the villages Shelqeti, Stajka, Kosmaci and Ashta, which lie south to the project area at a length of 6.5 km, will be protected against the flooding hazards.

The flooding in December 2009 - January 2010, during which the Drini River dis-charge was estimated at about 2,350 m3/s, was studied in details by the POYRY on behalf of Energji Ashta (Poyry, 2010). During this event, the area south to the project area was not touched, due to the construction works for the channel running from Ashta 1 to Ashta 2 powerhouse, which served as embankment against the flooding in this area.

Fig. no 2.1.22 shows the area flooded in the period December 2009-January 2010. According to the study of POYRY (POYRY, 2010), it is obvious that in the case of maximal flow, for instance that of December 2009-January 2010, large areas of land and residential areas are flooded on both banks of the Drini River, from the Spathari weir till its discharge into the Buna River. The feasibility study on the Ashta HPP project shows that the impacts associated to the scale of flooding, will be:

elimination of flooding hazards for the area south of the project, the villages Shelqet, Stajka, Kozmaci and Ashta; and

- cm deeper flooding in the area northweast to the Ashta village, from Jubani village to the areas near the city of Shkodra (fig. 2.1.22)

In conclusion, during the operation phase of the Ashta HPP, there will be a positive impact regarding the significant reduction of the flooding in the study zone.

The HPP channel renders unnecessary any protection works in the south of the pro-ject track (Shelqeti, Stajka, Kosmaci, and Ashta villages), thus eliminating the ex-penses for such works in this area.

In the framework of the Environment Management Plan, there will be a Flood Emer-gency Plan included as well.

4.3.7 Erosion and sedimentation

The construction of the 5 km long channel between the Ashta 1 and Ashta 2 power-houses, and of the embankment 1.5 km long downstream Ashta 2 powerhouse, will finally put an end to the erosion on the left river bank, north of the villages Stajka, Kosmaci and Ashta. Whereas the construction of the Ashta 2 tailrace channel, which will help to maintain the depth of the Drini riverbed downstream the Ashta 2 power-house, will reduce the hazard of the erosion on both banks of the river, between the villages Ashta and Jubani.

Hence, the construction of the Ashta HPP and its structures, will significantly improve the situation regarding the erosion in the project area, by establishing a completely protected area left of the Drini River flow, in the sector Spathari-Ashta. Besides, the ban on the extraction of the construction aggregates on the left of the Drini River bank, due to the construction works for 6.5 km of length along the river segment (in-cluding protection works in the north and north-west of the village Ashta), which re-duces access to the area, will give a positive impact on the rehabilitation of the area between the channel and the communal land in the south.

With regard to erosion, it should be pointed out that the reduced area for the water to flow on the Drini River natural bed will provide for the rise in the activity of the river bed processes, particularly in the west of the HPP, in the segment where the river bed will be kept deep.During the design phase Energji Ashta worked out the necessary technical solution in order to protect the main channel radius from erosion along more than 5 km of length.

The HPP channel renders unnecessary any protection works south of the project area, thus reducing the expenses for such works.

A temporary rise of erosion is expected to be seen on the Drini riverbed, in case of extraordinary discharge of the Drini River. In addition, because of the digging in the Drini River bed and the Spathari Reservoir, there will be a larger amount of sus-pended solid discharges in the river waters.

The lower level of the intake from the Spathari reservoir, from19 m asl to16.5 m asl will provide for a smaller amount of solid sediment discharge of the Gjadri River into the Spathari Reservoir. Through the Drini River, the solid discharge will be deposited in the river's lower flow as well as into the Buna River and from there into the Adriatic Sea. Based on this fact, as well as considering the ban on the extraction of the con-struction aggregates (sands and gravel) in the area south to the project track, it can be expected that the Ashta HPP is going to have a slight positive impact regarding the evolutionof the coastal area, during the operation stage.

4.3.8 Other physical effects during operation stage

4.3.8.1 Gases of greenhouse effect

The power production relying on the water resources does not discharge carbon or other gases in the air, which cause the greenhouse effect. This is clean, renewable energy.

In the publication of the National Power Agency, it is stated that: "With regard to the power in Albania (NEA, 2008), it is necessary to maximize the share of power gen-erated by the Hydropower plants, in order to face the impact from the climatic changes, by building HPPs, be that small, medium or large.

The International Panel on the Climatic Changes discourages the use of technology which involves the discharge of greenhouse-effect gases into the air, and encour-ages the use of renewable resources of energy, placing an emphasis on the hydro-power resources (IPCC, 2007).

It should be noted that the power generated by the Ashta 1 and Ashta 2 HPP, will be sparing us an amount of carbon gas (CO2), of about 225.000 t/year which would the needed fuel to generate the equal power. Such amount of carbon gas may be assimilated by a forest with 250,000 trees for 40 year (The global cooling centre, 2008; and Francfort J. E., 1997).

In the meantime, additional amount of methane generated by the increase of water surface in Spathari reservoir (including flooded islands) is estimated at 590 t/year CO2. (http://news.softpedia.com/news/Temperate-Area-Reservoirs-Emit-a-Lot-of-Methane-160312.shtml).

4.3.8.2 Noise

The power will be produced by 45 turbines in each of the powerhouses in Ashta 1 and Ashta 2.The turbines will be HydroMatrix®. The generated noise will be at 30 dB (A). Such levels cause no disturbances to hearing, and are in compliance with the standards of noise levels in the bedroom (joint Ordinance of the MoEFWA and the MH, no.8, dated 27.11.2007 "On the noise limits in specific environments").

No other noise source is expected from the Ashta HPP.

4.3.8.3 Wastewaters

In the course of operation, the HPP's will not discharge polluted waters.

After the HPP starts operating, there will be about 25 staff to be employed by the company, to work in the Ashta 1. It is planned to build up a small wastewater treat-ment plant, so as to provide for the treatment of the wastewaters as required in the Law no.9115, dated 24.7.2003 “On the environmental treatment of wastewaters” and the DCM no.177 of 31.03.2005 “On the allowed standards of liquid discharge and the criteria for zone classification of receiver water environments”

4.3.8.4 Solid waste

The HPP will not discharge solid waste either. The only solid waste will be the wrap-ping and packing of material like wood, carton, plastic, etc., which will come up while there is installation of new equipment, devices, or machinery in the framework of the HPP construction works.

Another group of waste will be those from the consumed food from the 25 staff working in the Ashta HPP. This is not hazardous waste and will be collected and taken away to the sanitary landfill for the urban waste of the COB pursuant to the provisions in the Law no.9010, dated 13.2.2003 “On the environmental administration of solid waste”. Energji Ashta Ltd, which will exploit the HPP on the basis of a concession contract, will demand from the local authorities of the COB to administer the removal and transport of the solid waste to the landfill.

4.3.8.5 Hazardous waste

The HPPs do not discharge or create hazardous waste. Such may be created in the case of technical services of the special equipment or general recovery services. Here, there may be replacement of used oils, paints, solvents, etc. Mitigation meas-ures need to be taken so that the used oils and other substances, be collected in special containers, which, together with other waste material like wrapping of the equipment, or oils, paints, solvents, will be treated as provided for in the Law no.9537, dated

18.5.2006 “On the administration of hazardous waste”. They must not be considered and treated as common urban waste.

The disposal site for the hazardous waste must be determined in cooperation with the REA Shkodra. Energji Ashta will prepare an emergency plan, with measures to be taken in case of accidental leaking of lubricants or other oils and substances classified as hazardous waste.

4.3.9 Biological environment

Due to the anticipated type of dam, its height and the HPP type considered for construction, potential impacts on the environment during the operational phase are almost negligible or minimal.

4.3.9.1 Activity: Fluctuations or variations of low water levels in the Spathari reservoir

Potential environmental impacts: Loss and damage of habitats and natural vegetation (alluvial forests), loss of biodiversity. Water level fluctuations represent a constant stress of hydro vegetation – hygrophylic or the alluvial one (riparian).

Preventive measures and mitigation of the environmental impacts: Possession of a regime which minimizes water level fluctuations or variations in the reservoir water level (ecological water release of 30 m3/sec).

4.3.9.2 Activity: Changes in the aquatic environment such as water quality, water temperature, flow speed.

Potential environmental impacts: Water qualitychange might affect aquatic habitats.

Preventive measures and mitigation of the environmental impacts: Base component environmental monitoring and especially that of the water quality and sediments should continue throughout the whole operation phase.

4.3.10 Socio-economic environment

After the Ashta HPP starts operating, it will employ only 25 staff to operate its struc-tures. Nevertheless, the advantages from this HPP operation, are mainly in the indi-rect impact, such as the reduction of power import, the improvement of power supply for the whole country in general and the local area in particular. These two HPPs will be producing power equal to the amount to cover the consumption needs of about 100,000 families. Hence, it is going to reduce the import of power and will contribute to a better and reliable power supply.

The improved power supply will serve to encourage new business and it will posi-tively affect the quality of life for the local people near the project area and the peo-ple in the commune of Bushati in general.

Another advantage will be the saving of funds that would be otherwise needed to build up protection infrastructure against flooding and erosion, on the left of the Drini River, from the Spathari weir in the west of the village Ashta, for more than 6.5 km of length. The HPP channel (5 km long) and the embankment (1.5 km long) down-stream Ashta 2 powerhouse, left of Drini River, are sufficient to provide for the needed protection.

4.3.11 Cumulative impacts

4.3.11.1 General overview

The construction of dams in the riverbeds is associated with negative environmental impacts due to the fact that dams block or change the natural flow of the river and its sediments. Hence, the river flow and the nearby areas are immediately affected due to their high sensitivity to the hydrological cycle.

The construction of dams and changes in the river flow highly affect the wildlife due to loss of habitats and land use changes in the watershed. Migratory patterns of wild-life may be disrupted by the dams and other associated developments. However, aquatic fauna, including waterfowl, reptiles, and amphibian populations are generally expected to increase in the reservoir. (WB. Technical Paper no 154, 1991).

In general the construction of dams is accompanied with great hydrological changes, with environmental impact as follows:

fragmentation of the riverine habitats;

impact to the flow downstream of dams or weirs, caused by changes in the river flow, such as: loss of flooded lands in the periods of maximal discharges; deterioration of water quality, loss of spawning grounds and barriers to fish migration, loss of riverine areas and wetlands near the rivers;

reduction of the river flow up to periodic drying up of rivers. This causes biological stress with a negative impact on the biodiversity, also worsening the quality of water as a result of the increased impact of the diffuse and point source pollution;

less outstanding but nevertheless significant changes in hydrology may affect the ecosystem, with consequences of genetic isolation from fragmentation of habitats;

changes in the ecosystem relating to the cycle of nutrients and the primary productivity;

pollution from Methyl Mercury in the food chain; and

greenhouse gas emission from the HPP reservoirs.(e.g. Duchemin et al. 1995, Kelly et al. 1997, Rosenberg et al. 1997).

In addition, the reduction of the solid discharges due to the sediment deposition on the consecutive reservoirs may cause the progressive decrease of the nutrients. This has a negative impact on the

development of the food chain which sustains aquatic fauna. This effect may be insignificant in the case of a single dam.

The environmental changes in riverine habitats may be cumulative - and thus much more severe - in the case of the construction of a series of dams or weirs as com-pared with a single one.

4.3.11.2 Cumulative impacts on the Drini River cascade

There are five existing dams and one weir built on the cascade of the Drini River (fig. 2.2.1). Two of the dams are erected in FYROM and three of them are located in Al-bania (Fierza HPP, Koman HPP and Vau Dejes HPP), as well as one weir (Spathari). The Spathari weir is less than 15 meters high and it is the last one built in 1974 on the Drini River cascade, 2 km downstream the Vau Dejes dam). Therefore, the damage on the environment was done about 40 years ago, while now ASHTA HPP will use and upgrade the existing weir and reservoir in order to obtain energy.

The construction of three HPPs at Fierze, Koman and Vau Dejes was done prior to the 1980's. Such large projects at the time were not supported by environmental sur-veys and Environmental Impact Assessment. The Spathari weir was built in 1974, with the purpose to build a reservoir in the framework of the Bushati HPP project. The Bushati HPP was designed with assistance from the Chinese Government dur-ing the Communist times, but political differences led to an ideological split and the project was abandoned. The Albanian Government tried to renew the project in 2000, but soon withdrew due to serious environmental and social impacts such a large project would entail in local, national and transboundary context.

None of the three HPPs or the Spathari weir provide for any fish pass. The damage was done in the 70-ies, with habitats fragmented and fish migration routes inter-rupted.

As noted in the previous chapters, the EIA process is new to Albania and no one of the HPP erected in the 70-ies was subjected to an EIA process. Furthermore, the cumulative effects are better addressed in an SEA rather than EIA, and clearly Alba-nia did not have an SEA for the Energy Sector.

The analysis of the cumulative impacts is a significant method to understand and predict the impact of the dams on the river basin. This analysis is difficult as it re-quires cooperative efforts of several scientific disciplines and experienced experts (Rosenberg David M., et al, 1997).

It should be pointed out that since then, (i.e. after the construction of the Fierza, Ko-mani and Vau Dejes dams, and Spathari weir) there have been no researches into:

the sediment transport into their respective reservoirs;

the impact of the sedimentation reduction on the erosion of the riverbed and the riv-erbanks downstream the dams;

the impact of the sedimentation reduction due to the reckless extraction of construc-tion materials from the riverbed;

the impact on coastal erosion due to:

the reduction of solid discharges down-stream the dams; and

the reckless and often unlawful exploitation of the gravels and sands downstream the dams;

the impact on the lands which are inundated by the reservoirs;

the impact of dams on habitat fragmentation, quality of habitats, interruption of aquatic migration routes, and on the aquatic fauna in general and impacts on fish in particular; and

the impact of the greenhouse gas created in reservoirs, due to the decomposed vegetation as a result of flooding; etc.

The above impacts become more intense from the construction of several consecu-tive dams on the Drini River cascade which bring cumulative effects. The reduction of sediment discharge in the lower part of the Drini Riverbed, downstream Spathari weir, combined with the reckless exploitation of the construction materials on this riverbed, is believed to have had a negative impact on both the natural process of the sediment discharge on the lands periodically flooded by the Drini and Buna Rivers, and on the erosion of the coastline at the Buna River mouth. Drini River discharges water to the Buna River, and the later discharges into the Adriatic Sea.

Another negative aspect which may be perceived qualitatively, in the absence of in-depth studies, is also the transportation of suspended sediments in the Drini River waters downstream of the Spathari reservoir. The transportation of suspended sediments in this reservoir is practically dominated by the discharges from the Vau Dejes HPP, because the Gjadri River discharge is rather low (annual average of the dis-charge is 8 m3/s). In the period prior to the construction of the Vau Dejes HPP dam, the bottom sediments transported in the Drini River at this place were estimated at 500.000 m3/year. Nowadays, the bottom sediments transport of the Gjadri River into the Spathari reservoir is estimated at about 30.000 m3/year. It should be noted that the Gjadri River in 2008, discharged partly into the Drini River, downstream Vau Dejes dam, and partly into the Drini i Lezhes (Lezha Drini River or small Drini River). After 2008, as a result of some hydro technical works, the Gjadri River totally discharges into the Drini River, downstream Vau Dejes dam.

It can be seen that the deposition of sediments in the six consecutive reservoirs along the Drini River flow, has minimized the sediment transportation, as well as the amount of nutrients which are discharged into the Spathari weir together with the river waters.

The above-mentioned arguments might explain the lower biotic activity that is ob-served in the segment of the Drini River, right downstream of the Spathari weir to the village Ashta (5 km long), as described by Lahmayer International (2001), which corresponds to the project area for the Ashta HPPs'. (fig. 3.2 according to the EIA re-port, 2009). Other reasons for the low biotic activity in this river segment can be related to the increased human activity and pressure, particularly in the two last decades. Such human pressure has led to the destruction of the riparian vegetation, the unlawful fishing by inappropriate means and methods, the dumping of urban waste into the riverbed, the reckless and often unlawful extraction of the construction mate-rials (gravels and sands) from the Drini riverbed, etc.

4.3.11.3 Mitigation measures for cumulative impacts in the framework of the Ashta HPPs

The cumulative effects that HPP Ashta brings are negligible as compared with the impacts coming from the existing larger dams and reservoirs upstream of Drini River. The cumulative part of the Ashta HPP lies in the increase of the level of the existing Spathari reservoir, while there are foreseen mitigation measures to allow fish migra-tion (currently fish migration is interrupted), vegetation corridors, as well as flow of solid materials.

The Drini River is a Heavily Modified Waterbody due to heavy human influence with construction of several HPP. The free flow regime of the river have been altered since decades, habitats were fragmented, fish migration patterns have been negatively affected, etc. There are no fish-pass in any of the existing HPPs in the Drini River. The electrofishing survey downstream and upstream of Spathari weir indicated a clear interruption of migration routes for fish. The existing fish in the Spathari Reservoir are surviving upon the very limited size of the reservoir which has been cut off from the Drin River habitats both upstream (due to Vau Dejes Dam) and downstream (due to Spathari weir). Hence, the new fish pass would be a novelty for HPP systems in Albania and would hopefully open new habitats and allow fish migration easing such-a-way existing barriers.

In the Spathari reservoir, which is the last of the reservoirs in the Drini River cascade, the water amount is dominantly from the Vau Dejes discharges. As such, the solid sediments discharge is minimal, which is also affecting coastal areas since the Buna River discharges into the Adriatic Sea.

In order to mitigate the cummulative negative impacts from the HPPs built on the Drini River cascade, the Ashta HPPs project envisages the following:

The construction of a fishpass which would allow the migration of the ichtic fauna from the Spathari Reservoir to the Drini River. As described above, electrofishing indicated that fish migration in this area has been blocked since 1974, when the Spathari weir was built.

The assurances for continuity of the biological activity in the Drini River along the Ashta HPPs project site. For the first time in HPP design in Albania, there are provi-sions for a quantity of ecological water release of about 30 m3/s that will continue to flow in the 5-km long riverbed segment. This water amount is about 10% of the an-nual average flow of the Drini River at Spathari weir. Furthermore, biotic activity shall be ensured by the newly vegetated areas and corridors that shall be created along the riverine areas, in the Southern embankment of the channel, as well as formerly heavily gravel mining areas.

Lowering the altitude of the intake at Ashta 1 HPP, from 19 m asl (the current alti-tude of discharge at the Spathari weir) to 16.5 m asl. This lowering with 2.5 m of alti-tude will increase slightly the amount of solid sediments discharge in the lower flow of the Drini River (in quantity and particle size), which will thus lead to an increase in the solid sediments discharges into the Drini River downstream Spathari weir. Such increase in the solid discharges into the Drini River, though modest, will have an im-pact on both the reduction of erosion and the improvement of the biotic activity in the fluvial segment Spathari weir – Ashta 2 powerhouse, and the reduction of erosion at the Buna River mouth and its nearby coastline, because of the increased amount of the sediment transport from the Drini River into the Buna River.

The construction, in the southern part of the Drini riverbed, of the Ashta HPPs' channel (about 5 km long) which will discharge the water from the Spathari weir into the Ashta 2 HPP, as well as the construction of an embankment, about 1.5 km long, on the left of the Drini River, downstream Ashta 2 powerhouse, will be serving as physical barriers. It will reduce the impact of the human pressure on this segment, thus providing for the improvement of the environmental situation, including the re-surgence of the badly damaged vegetation, and the biological activity. This barrier will also serve as protection from the flooding south of this area.

5 Environmental Management Plan

The Environmental Management Plan is aimed at avoiding and/or mitigating of im-pacts on the biophysical and socio-economic environment, focusing on:

Health and safety of workers and prevention of environmental pollution;

Compliance of environmental standarts and best available techniques;

Performance of all project activities in a safe and effective manner, proper mainte-nance of machinery and equipment to protect workers and prevent environmental damage;

Procurement of all measures to control, avoid, or mitigate any leakage of hazardous materials/fluids;

Construction of project objectives in accordance with the best available national and international standards;

Monitoring of all activities with potential environmental impact during the construc-tion and exploitation of the Ashta HPPs'.

Item	Mitigation measures	Location of the measure	Period	Responsibility
Air Pollution	Fill and compact crushed limestone in access roads for vehicular access	Roads within the project area	First and second quarter from the start of construction works	CC
	Sprinkling with water of the dirt roads.	Roads with dense traffic, where the heavy vehicles will operate	During construction, in dry periods	CC
	Provide adequate maintenance of construction machineries and transport vehicles	Inside and outside the territory of the HPPs' facilities	According to the catalog of the relevant vehicles and machineries	CC
	Construction of gravel barriers for dust protection of the villages near the construction sites	Between the construction sites and the nearby inhabited areas	At the beginning of the construction stage	CC
	The use of fuel by 10 -50 ppm sulphur in all the construction machineries and trucks working with diesel	Inside and outside the project area	During the construction period	CC
	Establish a special site for washing the vehicle tyres.	Upon exiting the construction sites prior to access the national roads	At the start of the construction works	CC

	Covering trucks carrying construction materials for dust prevention	Inside and outside of the project area	During all the construction works period	CC
	Planting of vegetation (trees, shrubs and grass) in the areas to be decided with local authorities.	On the southern side of the Ashta 2 headrace channel, 5 km long; and On the Bushati communal park (on both sides of the small Drini Riverbed)	According to a work schedule, which will be approved by the CC and the CoB.	CC
	Rehabilitation of the communal roads that might be damaged by the heavy vehicles circulation during the construction works.	In the villages of the affected communes (Vau Dejes and Bushat).	During and upon completion of the construction works	CC
Quantity and Quality of surface and ground waters	Clearcutting the vegetation in the areas that will be inundated on the islands and riverbanks	Spathari reservoir	Before beginning to increase the water level in Spathari reservoir	CC
	Prepare a Flood Emergency Plan	Protection from eventual floods of the villages in the southern part of the project area during the construction period.	Prior to the start of the construction works	DC
	Prepare and implement an action plan to avoid or minimize the passage of the big solid materials (e.g. logs) in the waters of the Spathari reservoir and the Drini River .	-Spathari Reservoir; -HPP Ashta 1 intake; -Emergency discharge channel; and -Fish pass.	Prior to the beginning of the construction works in the Ashta 1 HPP intake	DC
	Implement the maintenance procedures of working machineries and transport vehicles to avoid oil spills in soil and water	All the territory affected by the project activities.	During all the construction works period	-DC -CC
	Construction of the wastewater treatment facility.	Construction site at Stajke	At the start of the construction works	CC

	Protection of the quantity and quality of the ground waters in the villages in the southern part of the project area, by eventual impacts from the construction activities of the HPPs' facilities.	Mainly the territoryof the villages of Stajka, Kosmaci and Ashta.	During construction and operation stages	-DC -CC
	Prepare and implement an emergency plan in case of accidental spill of fuel or mineral oil in soil or water resources.	All the territory affected by the project activities.	Prior to the start of the construction stage	-DC -CC
Solid and hazardous waste	-Collection of hazardous waste in special containers and places; -Placing of distinctive signs for fuels, oils, paints and other materials classified as hazardous waste. All waste classified as hazardous ones, which will be created during the construction and the operation periods.	All the territory affected by the project activities	During the construction and operation stages	CC
	Destruction and/or transport of the hazardous waste, based on the related Albanian legislation and in accordance with the Shkodra REA .	Approval by the local authority and the Shkodra REA.	During the construction and operation stages	CC
	Collection of non-hazardous solid waste and transport in the landfill of Bushati commune.	All waste created in the project area.	During the construction and operation stages	CC
	Sale of reusable items and other recyclable materials, including packaging (iron, wood, plastics, carton) to the recycling businesses	Areas for temporary storage of solid waste at the: - HPP's construction sites (during construction stage) ; and -the HPPs' facilities during operation stage	During the construction and operation stages	CC
	Implementation of traffic control measures at construction sites and the roads outside the project area, affected by the circulation of the transport vehicles.	Speed limit to 15 km/hour on the dirt and gravel roads and 20 km/hour on the asphalted communal and rural roads outside the project area and in villages close to project activities.	Prior to construction works	-CC -CoB

	Installation of appropriate traffic signs on the streets that will be used by the project vehicles as well as upon exiting the construction sites and accessing the main roads	Traffic signs related to the circulation of the heavy vehicles, mainly for the speed limits in the project area	Prior to construction works	-CC -CoB
Noise and fire prevention	Observance of daytime working hours (e.g. between 06:00 to 20:00 hrs.) and prohibition of work during the night	All territory affected by the project activities.	During construction stage	CC
	Working devices shall be switched off or brought to minimum labour regime during off periods	Working machineries and transport vehicle operating throughout the territory affected by the project activities.	During the construction stage	CC
	Use of protective wear for staff as headphones, gloves, helmet, etc.	All employees who are in contact or near noise-generating machineries	During construction stage	CC
	Construction of protection barriers in order to mitigate the noise impacts and reducing the dust emissions in the villages/dwelling s close to the construction sites	-Construction of gravel barriers along the southern borders of the construction sites; -Between the construction sites and the nearby inhabited areas	During construction stage	CC
	Preparation and implementation of a rigorous inspection program for maintenance of the construction machineries and the transport vehicles.	Ashta HPPs' construction sites	At the beginning of the construction stage	CC
	Measures for fire protection: -Design emergency exits in the HPPs' powerhouses; -Prepare and implement a fire prevention and protection plan; -Employee training for fire protection; -Equipment for fire protection within the project facilities; -All emergency exits in the project facilities should be well distinguished and always free to allow a quick passage in case of	-All the territory affected by the construction activities; -Within the powerhouses during operation stage	During design, construction and operation stages	-DC -CC -OC

	emergency.			
Biodiversity, Landscape and visual impacts	Preserving the vegetation cover wherever possible without questioning the integrity of the project	All the territory affected by the project activities.	During design and construction stages	-DC -CC
	Maintaining the ecological water release quantity at the average 30 m^3/s	Discharge from the Spathari weir into the existing Drini riverbed	During operation stage	-OC
	Clearcutting the vegetation in the areas that will be inundated on the islands and riverbanks in order to preserve good water quality for aquatic species	In the banks and islands covered by vegetation within the Spathari reservoir	Prior to operation stage	CC
	Construction and maintenance of a fish-pass to allow the fish passage between the Spathari reservoir and the Drini River.	In the project area near and at the Spathari weir	During design, construction , and operation stages	-CC -OC
	-Protect and displace the slow-moving fauna outside the inundated areas (including islands that shall be inundated) -Protection of fauna from accidental kills.	Within the Spathari reservoir banks and islands which will be flooded by the increase of the water surface level, and anywhere on the construction areas.	During construction and operation stage	-DC -CC
	Create newly vegetated areas and corridors within and outside the project area, to provide valuable habitats for the fauna	-On the site locations of the HPPs' facilities; -On the areas planned to be reforested by the LEAP of the Bushati commune.	During construction and operation phases	-DC -CC -CoB -REA
	Usage of native/indigenous species for restoration of the vegetation	-Close to Ashta 2 powerhouse; Within the communal territory close and along the Ashta 2 headrace channel (5 km long); On the southern side of this channel. -The list of indigenous plant species is presented in the EIA report (chapter on the environmental baseline).	After the construction and during operation phase	-DC -CC -CoB -REA
	Choose suitable colours for painting the HPPs' buildings, in	-External walls of the powerhouses, power	After the construction and	-DC

	order to fit with the surrounding environment	substation and any other eventual project facility.	during operation phase	-CC
	Organize and implement a biodiversity monitoring program to ensure good ecological features of the area are preserved and check performance of macro invertebrates, fishes, vegetation, and birds in the area.	Extended project area	During the construction and operation phases	-DC -CC
Socio-economic	Preparing and implementing of a formal system which responds quickly to any eventual complaints from people affected by the project activities, in case of environmental impacts (air, soil, and surface water pollution, noise, quantity and quality of drinking water, etc.).	Training of a number of specialists who can organize an investigation team within 24 hours	During construction and operation stages.	-CC -DC
	Observing speed limits and limiting heavy trucks circulation outside the project area during hours of intense traffic.	In the vicinity of the villages near the project area (Stajke, Kozmac, Ashta)	During the construction stage	-CC -CoB -REA
	Giving priority for employment opportunities to the population living near the project area.	Villages Stajke, Kozmac and Ashta	Prior to the start of construction period	-CC -CoB
	Preparation of an environmental monitoring plan to assess the impacts on the nearby receptors	In the territory affected by the project and the nearby dwellings (villages Mjeda, Stajke, Kosmac, and Ashta.	Prior to the construction period	-CC
	Publication of data and reports on environmental statement	Publication of monitoring reports.	Quarterly reports	-CC -REA

6 Environmental Monitoring Plan

The preparation and implementation of the Environmental Monitoring Program for all activities which may have an environmental impact, is required by the Albanian envi-ronmental legislation. Specifically it is required by Law no. 8934, “On Environmental Protection”, dated 05 September 2002, and amended by Law no. 9890, “On the En-vironmental Monitoring in Republic of Albania”, dated 03 March 2008, and the MoEFWA’s Minister Order no. 37, “On Self monitoring”, dated 03 March 2004.

The preparation of the Environmental Monitoring Plan for the design, construction and operation phases of the Ashta HPPs is based on the “Report on EIA from Con-struction and Operation of Ashta HPPs”, and is an integral part of the environmental permit. Based on the DCM no.103, “On the Environmental Monitoring in Republic of Albania”, dated 31 March 2002, in the table are presented the parameters to be monitored by Energji Ashta during the design, construction and operation stages.

The Environmental Monitoring Plan will ensure the assessment of the environmental situation in the project area during construction and operation stages, in the area from Spathari reservoir to the west of the Ashta village, in terms of the following parameters:

air quality; noise levels; soil and surface waters quality; discharge and quality of groundwaters on the water wells; solid and hazardous waste; and biodiversity.

Particular attention must be taken especially on the following items:

Rehabilitation of temporary construction areas by planting of indigenous species of trees, shrubs and grass;

Groundwaters (water level, well discharge, and groundwater quality) in the territory of the villages south of the project area (Mjeda, Kosmaci, Ashta). The water wells drilled in these villages use the groundwaters of the Drini River gravel Quaternary aquifer;

Ecological water release quantity on the Drini River bed; and

Design, construction and maintenance of the fish-pass, at Spathari weir.

The information and data to be collected from the monitoring will serve:

To monitor the proper performance of mitigation measures during the implementation of the project and operation of the HPPs;

To take remedial actions to improper execution of planned mitigation measures or any other degradation of surrounding environment in relation to the project activities; and

To serve to undertake improving measures in relation to different operations affect-ing the environment.

These data will be reported pursuant legal provisions (DCM no.103, “On the Envi-ronmental Monitoring in Republic of Albania”, dated on 31 March 2002) every three months to the REA Shkodra.

Tab. 9.1.Environmental Monitoring Plan

Impact	Parameters	Location	Frequency
Air quality	Inventory of gaseous emissions: SO_2	Construction area	Monthly during construction
	Particulate Matters	Villages of Mjeda, Kosmaci and Ashta	Monthly during construction
Surface waters	pH, temperature, Conductivity, TDS, SS, DO, COD, BOD_5, N-NH_4 N-NO_3 P-PO_4, bacterial pollution	Spathari reservoir, Drini River at Ashta village	-Monthly during construction -Once two months during the first two years dunig operation.
Noise	Leq (dBA)	Villages of Mjeda, Kosmaci and Ashta	Weekly: days and night, during construction
Waste waters	COD, BOD_5, SS, N- NH_4, NO_3 - N, PO_4 -P, bacterial pollution	At the discharging point of wastewater treatment plant	-Monthly first year of construction -Quarterly during second year of construction -Once three months, duning operation.
Groundwaters	-well water level; and -Water quality: pH, temperature, Conductivity, TDS, SS, DO, COD, BOD_5, N-NH_4 N-NO_3 P-PO_4, bacterial pollution	Villages of Mjeda, Kosmaci and Ashta	-Monthly during construction -Once three months, duning operation.
Solid waste	Solid waste from food products, paper, cartoon, plastics, metals, etc.	Construction sites	-Monthly during construction -Once three months, duning operation
Hazardous waste	Used mineral oils, grease, paints, their packages, used tires, etc.	Construction sites	-Monthly during construction -Once three months, duning operation

Biodiversity	Plant covered areas after rehabilitation of temporary construction occupied areas and high slopes through afforestation with native species to avoid erosion and the establishment of “water filters”	Project Area	Once a year after construciton completion of the weir and increase of the water level in the Spathari reservoir
	Control the dissemination of invasive species	Project Area	Once a year during and after construciton completion and increase of the water level in the Spathari reservoir
	Macroinvertebrates	Project Area	At least once a year
	Composition of fish species through electrofishing techniques	Above and below the Spathari weir	At least once a year (twice a year preferred) until after construction of the channel for the the free fish movement
	Monitoring of nesting and wintering birds	Project area	Twice a year
	Monitoring of ecological water release quantatiy of aproximately 30m^3/sec	Spathari weir	Twice a month in hot and dry seasons and once a month in wet seasons
	Assessment of effectiveness of fish-pass through monitoring surveys of fish composition at each waterbody: Drini River, Spathari reservoir and fish-pass	Spathari weir	Once a year after construciton completion of the weir and increase of the water level in the Spathari reservoir

7 Conclusions

The Ashta 1 and Ashta 2 HPPs represent a reliable alternative for the increased production of energy from renewable resources, without causing serious negative impacts or damages to the environment;

The Ashta 1 and Ashta 2 HPPs will enhance the effectiveness of the power potential use of the Drini River and will increase the national production of the energy, thus improving the power supply for the population and the economy;

Compared with the earlier alternatives, this project has several advantages including:

the area of agricultural land directly affected by this new project is only 7 ha. This area of land will be inundated due to the rise of water level altitude in the Spathari reservoir. The company Energji Ashta will pay compensation to the land owners for the loss of land, as envisaged by the Albanian legislation;

the project will not inundate any residential or business buildings, etc.;

the project will not change the existing hydrological regime of the river in the highly important complex Drin-Buna-Shkodra Lake;

the project will not affect any Protected Area or objects of the archeological/historical/cultural heritage;

the project will not affect the Shkodra Lake and the Buna River ecosystems;

it has the shortest length channel and affects only a segment of the Drini River bed (Spatharie-Ashte, 5 km in length), whose biodiversity as been identified (Lahmayer International, 2001) as much poorer than the rest of the riverbed (segment Ashta 2 HPP-the Buna River).

it will open migration routes for fishes (fish-pass) since those routes have been interrupted back in the 70-ies with the construction of Vau Dejes Dam (upstream) and Spathari weir (downstream); and

the project will not have negative impacts on the coastal area erosion at the Buna River mouth and its nearby coastline.

There are no significant long-term impacts from the construction of the Ashta HPP structures, concerning environmental pollution, and there will be no discharge at all of polluting substances into the air, soil and water during operation. During the operation, the Ashta HPP, will spare from emitting into the air of an amount of 225,000 t/year CO2, that would have to be in the case of a plant running on fuels.

The amount of the gas emmission into the air, discharged by the vehicles and machinery in the project area, has been estimated to be low, and within the acceptable standards for the urban areas.

The excavated material that will be transported during the construction phase, will be mainly gravels, which will cause minimal amount of dust. Nevertheless, in time of dry weather, water splashing of roads will be used to reduce the dusts.

The modelling of noises in the residential areas close to the project area, shows that the noises generated by the machinery and the vehicles that will be used for construction and transport, will be below the standards provided for in the guidelines of the WHO and the World Bank.

The excavated material, mainly gravels and sand, will be used for the construction of the HPP structures, whereas, the topsoil, will be used to improve the quality of the low quality lands and the refilling of holes created as a result of the unlawful extraction of gravels in the last 20 years.

The project is not believed to impact the quantity and the quality of groundwaters in the territory of the villages to the South and South-West of the project area, because the basement of the channel linking Ashta 1 powerhouse with Ashta 2 powerhouse, consists of gravels which are permeable.

It is believed that there will be a slight increase of the solid sediments discharged into the Drini River - and further in the Buna River and the Adriatic Sea - as a result of the lower altitude for the intake at the Spathari weir from 19 m asl at present to 16.5 m asl.

The presence of the 5 km long channel will serve as embankment to protect from erosion and flooding, the agricultural land and the villages south to the channel (Stajke, Kosmac, Ashta). This channel, together with the embankment 1.5 km long, on the left of the Drini River,downstream Ashta 2 HPP, will be providing for the rehabilitation of the damaged riverine areas.

The project takes into account the most advanced international standards, regarding the ecological water release, for the purpose of allowing the continuity of the biological activity on this riverbed. The amount of water that shall be released in order to provide for the continuity of the hydrological and biological processes, shall be average 30 m3/s. Such amount will remain on the existing riverbed, along 5 km, and then, downstream the Ashta 2 powerhouse. It will have the normal discharge in the exisitng riverbed, the same with the normal flow currently passing through the Spathari weir.

The Ashta HPP will be built in the area with the least biotic activity of the river. The area where the channel shall be erected is also degrated by human activities. It consists mainly of gravels, currently serving as a site for dumping urban waste, for the exploitation of gravels and sand, and where illegal hunting and fishing methods are exploited .

The project area has the flora and fauna which is quite common for the area. The construction of the channel, for the discharge of water from the Spathari weir into the Ashta 2 HPP, about 5 km long, will also serve as physical barrier to reduce the human activity in this river segment, that will help and encourage the restoration of the damaged riverine vegetation and the biological activities.

The construction of the fish pass at the Spathari weir will re-establish the continuity of the ichtic fauna, which will provide for the rehabilitation of the aquatic biological environment. Such continuity and migration routes were suspended in 1974 with the construction of the Vau Dejes Dam and Spathari weir.

The project foresees planting of native vegetation to compensate for the clearcutting of trees, due to the inundation of the small islands within the Spathari reservoir. Afforestation would include an area three times larger from that affected, and would include the Bushati communal park, the Southern part of the Ashta HPPs' channel and elswhere as agreed with communal and forestry department officials.

It will not affect the irrigation system of the agricultural lands. The present amount of 20 m3/s for the main irrigation channel, dishcarged form the Spathari reservoir, at the village Mjeda, will remain unchanged.

The drainage channel along the left side of the Ashta1-Ashta2 channel, will add to the amount of discharge for the irrigation of the agricultural lands in the commune of Bushat.

From the social aspect, the Ashta HPP construction will provide for the employment of the local population, in particular from the villages along the project area (Ashta, Kosmac, Stajke).

The construction and operation of the Ashta HPPs will be subject to environmental monitoring, consisting of the following:

the air quality in the project area and the houses nearby;

the noise levels in the houses closest to the HPP project area;

the environmnetal management of the solid and hazardous waste that will be generated in the course of construction;

the quality of the Drini River waters upstream and downstream of the HPP construction site;

the amount and the quality of the groundwaters in the villages close to the HPP structures in the course of construction;

the rehabilitation of habitats and planting of vegetation in the project area;

the performance of macroinvertebrates and fishes in the Spathari reservoir, the fish-pass, and the Drini River segment from the Spathari weir to Ashta 2; and

overall biodiversity tendencies in the project area, including surveys about wintering birds, creation of new habitats, ecological corridors, etc.

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9 Annexes

9.1 Necessary permits

Pursuant to the legal framework in Albania, the company Energji Ashta has been hired and has received for this purpose, all necessary permits, to build and then run the Ashta Hydropower Plant (HPP). This includes the respective decisions of ANCTP, the CTPs' of the Commune of Bushati and Municipality of Vau Dejes, the CDD, the METE, the MoEFWA, the Power Distribution Operation, and the ERE.

9.2 Public consultation

The METE has organized two open public meetings in 2006 and 2007, for the dis-cussion of the alternative of the Ashta HPP and the difference from the earlier alter-native of the Bushati HPP. The meetings were held in the municipality of Vau Dejes with the participation of all the stakeholders, including the local government, the REA, the local people in this zone affected by the project, etc.

The company Energji Ashta has held open meetings with local people in the areas affected by the project. Two of these meetings were related to the Environmental Impact Assessment issues, on 11th of December 2008 and on 6th of April 2009. In these meetings there were participants as follows:

Representatives of the Energji Ashta company, which is in charge of the design, the implementation and will also run the HPP;

Representatives from the prefecture and the Region Council administration, Shkodra;

Representatives from the Bushati commune administration;

Representatives from the local people of the zones affected by the project;

Local people of the zones not in the project zones, but nevertheless part of Bushati commune;

Representatives from environmental association in the district of Shkodra;

Representatives and experts of surface and ground waters;

Representatives from VEVE group, which is the consultant and representative of the Company -Energji Ashta, in Albania; and

Experts of the work group for the Environmental Impact Assessment.

There were four important issues that were raised in particular by the participants:

the right to taking 20m3 water for irrigation, as it is now with the irrigation channel built in the village Mjeda.

the right to allowing groundwater so as to ensure sufficient amount of potable water for the wells in the villages Kosmaci and Ashta;

compensation for the expropriation of the agricultural land, if it is going to be affected by the HPP; and

any social project.

The issues were accepted by the company Energji Ashta.

Below are the lists of participants as well as notes taken from the questions and answers in the public meetings.

List of participants in the meeting on 11th of December 2008, in the commune of Bushati

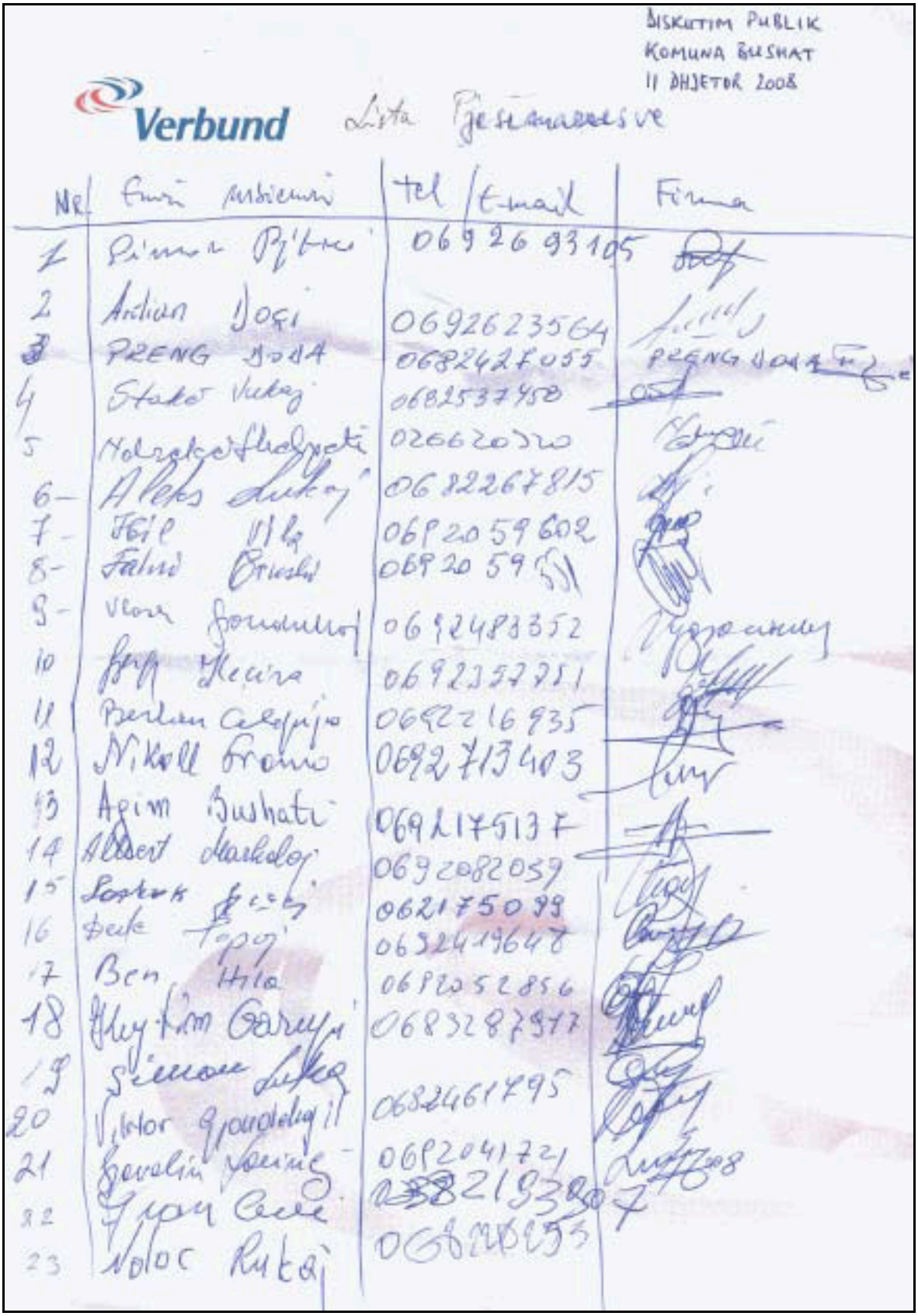
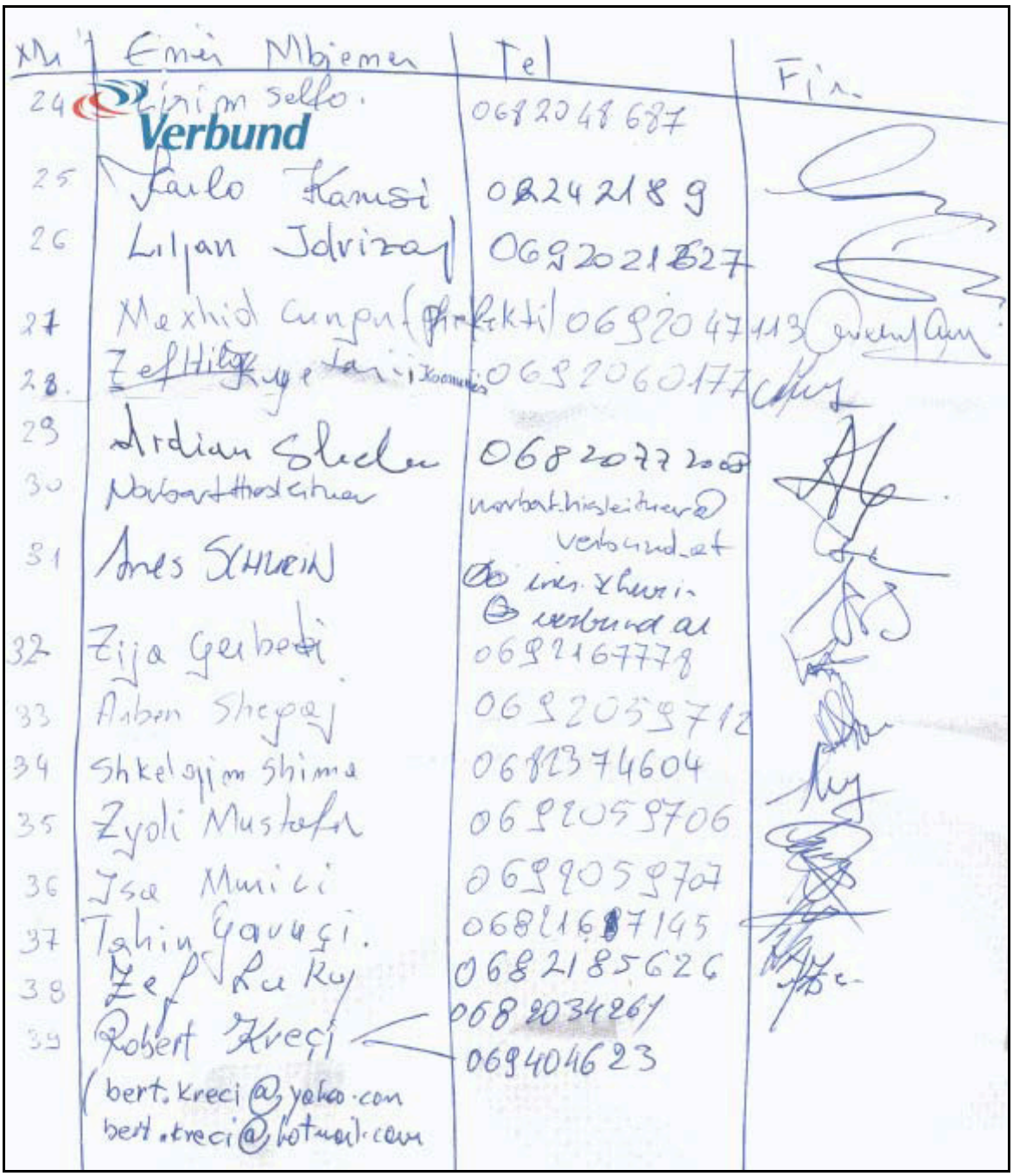


Fig. 10.2.1 List of participants in the meeting of 11th of December 2008 (continues ….)

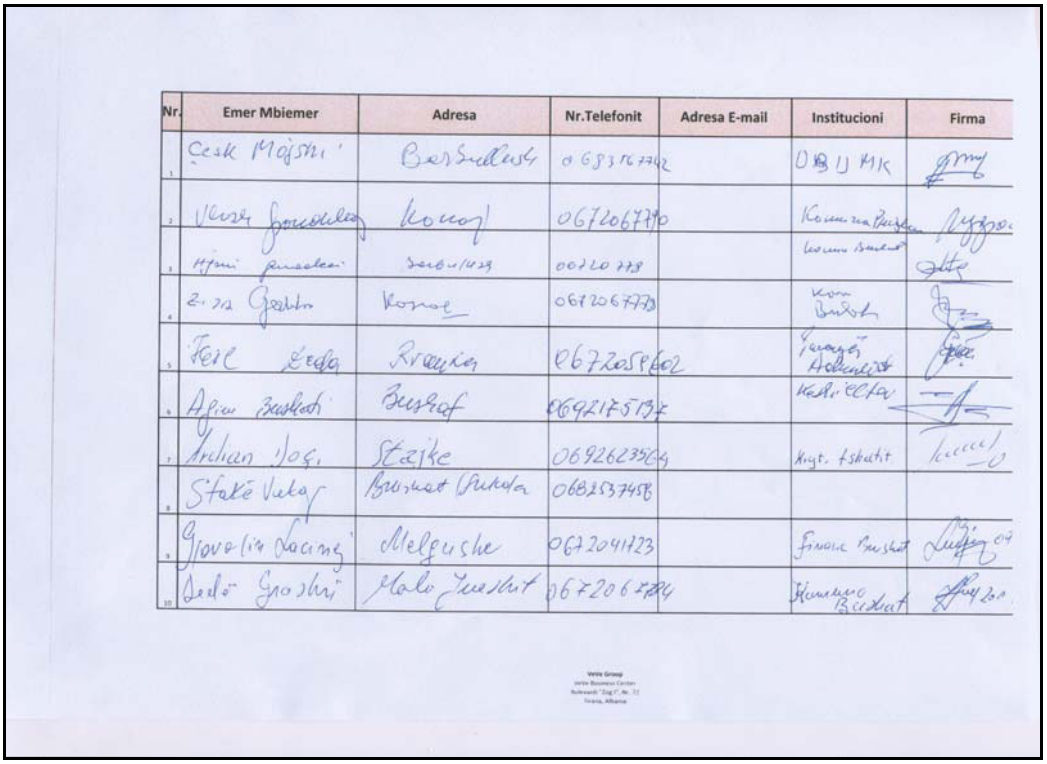


Nr	Emri Mbiemri	Tel	Fir.
24	Lirim Selfo.	0682048687	
25	Karlo Kamsi	0224 2189	
26	Liljan Idrizaj	0692021627	
27	Mexhid Cungu (prefekti)	0692047113	
28.	Zef Hilg Kuye Tari i Kosmetics	0692060177	
29	Ardian Shehu	0682077 2008	
30	Norbert Hiesleitner	norbert.hiesleitner@verbund.at	
31	Ines Schurin	ines.schurin@verbund.at	
32	Zija Gerbeti	0692167778	
33	Arben Shegaj	0692059712	
34	Shkelqim Shima	0682374604	
35	Zyoli Mustafa	0692059706	
36	Isa Murici	0692059707	
37	Tahin Garuçi.	0682167145	
38	Zef Lu Ku	0682185626	
39	Robert Kreçi	0682034261	
	(bert.kreci@yahoo.com	069404623	
	bert.kreci@hotmail.com		

View of the meeting on 11th of December 2008, in the commune of Bushati

Fig. 10.2. 2 View of the public consultation in the meeting of 11th of December 2008

List of participants in the meeting on 06 April 2009, in the commune of Bushati



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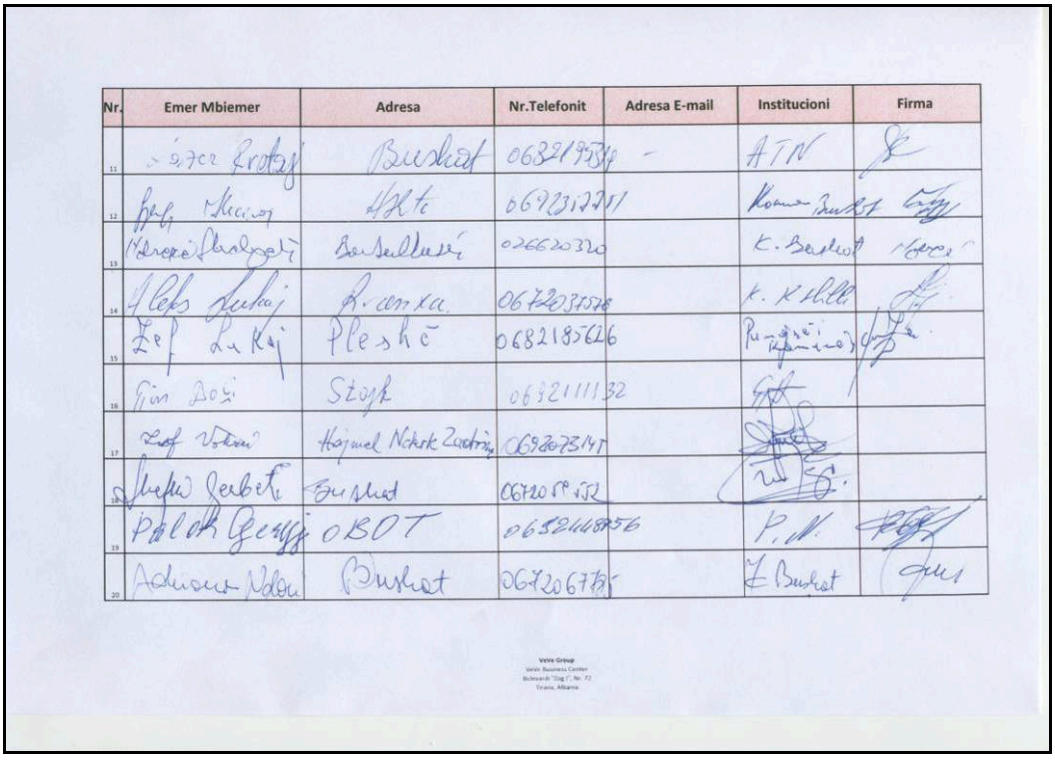

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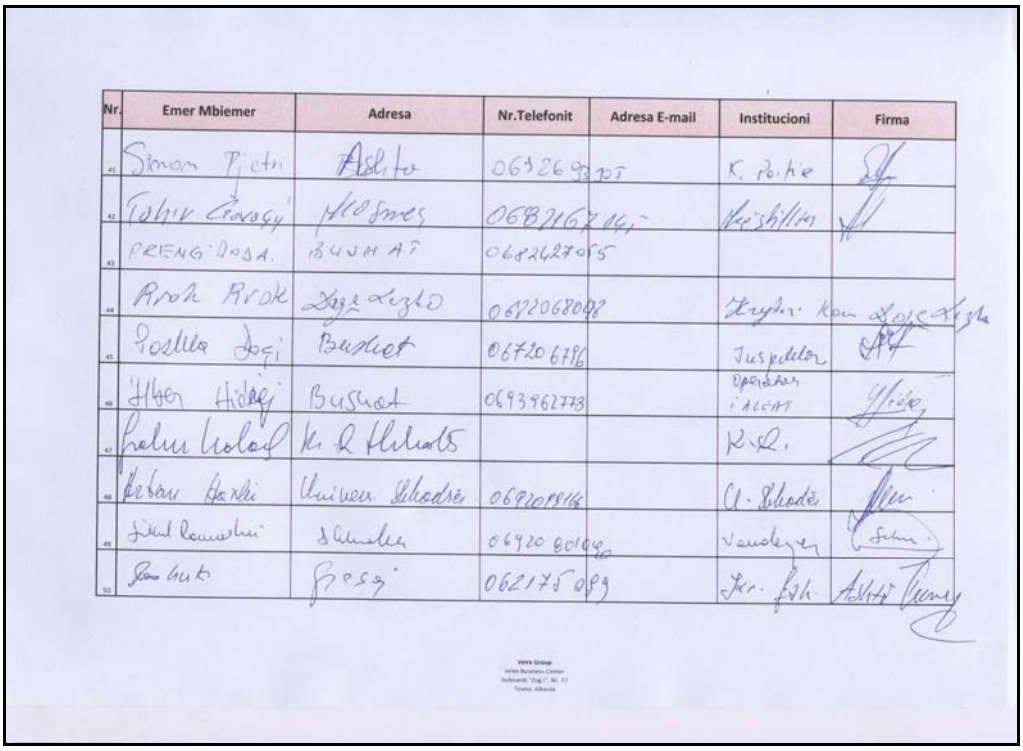
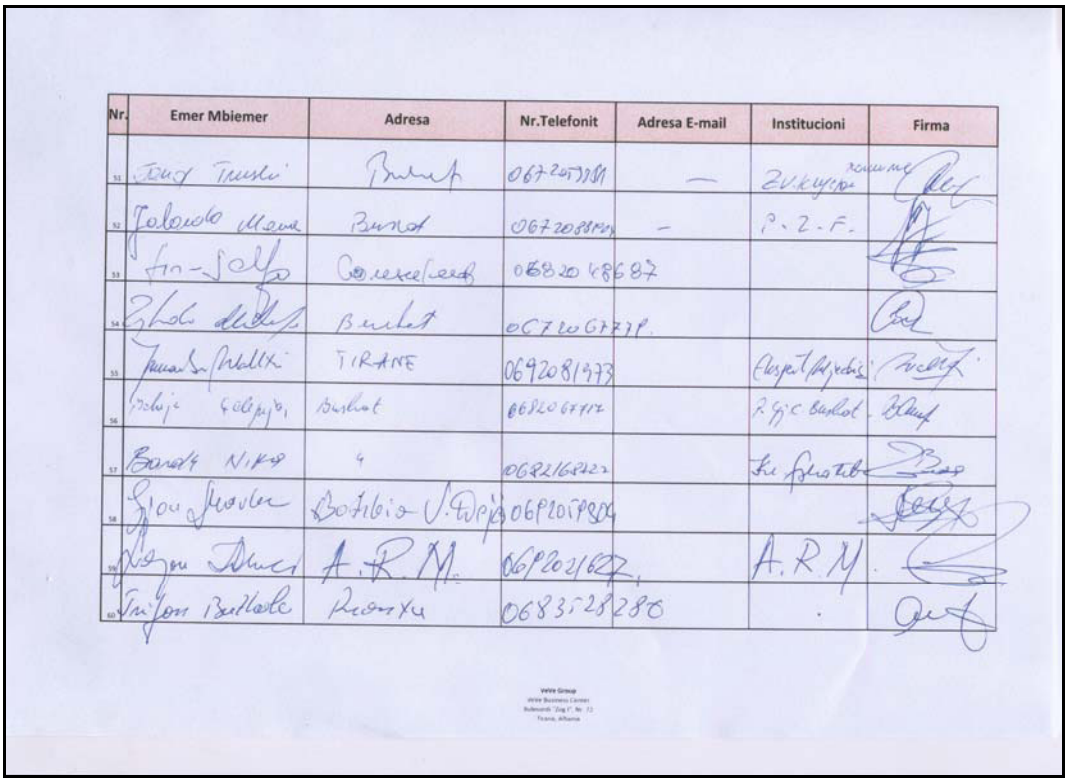
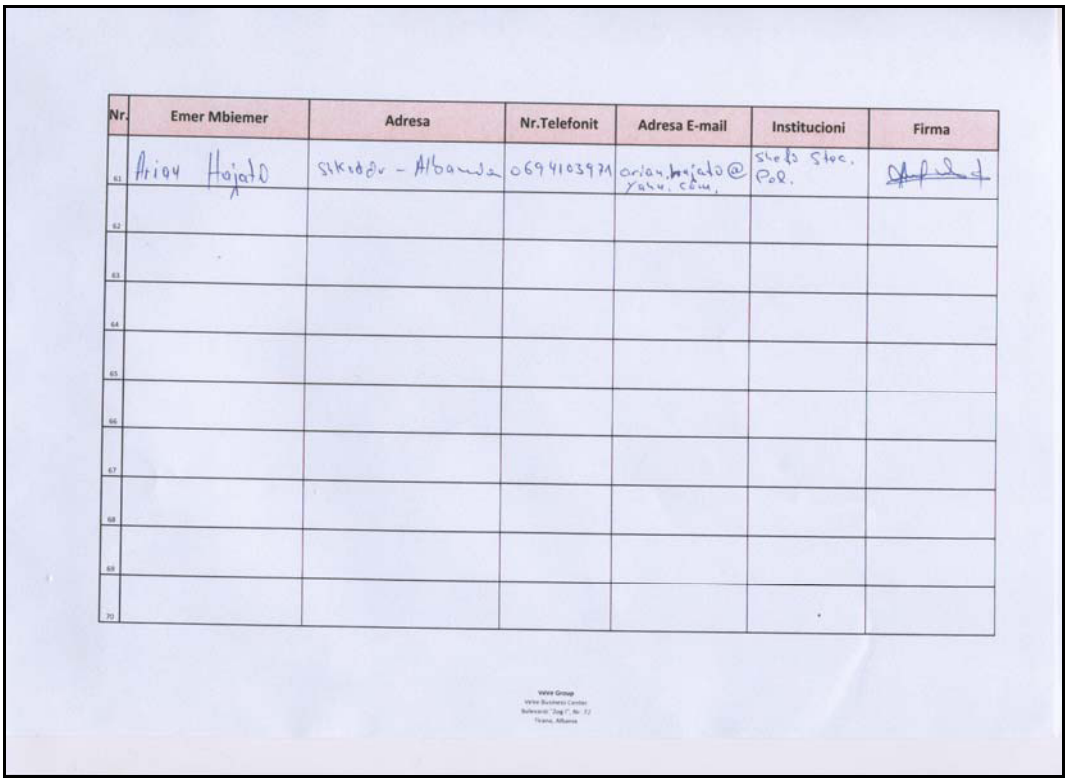


Nr.	Emer Mbiemer	Adresa	Nr.Telefonit	Adresa E-mail	Institucioni	Firma
41	Simon Pjetri	Astir	06926		K. Po.Ke	
42	Fahir Çarçagi	Mirdite	06821		Kryeshkollen	
43	PRENG DOGA.	BUNHAT	06826			
44	Arsh Arsh	Zogu i Zi	06820		Zëvend. Kom.	
45	Pashko Doçi	Bushat	06720 6786		Inspektor	
46	Ilber Hidiri	Bushat	0693962773		Operator i ALCOM	
47	Fatmir Mulaj	K. P. Shkodër			K.P.	
48	Besar Haxhi	Univer. Shkodër	06920		U. Shkodër	
49	Lirak Rama	Shkodër	06920 60		Vendlevjes	
50	Ilir Luka	Gosë	062175		Jur. Fsh.	



Nr.	Emer Mbiemer	Adresa	Nr.Telefonit	Adresa E-mail	Institucioni	Firma
51	Ilirjan Tushi	Bushat	067205	—	ZVKQVISE	
52	Fatmira Mema	Bushat	06720	-	P.Z.F.	
53	Fin-Jolfo	Gomsecelerat	068 20 48687			
54	Shkelzen Ahmetaj	Bushat	067206771			
55	Jonuz Abdixhiku	TIRANE	06920819		Ekspert Kyqeshi	
56	Gezim Gjoka	Bushat	06820 67		P. Gjic Bushat	
57	Bardh Nika	4	06821		Te Fshatrat	
58	Gjon Gjeloshi	Bathore J. Dajt	06820			
59	Marjon Dhuci	A.R.M.	06820216		A.R.M.	
60	Trajan Bushati	Durrës	0683528280			



Nr.	Emer Mbiemer	Adresa	Nr.Telefonit	Adresa E-mail	Institucioni	Firma
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Fig. 10.2.3 Listof participants in the meeting on 06 April 2009, in the commune of Bushati

View of the meeting on 06 April 2009, in the commune of Bushati

Fig. 10.2.4. View of the public consultation in the meeting of 06 April 2009

9.2.1 Questions made by the participants in the public meetings:

In the public consultations there were a number of questions, the most basic of which have been grouped below:

1. Will the project affect the irrigation system? If yes, what is it?

2. Will the agricultural lands be affected? If yes, how will the local people be compensated?

3. Will the project affect the groundwater and the water supply for the commune of Bushati?

4. What is the effect of the project regarding the risk of floods, in case of heavy precipitations?

5. What is the effect on the land erosion in the project area?

6. Will it have any effects on the seaside and at the confluence with the Buna River?

7. What will be the effects regarding the use of the construction aggregates in the project area?

8. Will it affect the quality of the roads in the project zone?

9. How is it going to affect the employment of the local people?

The representatives of the company Energji Ashta and the EIA work group, gave the following answers.

9.2.1.1 Question 1:

Will the project affect the irrigation system? If yes, what is it?

Answer (Mr. Gerd Frik, representative of Energji Ashta):

The project is not going to have any negative effects on the water supply for irriga-tion. The commune receives 20m3 of water for irrigation from the Spathari reservoir, west of the village Mjeda. This amount will be provided to the irrigation channel in the same place, even in the case that the Drini River flow falls sharply. In the case that the river flows falls sharply, the HPP will temporarily suspend its operation.

The project is thought to have positive effects on the improvement of the irrigation and drainage of the zone south to the project (Bushati commune agricultural lands), because, along the 5-km channel, from the Ashta 1 HPP to the Ashta 2 HPP, to the south, Energji Ashta will build a drainage channel, which will add to the drainage sys-tem of the Bushati commune lands, north of the lands in the villages Stajka and Kosmaci.

9.2.1.2 Question 2:

Will the agricultural lands be affected? If yes, how will the local people be compen-sated?

Answer (MR. Gerd Frik, representative of Energji Ashta):

The agricultural land will not be affected. In the course of the design drafting, in close consultation with the Bushati commune administration and the work group of the EIA, Energji Ashta has chosen to place the channel between Ashta 1 HPP andAshta 2 HPPP, on the Drini River bed, on gravelly land.

During the construction, there may be temporary damage of a very limited area of agricultural land, north-west of the village, Kosmaci. In such a case, the company, Energji Ashta pledges to pay for expropriation or its rehabilitation at the end of the construction.

9.2.1.3 Question 3:

Will the project affect the groundwater and the water supply for the commune of Bushati?

Answer (MR. Gerd Frik, representative of Energji Ashta):

The project is not going to affect the amount and the quality of the groundwater in the territory of Bushati commune. Neither will it have any effects on the potable water supply in the zone.

The local villages have their potable water at the depth of 1.0-12.0m, from quaternary gravels. In most part of the commune territory, these gravels reach the depth of about 30m.

The 5-km long channel runs through permeable geological formations (as confirmed by the drilling done by Gjeostudio 2000 as ordered by the company Energji Ashta), mainly gravels, which do not block the passage of groundwater from the Drini River bed to the Quaternary gravel aquifer south to this channel.

In the EIA study, chapter of monitoring, it has been stated that there will be monitor-ing of the groundwater regime south to the HPP channel. Hence, the potable water wells will be monitored for the well water level, flow and quality.

9.2.1.4 Question 4:

What is the effect of the project regarding the risk of floods, in case of heavy precipi-tations?

Answer (EIA report team):

Regarding this issue, the project is going to have but positive effects only, and, the area along the 5-km channel will be finally protected. The existing embankment and other protection objects will not be necessary, which will also avoid the expenses for their maintenance and.

In addition, the segment of 2 km along the south bank of the Drini River, west of the Ashta 2 powerhousewill serve as protection from flood, because, an embankment gabion will be built, and it is going to eliminate the risk of floods as well as that of the land erosion to the south.

9.2.1.5 Question 5:

What is the effect on the land erosion in the project area?

Answer (EIA report team):

It will have a positive effect along a segment of 6.5km, which includes the project channel (5 km long) as well as the embankment (1.5km long) west of the Ashta 2 powerhouse. The Ashta HPPconstruction will finally eliminate the risk of the land erosion in the project area. After the construction, there will be no effects, as the wa-ter will be flowing on the natural Drini River bed. The company has planned since its design, the reduction of the water current force, to anticipate the Drini River bed ero-sion west of the project area.

Besides, part of the water flowing out of the Ashta 2 HPP, will be directed, through a short channel north-eastward, on the Drini River bed, north of the channel between the Ashta 1 and Ashta 2 HPPs'. This part of the project is intended to alleviate the effect of water reduction on the Drini River bed, as well as the water current force while it flows out of the Ashta 2 HPP.

9.2.1.6 Question 6:

Will it have any effects on the seaside and at the confluence with the Buna River?

Answer (EIA report team):

The seaside erosion at the discharge of the River Buna into the sea has been caused by the extreme reduction of the solid sediments discharge of the Drini River into the Buna River, after the construction of the dams of the Fierze, Koman and Vau Dejes HPP's. The construction of the Vau Dejes dam in 1970, put an end to the dis-charge of solid sediments from the Drini River into the Buna River, and farther on into the seaside. After 1970, this part of the Drini River has been supplied with solid sediments from the branch of the Gjadri River discharging into the Drini River, and this is after the Drini River flows out of the Vau Dejes HPP. But such sediments are just tiny particles flown without precipitation, whose effect regarding the supply of the seaside with solid sediments (through the Buna River), is almost insignificant.

It should be pointed out that the present level of the Drini River flow beneath the Spathari bridge, has been estimated to go down by 2.5 m, from 19m asl to 16.5m asl, which shows that the Energji Ashta project is not going to have any effects re-garding the reduction of the solid sediments amount flown into the Drini River through the Spathari reservoir. The drop of the water level in the intake structure shows that the Ashta 1 HPP will affect the increase in sediments into the Drini River, which will then be discharged into the Buna River and finally into the seaside. These sediments consist mainly of tiny particles flown without precipitation.

9.2.1.7 Question 7:

What will be the effects regarding the use of construction aggregates in the project area?

Answer (EIA report team):

After the construction of the Vau Dejes HPP in 1970, the discharge of the solid sediments from the Drini River into the Buna and farther on into the Adriatic Sea.

The amount of sediments supplying this segment of the Drini River, prior to the construction of the dams of the Fierze, Koman and Vau Dejes HPP's, was about 500,000 m3/year.

In the last two decades, the Drini River bed, from the Spathari weir to the Buna River, has been exploited to the extreme, violating any technical or scientific sense regarding the extraction of the construction aggregates. In the last years, the ex-tracted construction aggregates reaches 500, 000 m3/year.

Such exploitation has brought to the ruin of the forested part of the Drini River bed, mainly in the territory of the commune of Bushati.

The Energji Ashta Project, in cooperation with the local government authorities, will provide for conditions to put a ban on the extraction of the construction aggregates on the Drini River bed, south to the HPP channel, for a length of 7 km, (5 km from Ashta 1 to Ashta 2 and 2 km of embankment west of Ashta 2).

In agreement with the local authorities, the Energji Ashta will take over the rehabilita-tion of part of the ruined area south to the project channel.

It should be pointed out that the channel may as well partly serve as an obstacle for the extraction of the construction aggregates on the Drini River bed, because it is going to block the access from the Bushati commune territory for a length of 7 km (Spathari weir west of the village Ashta, to the Drini River bed.

9.2.1.8 Question 8:

Will it affect the quality of the roads in the project zone?

Answer (Energji Ashta):

In the course of construction, the project will be using the national roads mainly and the Drini River bed. With regard to vehicles using the national roads in the framework of the project, the Energji Ashta Ltd company will make an agreement with the re-sponsible state authorities. In case the communal roads will be needed, the Energji Ashta will make an agreement with the commune of Bushati, with special provisions for the liabilities of the company Energji Ashta as well as the road rehabilitation, the time in which the vehicles may use these roads for purposes of the project imple-mentation.

Along the channel from Ashta 1 to Ashta 2, the design includes the construction of three overpasses that will enable the local people and cattle to pass from the territory of the commune of Bushati to the Drini River bed.

9.2.1.9 Question 9:

How is it going to affect the employment of the local people?

Answer (Energji Ashta):

During construction, the Energji Ashta will contract a number of local construction companies, which will help with the decrease of local unemployment in the commune and in the prefecture. These companies, like Energji Ashta Ltd itself, will be paying the local and central taxes, which will increase the local and state incomes from taxes.

9.2.1.10 Recent public hearing events

On March 2, 2010, another public hearing for stakeholders was organized by Energji Ashta. This stakeholder's consultation was taking place at the Bushati Commune, Municipality Hall. The meeting was open to the public. The purpose of public meeting was to provide a brief survey over developments of last 9 months regarding HPP Ashta project and to demonstrate the current status.

Information was given about the commencement of construction work and the up-coming steps as well as summary of activities that were realized since the last public meeting.

The meeting was announced in several local media and publicly at the Commune of Bushat. Dates of publications: February 19, 2010: page 10; February 25, 2010: page 16; March 1, 2010: page 10. Total paper circulation 25,000 - 30,000 copies distrib-uted.

The venue covered a Project Description, overview on project status and time schedule, provided details on project layout and construction activities, an overview on the status of permits, project organization and contacts, Project Partners (intro-duction of partner companies), environmental impact of project, floods in project area, impact of HPP Ashta with regard to floods, project development under the Clean Development Mechanism, establishment of Citizen Information Office plus Question and Answers session.

No areas of conflict were raised during the stakeholders hearing.

On April 6, 2011 another Public Consultation was organized, informing the interested public about current status of the project implementation, providing an overview of the events since the last meeting, presenting activities and outcomes of environ-mental monitoring, social contributions of the Operator, as well as a Question and Answers session.

A number of questions were asked by participants during the meeting. Representatives of Energji Ashta and EIA study group answered the questions. The following topics have been discussed with the local people:

Impact on the irrigation system and on agricultural land:

Drinking and groundwater will not be affected by the project. There will be no negative impacts on the irrigation system of the area. The HPP developer promises to temporary stop the operation of the HPP in the case of water levels in Drini River drop to historical minimum. Further to that the draining system for irrigation fields will be extended.

The agriculture land will be not affected significantly. During the construction phase there might be an impact on the agriculture land, where the operator will undertake either payment for the expropriation or the rehabilitation of the land at the end of con-struction period.

Floods:

The project will have a positive impact, because 5 km south of the channel will be protected once and for ever from the floods. In this way the existing protection works will become obsolete and the expenses for rehabilitation and maintenance will be eliminated permanently.

At the same time 2 km segment along the southern River Drini bank to the south HPP Ashta 2 will protect from the floods because an embankment will be con-structed, which will eliminate the flood danger as well as the erosion of land to the south.

There will be a positive impact on erosion along the project's channel and the con-crete embankment. The new construction will eliminate permanently the danger of the land erosion in the area of project. Beyond this area the project will have no im-pact, as the water will flow into the natural bed of River Drin. Verbund has planed in the project the softening of water flow power, to prevent erosion in the River Drin to south of project area.

Local employment:

During the construction phase, the developer will employ a number of Albanian con-struction companies, which will help to reduce unemployment on Commune and Dis-trict level. These companies, as well as the developer itself, will pay local and state taxes, which in turn will improve the income at the Commune and State level.

PHOTOS

9.3 List of fauna in the Drini River and nearby wetlands

9.3.1 List of amphibians, abundance and status

Tab. List of amphibians in the Drini River and in its close wetlands

Nr.	Species	English name	Abundance[1]	Protection status	National status	International status
1	*Bombina variegata*	Yellow-Bellied Toad	O	Protected	LRnt	LRlc
2	*Bufo bufo*	Common toad	O	Protected	LRnt	LRlc
3	*Bufo viridis*	European green toad	O	Protected	LRnt	LRlc
4	*Hyla arborea*	European Tree Frog	O	Protected	LRlc	LRlc
5	*Rana balcanica*	Greek March Frog	O	Not protected	VU	LRlc
6	*Rana lessonae*	Pool frog	O	Protected	LRnt	LRlc
7	*Rana dalmatina*	The Agile Frog	O	Protected	LRlc	LRlc
8	*Rana graeca*	Stream Frog	P	Protected	LRnt	LRlc
9	*Salamandra salamandra*	Fire Salamander	P	Protected	LRnt	LRlc

[1] O-Observed; P-Potentially present but not observed during field survey; U-Unlikely

Nr.	Species	English name	Abundance[1]	Protection status	National status	International status
10	*Triturus cristatus*	Great Crested Newt	O	Protected	LRlc	LRlc
11	*Triturus vulgaris*	Smooth newt	O	Protected	LRlc	LRlc

Risk categories, according to IUCN, 2001:

CR- critical risk of extinction(Critically endangered); DD-Deficient Data; EN- endangered; VU- Vulner-able; LRcd- Lower Risk conservation dependent; LRnt – Low Risk nearly threatened; LRlc-Lower Risk less concern

9.3.2 List of reptiles, abundance and status

Risk categories, according to IUCN, 2001:

Nr.	Species	English name	Abundance[1]	Protection status	National status	International Status
1	*Testudo hermanni*	Hermann's tortoise	O	Protected	LRnt	LRnt
2	*Emys orbicularis*	European pond Terrapin	O	Protected	LRnt	LRnt
3	*Algyroides nigropunctatus*	Dalmatian algyroides	P	Protected	LRnt	LRlc
4	*Hemidactylus turcicus*	Turkish Gecko	O	Protected	LRnt	
5	*Lacerta viridis*	European Green Lizard	O	Protected	LRlc	LRlc
6	*Lacerta trilineata*	Balkan Green Lizard	O	Protected	LRnt	LRlc
7	*Podarcis muralis*	common wall lizard	O	Protected	NE	LRlc
8	*Podarcis taurica*	Balkan Wall Lizard	O	Protected	LRnt	VU
9	*Pseudopuss apodus*	European Legless Lizard	O	Protected	LRnt	LRlc
10	*Anguis fragilis*	Slow worm	O	Protected	NE	NE
11	*Coluber caspius*	Large Whip Snake	O	Protected	NE	
12	*Coluber*	Balkan Whip	O	Protected	LRnt	LRlc

Nr.	Species	English name	Abundance[1]	Protection status	National status	International Status
	gemonensis	Snake				
13	*Coluber jugularis*	Caspian Whip Snake	P	Protected	LRlc	
14	*Coluber najadum*	Dahl's Whipsnake	O	Protected	LRcd	
15	*Elaphe longissima*	Aesculapian Snake	P	Protected	LRnt	NE
16	*Elaphe quatuorlineata*	Four-lined snake	P	Protected	VU	
17	*Elaphe situla*	European Ratsnake	P	Protected	VU	LRlc
18	*Malpolon monspensulanum*	The Montpellier snake	P	Protected	NE	LRlc
19	*Natrix natrix*	European Grass Snake	O	Protected	LRlc	LRlc
20	*Natrix tessellata*	Dice snake	O	Protected	LRnt	VU
21	*Telescopus fallax*	Mediterranean Cat Snake	P	Protected	LRcd	
22	*Vipera ammodytes*	European Nose Horn Viper	O	Protected	LRlc	

CR- critical risk of extinction(Critically endangered); DD-Deficient Data; EN- endangered; VU- Vulner-able; LRcd- Lower Risk conservation dependent; LRnt – Low Risk nearly threatened; LRlc-Lower Risk less concern

O-Observed; P-Potentially present but not observed during field survey; U-Unlikely

9.3.3 List of birds, abundance and status

Tab. List of birds, abundance and status

Nr.	Species	English name	Ecotype[2]	Abundance[3]	Protection status	National Status	International Status
	Gavia arctica	Black-throated Loon	W	O	Protected		LRlc
	Tachybaptus ruficollis	Little Grebe	R	O	Protected		LRlc
	Podiceps cristatus	Great Crested Grebe	R	O	Protected		LRlc
	Podiceps nigricollis	Black-necked Grebe	W	O	Protected		LRlc

[2] R- Resident and nesting; W - Wintering, , SV- Summer visitor and nesting , MP - migratory passerby;
[3] O-Observed; P-Potentially present but not observed during field survey; U-Unlikely

Nr.	Species	English name	Ecotype [2]	Abundance [3]	Protection status	National Status	International Status
	Phalacrocorax carbo	Great Cormorant	W	O	Protected	LRlc	LRlc
	Phalacrocorax pygmeus	Pygmy cormorant	R	O	Protected	CR	LRlc
	Ardeola ralloides	Squacco Heron	MP	P	Protected	VU	LRlc
	Egretta garzetta	Little Egret	W	O	Protected	VU	LRlc
	Egretta alba	Great White Egret	W	O	Protected	EN	LRlc
	Ardea cinerea	Grey Heron	R	O	Protected	VU	LRlc
	Ardea purpurea	Purpure Heron	SV	P	Protected	EN	LRlc
	Ciconia ciconia	White Stork	SV	U	Protected	CR	LRlc
	Platalea leucorodia	Euroasian Spoonbill	SV	P	Protected	EN	LRlc
	Anas crecca	Teal	W	P	Not protected		LRlc
	Anas platyrhynchos	Mallard	W	P	Not protected		LRlc
	Cygnus cygnus	Whooper Swan	W	P	Protected		LRlc
	Milvus migrans	Black Kite	MP	P	Protected	EN	LRlc
	Milvus milvus	Red Kite	MP	P	Protected	EN	LRnt
	Circus cyaneus	Hen Harrier	W	O	Protected	EN	LRlc
	Circus aeruginosus	Marsh Harrier	W	O	Protected	VU	LRlc
	Accipiter nisus	Sparrowhawk	R	P	Protected	EN	LRlc
	Buteo buteo	Buzzard	R	O	Protected	VU	LRlc
	Falco tinnunculus	Kestrel	R	O	Protected	VU	LRlc
	Falco subbuteo	Hobby	SV	P	Protected	VU	LRlc
	Falco peregrinus	Peregrine	R	O	Protected	VU	LRlc
	Fulica atra	Coot	W	O	Not protected		LRlc
	Perdix perdix	Grey Partridge	R	P	Not protected		LRlc
	Coturnix coturnix	Quail	R	O	Not protected		LRlc
	Gallinago gallinago	Snipe	W	O	Not protected		LRlc
	Scolopax rusticola	Woodcock	W	P	Not protected		LRlc
	Pluvialis squatarola	Grey Plover	W	P	Not protected		LRlc
	Calidris alpina	Dunlin	W	P	Not protected		LRlc
	Calidris minuta	Little Stint	W	P	Not protected		LRlc
	Actitis hypoleucos	Common sandpiper	W	P	Not protected		LRlc
	Charadrius hiaticula	Ringed Plover	W	P	Not protected		LRlc
	Numenius arquata	Curlew	R	P	Not protected		LRnt
	Vanellus vanellus	Lapwing	W	P	Not protected		LRlc
	Tringa totanus	Common Redshank	W	O	Not protected		LRlc
	Tringa erythropus	Spotted Redshank	W	P	Not protected		LRlc
	Tringa nebularia	Greenshank	W	P	Not protected		LRlc
	Tringa ochropus	Green Sandpiper	W	O	Not protected		LRlc

Nr.	Species	English name	Ecotype [2]	Abundance [3]	Protection status	National Status	International Status
	Larus ridibundus	Black-headed Gull	R	O	Not protected		LRlc
	Larus cachinnans	Yellow-legged Gull	R	O	Protected	EN	LRlc
	Columba livia	Rock Dove	R	O	Protected		LRlc
	Columba oenas	Stock Dove	R	O	Protected		LRlc
	Streptopelia decaocto	Collared Dove	R	O	Not protected		LRlc
	Streptopelia turtur	Turtle Dove	SV	O	Not protected		LRlc
	Tyto alba	Barn Owl	R	O	Protected	VU	LRlc
	Otus scops	Scops Owl	SV	O	Protected		LRlc
	Bubo bubo	Eagle Owl	R	O	Protected	CR	LRlc
	Athene noctua	Little Owl	R	O	Protected		LRlc
	Asio otus	Long-eared Owl	W	P	Protected	LRnt	LRlc
	Apus apus	Swift	SV	O	Protected	LRcd	LRlc
	Apus pallidus	Pallid Swift	SV	O	Protected	LRcd	LRlc
	Alcedo atthis	Kingfisher	W	O	Protected		LRlc
	Merops apiaster	Bee-eater	SV	O	Protected	EN	LRlc
	Upupa epops	Hoope	SV	O	Protected	VU	LRlc
	Coracias garrulus	Roller	SV	P	Protected	CR	LRnt
	Galerida cristata	Crested Lark	R	O	Protected		LRlc
	Lullula arborea	Woodlark	R	O	Protected		LRlc
	Alauda arvensis	Skylark	R	O	Not protected		LRlc
	Riparia riparia	Sand Martin	SV	P	Protected		LRlc
	Ptyonoprogne rupestris	Crag Martin	R	O	Protected		LRlc
	Hirundo rustica	Swallow	SV	O	Protected		LRlc
	Hirundo daurica	Red-rumped Swallow	SV	O	Protected		LRlc
	Delichon urbica	House Martin	SV	O	Protected		LRlc
	Anthus pratensis	Meadow Pipit	W	O	Protected		LRlc
	Anthus spinoletta	Water Pipit	W	P	Protected		LRlc
	Motacilla cinerea	Grey Wagtail	R	O	Protected		LRlc
	Motacilla alba	Pied Wagtail	R	O	Protected		LRlc
	Motacilla flava	Yellow Wagtail	SV	O	Protected		LRlc
	Troglodytes troglodytes	Wren	R	O	Protected		LRlc
	Cettia cetti	Cetti's Warbler	R	O	Protected		LRlc
	Acrocephalus arundinaceus	Great Reed Warbler	SV	O	Protected		LRlc
	Acrocephalus melanopogon	Moustached Warbler	R	P	Protected	EN (D1)	LRlc
	Acrocephalus schoenobaenus	Sedge Warbler	SV	P	Protected	EN (D1)	LRlc
A	*Acrocephalus scirpaceus*	Reed Warbler	SV	P	Protected	LRnt	LRlc
	Sylvia borin	Garden Warbler	SV	P	Protected		LRlc
	Sylvia atricapilla	Blackcap	R	O	Protected		LRlc
	Sylvia communis	Whitethroat	SV	O	Protected		LRlc
	Sylvia curruca	Lesser Whitethroat	SV	O	Protected		LRlc
	Sylvia melanocephala	Sardinian Warbler	R	P	Protected		LRlc
	Phylloscopus bonelli	Bonelli's Warbler	MP	O	Protected		

Nr.	Species	English name	Ecotype [2]	Abundance [3]	Protection status	National Status	International Status
	Phylloscopus sibilatrix	Wood Warbler	MP	P	Protected		LRlc
	Phylloscopus collybita	Chiffchaff	R	O	Protected		LRlc
	Regulus regulus	Goldcrest	R	O	Protected		LRlc
	Regulus ignicapillus	Firecrest	R	O	Protected		
	Erithacus rubecula	Robin	R	O	Protected		LRlc
	Luscinia megarhynchos	Nightingale	SV	O	Protected		LRlc
	Phoenicurus ochruros	Black Redstar	R	O	Protected		LRlc
	Phoenicurus phoenicurus	Redstar	SV	O	Protected		LRlc
	Saxicola rubetra	Whinchat	SV	P	Protected		LRlc
	Saxicola torquata	Stonechat	R	O	Protected		
	Oenanthe oenanthe	Northern Wheatear	SV	O	Protected		LRlc
	Oenanthe hispanica	Black-eared Wheatear	SV	P	Protected		LRlc
	Muscicapa striata	Spotted Flycatcher	SV	O	Protected		LRlc
	Aegithalos caudatus	Long-tailed Tit	R	P	Protected		LRlc
	Turdus merula	Blackbird	R	O	Not protected		LRlc
	Turdus pilaris	Fieldfare	W	O	Protected		LRlc
	Turdus philomelos	Song Thrush	W	O	Protected		LRlc
	Turdus iliacus	Redwing	W	O	Protected		LRlc
	Turdus viscivorus	Mistle Thrush	W	O	Protected		LRlc
	Parus lugubris	Sombre Tit	R	O	Protected		LRlc
	Parus cristatus	Crested Tit	R	O	Protected		LRlc
	Parus ater	Coal Tit	R	O	Protected		LRlc
	Parus coeruleus	Blue Tit	R	O	Protected		LRlc
	Parus major	Great Tit	R	O	Protected		LRlc
	Sitta neumayer	Rock Nuthatch	R	O	Protected		LRlc
	Tichodroma muraria	Wallcreeper	W	P	Protected	EN	LRlc
	Remiz pendulinus	Penduline Tit	R	P	Protected	VU	LRlc
	Oriolus oriolus	Golden Oriole	SV	O	Protected		LRlc
	Lanius collurio	Red-backed Shrike	SV	O	Protected		LRlc
	Lanius excubitor	Great Grey Shrike	SV	P	Protected	DD	LRlc
	Lanius senator	Woodchat Shrike	SV	O	Protected		LRlc
	Lanius minor	Lesser Grey Shrike	SV	P	Protected	DD	LRlc
	Garrulus glandarius	Jay	R	O	Protected		LRlc
	Pica pica	Magpie	R	O	Protected		LRlc
	Corvus monedula	Jackdaw	R	O	Protected		LRlc
	Corvus frugilegus	Rook	W	O	Protected		LRlc
	Corvus cornix	Hooded Crow	R	O	Protected		
	Corvus corone	Carrion Crow	R	O	Protected		LRlc
	Corvus corax	Raven	R	O	Protected		LRlc
	Sturnus vulgaris	Starling	R	O	Not protected		LRlc
	Passer domesticus	House Sparrow	R	O	Not protected		LRlc
	Passer hispaniolensis	Spanish Sparrow	R	O	Protected		LRlc
	Passer montanus	Tree Sparrow	R	O	Protected		LRlc
	Fringilla coelebs	Chaffinch	R	O	Protected		LRlc
	Fringilla montifringilla	Brambling	W	P	Protected		LRlc
	Serinus serinus	Serin	R	O	Protected		LRlc
	Carduelis carduelis	Goldfinch	R	O	Protected		LRlc

Nr.	Species	English name	Ecotype [2]	Abundance [3]	Protection status	National Status	International Status
	Carduelis spinus	Siskin	W	P	Protected		LRlc
	Carduelis cannabina	Linnet	W	P	Protected		LRlc
	Emberiza citrinella	Yellowhammer	R	O	Protected		LRlc
	Emberiza cirlus	Cirl Bunting	R	O	Protected		LRlc
	Emberiza cia	Rock Bunting	R	O	Protected		LRlc
	Emberiza hortulana	Ortolan Bunting	SV	O	Protected	DD	LRlc
	Emberiza schoeniclus	Reed Bunting	R	O	Protected		LRlc
	Emberiza melanocephala	Black-headed Bunting	SV	P	Protected		LRlc
	Miliaria calandra	Corn Bunting	R	O	Protected		LRlc

Risk categories, according to IUCN, 2001:

CR- critical risk of extinction(Critically endangered); DD-Deficient Data; EN- endangered; VU- Vulner-able; LRcd- Lower Risk conservation dependent; LRnt – Low Risk nearly threatened; LRlc-Lower Risk less concern

2 R- Resident and nesting; W - Wintering, , SV- Summer visitor and nesting , MP - migratory passerby;

3 O-Observed; P-Potentially present but not observed during field survey; U-Unlikely

9.3.4 List of mammals, abundance and status

Nr	Species	English name	Abundance [1]	Protection status	National Status	International Status
1	*Erinaceus concolor*	Eastern hedgehog	O	Protected	NE	LRlc
2	*Talpa stankovici*	Stankovici's mole	O	Protected	NE	LRlc
3	*Crocidura suaveolens*	Lesser white-toothed shrew	O	Protected	NE	LRlc
4	*Crocidura leucodon*	Bicoloured white-toothed shrew	O	Protected	DD	LRlc
5	*Suncus etruscus*	Etruscan Shrew	P		DD	LRlc
6	*Rhinolophus blasii*	Blasius's horseshoe bat	O	Protected	LRnt	LRlc
7	*Rhinolophus euryale*	Mediterranean horseshoe bat	P	Protected	VU	LRnt
8	*Rhinolophus ferrumequinum*	Greater horseshoe bat	O	Protected	NE	LRlc
9	*Rhinolophus hipposideros*	Lesser horseshoe bat	P	Protected	LRnt	LRlc
10	*Miniopterus schreibersi*	Schreiber's bat	P	Protected	NE	LRlc
11	*Myotis blythii*	Lesser mous-eared bat	O	Protected	NE	LRlc
12	*Myotis capaccinii*	Long-fingered bat	O	Protected	NE	VU
13	*Myotis myotis*	Greater mouse-eared bat	P	Protected	NE	LRlc
14	*Pipistrellus kuhli*	Kuhl's pipistrelle	P	Protected	NE	LRlc
15	*Pipistrellus nathusii*	Nathusius's pipistrelle	P	Protected	NE	LRlc
16	*Pipistrellus pipistrellus*	Common pipistrelle	O	Protected	NE	LRlc
17	*Hypsugo savii*	Savi's pipisterlle	P	Protected	NE	LRlc
18	*Vespertilio murinus*	Parti-coloured bat	P	Protected	DD	LRlc
19	*Tadarida teniotis*	Free-tailed bat	P	Protected	DD	LRlc
20	*Lepus europaeus*	Brown hare	P	Not protected	NE	LRlc
21	*Glis glis*	Fat dormouse	P	Protected	LRnt	LRlc
22	*Muscardinus avellanarius*	Hazel dormouse	P	Protected	DD	LRlc

Nr	Species	English name	Abundance[1]	Protection status	National Status	International Status
23	*Microtus (Pitymys) thomasi*	Thomas pine vole	P	Protected	LRnt	LRlc
24	*Apodemus flavicollis*	Yellow-necked mouse	O	Protected	NE	LRlc
25	*Apodemus mystacinus*	Broad-toothed Field Mouse	P	Protected	NE	LRlc
26	*Apodemus sylvaticus*	Long-tailed field mouse	O	Protected	NE	LRlc
27	*Mus musculus domesticus*	House mouse	O	Not protected	NE	LRlc
28	*Mus macedonicus*	Macedonian mouse	O	Protected	NE	LRlc
29	*Rattus norvegicus*	Brown rat	O	Not protected	NE	LRlc
30	*Rattus rattus*	House rat	O	Not protected	NE	LRlc
31	*Canis aureus*	Jackal	P	Protected	EN	LRlc
32	*Vulpes vulpes*	Red fox	O	Not protected	NE	LRlc
33	*Lutra lutra*	Common otter	O	Protected	VU	LRnt
34	*Meles meles*	Badger	O	Protected	EN	LRlc
35	*Mustela nivalis*	Weasel	O	Protected	NE	LRlc

[1] O-Observed; P-Potentially present but not observed during field survey; U-Unlikely

9.3.5 Elecrofishing results

Presence of fish species in the Ashta HPP project area

Report from the Electrofishing survey

Place of survey

The survey was conducted in the Drini River; from Vau Deja HPP dam to Spathari weir and downstream to Spathari weir up to 2 km distance along River Drin. The river comes down from HPP Vau Deja from two branches, which are merged after 1.3 km.

The bottom of the right branch is composed from rock and gravel with partial and irregular deposits of sand and silt. In some parts of this branch, especially in the part where no human activities are present, these deposits help vegetation growth along the riverside. The sub-merged vegetation consists of algae and club-rush and the riverside vegetation consists of willow and club-rush.

The left branch – where the powerhouse is located – is composed from rock and gravel, but large deposits of sand and silt are also noted, especially in the left side of the river. The right side of the river is totally covered by gravel.

The submerged vegetation is not much evolved and the vegetation along the riversides is rep-resented by willow, poplar and chaste trees. In the left branch a high level of erosion by the river flow is noted. Sand and silt deposits are noted in the confluence of the two river branches and the vegetation is composed of reed, willow, poplar and bushes. The riverbed up to 2 km downstream of Spathari weir is completely gravel, and sand deposits with poor vege-tation can be found in some small parts.

Figure 3. Survey area

Method of work:

The methods used for this study has been electro-shocker and nets. Nets with 5 mm mesh size were used in order to catch as many as possible fish species. The nets were located down-stream and Spathari weir and in the confluence of Drini River branches, near Vau Deja dam.

The electro shocker method was performed along the riverside and in the central part of Drini river flow to make possible investigation of flow impact in species composition. The fish species were determined using as a key definition “Handbook of European Freshwater Fishes” of Maurice Kottelat & Jörg Freyhof (2007).

Results:

No.	Fish types	Nomber of individuals
1	*Anguilla anguilla* (eel) *migrating*	5
2	*Carassius gibelio* (Prussian carp)	2
3	*Rutilus ohridanus* (Ohrid roach)	7
4	*Alburnus scoranza* (bleak)	50
5	*Squalius cephalus* (chub)	5
6	*Perca fluviatilis* (perch)	42
7	*Salaria fluviatilis* (freshwater blenny)	3
8	*Gambusia holbrooki* (eastern mosquito fish)	3
9	*Cobitis ohridana* (Ohrid spined loach)	1

Nets use was not efficient because of the high water discharge and the difficult and inappro-priate riverside of River Drini. The most efficient was the electro shocker method. From this method the species of fishes cached are listed below:

The amount of fishes cached was small, because of the high water discharges from Vau Deja dam, which result in displacing the fishes downstream of Spathari weir.

The expectation was to catch the following species Cyprinus carpio (common carp), Chon-drostoma nasus (nase), Barbus rebeli (western Balkan barbel), Salmo farioides (Balkan brook trout), etc, but the weather conditions were not fully appropriate.

The larger concentration of fish was in small bays along the riverside where the batches where composed from bleak, perch and less Ohrid roach and chub. The freshwater blenny was found in the part of the river where the stream is strong and the riverbed is with big stones. Prussian carp was found down and up stream of Spathari weir where Drini river stream is quite. Eels were caught just below Vau Deja dam mostly in the side of water dis-charging gates.

Further surveys would be necessary to have a clear picture for fish composition species for this segment of Drini river. This is necessary to figure out fish migration due to the amount of water discharged from Vau Deja dam and for the natural migration from Drini river to the sea and vice versa. The study must be conducted at least in 2 km distance before Gjader River joins Drini River, and from Gjader river up to Gocaj bridge, just in Lezha district entrance. This should be done to define if this river is the source of migrating from the sea of these species: Dicenthrachus labrax (sea bass), Mugil cephalus (common mullet), Liza ramada (thinlip mullet).

The findings during the electrofishing survey concur with the common sense expectation in that the construction of Spathari weir has interrupted fish migration upstream and down-stream from this weir.

The fish population presented in the area between Vau Deja and Spathari weir are fish spe-cies that survive from Hydropower Vau Deja discharges, from upper stream of Gjadri River and those that can live in the small bays of Drini River.

The fluctuations of the Drini riverflow volumes, changes in water quality and illegal fishing techniques might also siginficantly affect fish population in this area.

The points where fish species were caught:

Figure 1 *Anguilla anguilla*

Figure 2 *Carassius gibelio*

Figure 3 *Rutilus ohridanus*

Figure 4 *Alburnus scoranza*

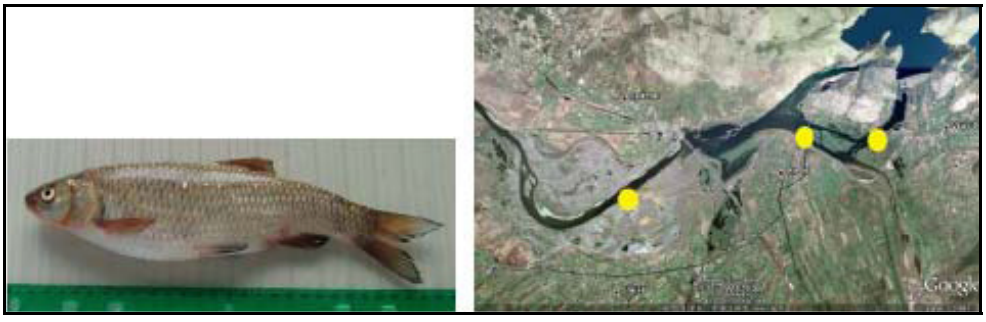


Figure 5 *Squalius cephalus*

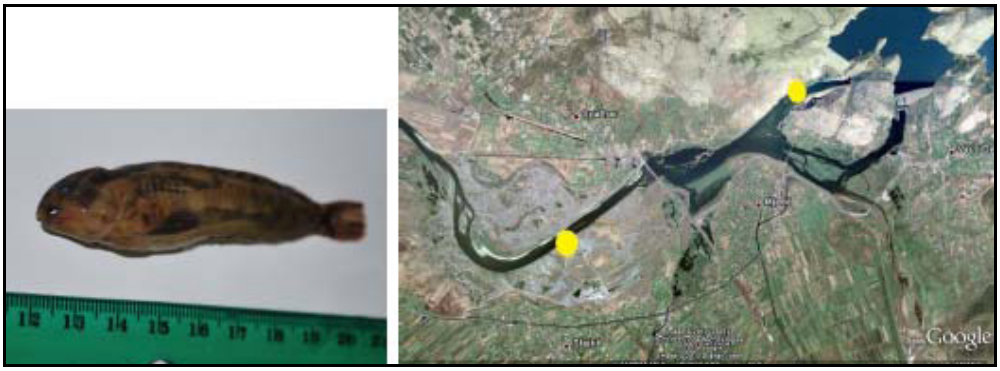
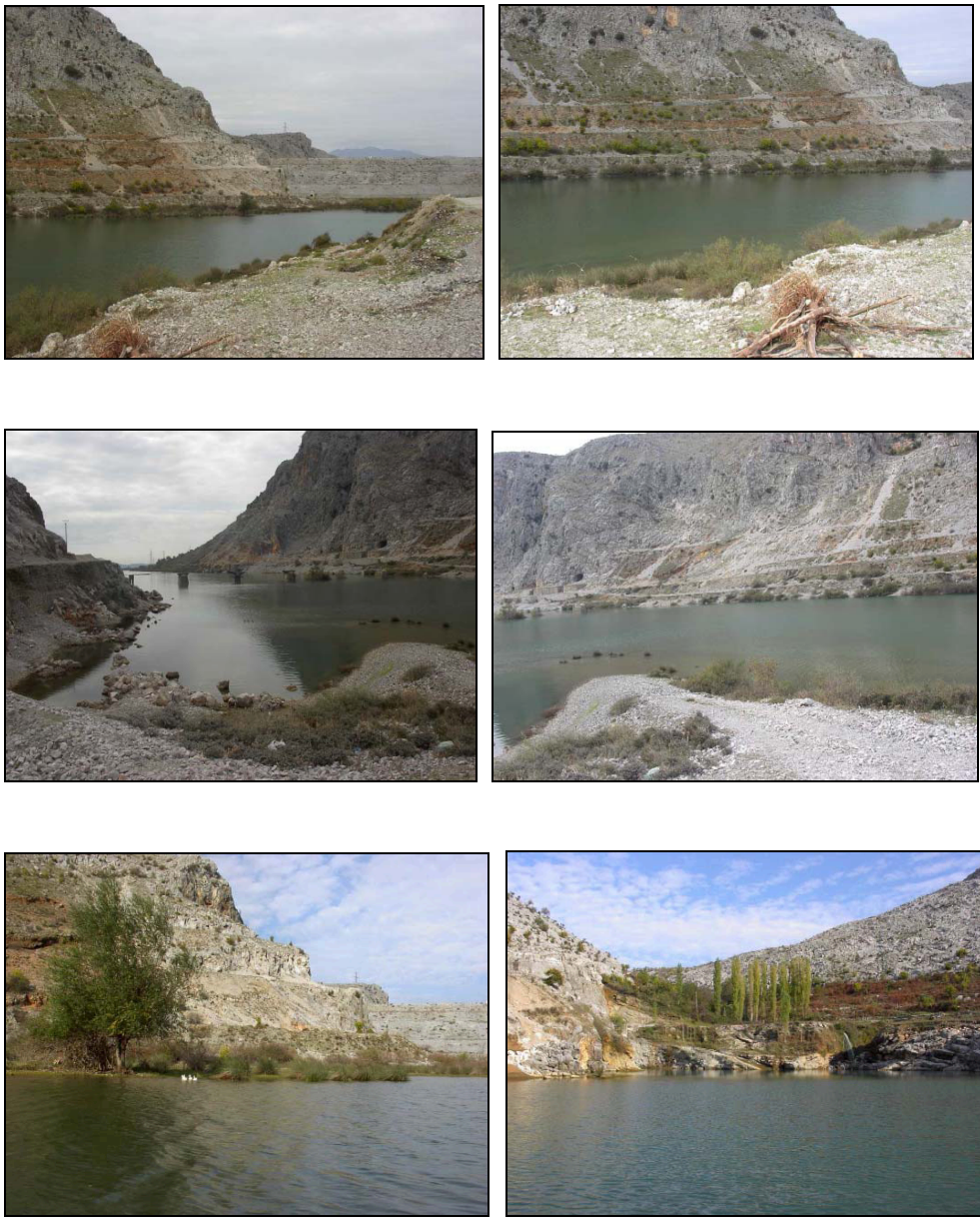


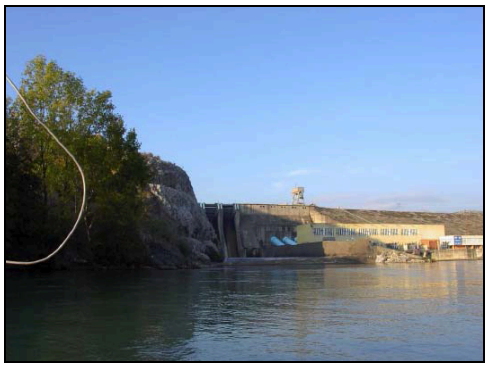
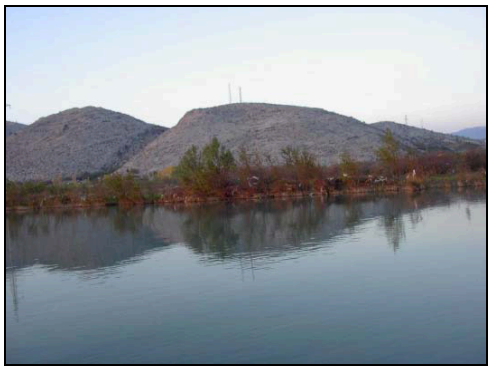
Figure 6 *Salaria fluviatilis*

Figure 7 *Perca fluviatilis*

Figure 8 *Gambusia holbrooki*

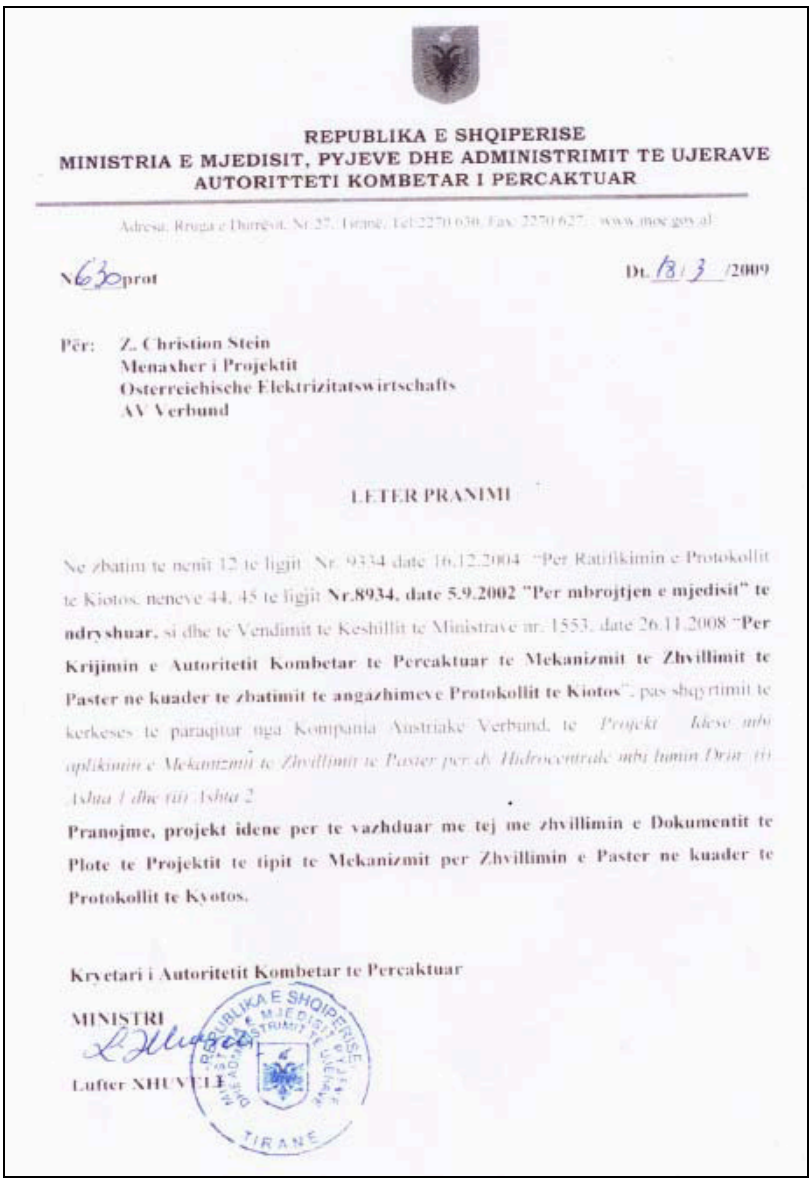
Figure 9 ***Cobitis ohridana***



9.4 The applied principle of clean energy

Draft-idea for the applied Mechanism of Clean Development, in the framework of Kioto Protocol.



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MINISTRIA E MJEDISIT, PYJEVE DHE ADMINISTRIMIT TE UJERAVE
AUTORITTETI KOMBETAR I PERCAKTUAR

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Nr.630prot Dt. 18/3/2009

Për: Z. Christion Stein
Menaxher i Projektit
Osterreichische Elektrizitatswirtschafts
AV Verbund

LETER PRANIMI

Ne zbatim te nenit 12 te ligjit Nr. 9334 date 16.12.2004 "Per Ratifikimin e Protokollit te Kiotos, neneve 44, 45 te ligjit **Nr.8934, date 5.9.2002 "Per mbrojtjen e mjedisit" te ndryshuar**, si dhe te Vendimit te Keshillit te Ministrave nr. 1553, date 26.11.2008 "**Per Krijimin e Autoritetit Kombetar te Percaktuar te Mekanizmit te Zhvillimit te Paster ne kuader te zbatimit te angazhimeve Protokollit te Kiotos**", pas shqyrtimit te kerkeses te paraqitur nga Kompania Austriake Verbund, te *Projekt Ideve mbi aplikimin e Mekanizmit te Zhvillimit te Paster per dy Hidrocentrale mbi lumin Drin (ti Ashta 1 dhe tiri Ashta 2*

Pranojme, projekt idene per te vazhduar me tej me zhvillimin e Dokumentit te Plote te Projektit te tipit te Mekanizmit per Zhvillimin e Paster ne kuader te Protokollit te Kyotos.

Kryetari i Autoritetit Kombetar te Percaktuar

MINISTRI

Lufter XHUVELI

REPUBLIKA E SHQIPERISE MINISTRIA E MJEDISIT PYJEVE DHE ADMINISTRIMIT TE UJERAVE TIRANE

Fig. 10.5.1. Letter of acceptance of the Minister of Environment, Forestry and Water Management Mr. L. Xhuveli, regarding the Energji Ashta draft-concept about clean energy.