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GOVERNMENT OF ALBANIA

MINISTRY OF PUBLIC WORKS, TRANSPORT AND TELECOMMUNICATION
Project Coordination Unit (PCU)

BAJKAJ LANDFILL HIMARA WASTE TRANSFER AND ASSOCIATED STRUCTURES

ENVIRONMENTAL IMPACT ASSESSMENT

JULY 2009

Environmental Impact Assessment
Bajkaj Landfill,
Himara Waste Transfer
and Associated Structures

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Ministry of Public Works, Transport and Telecommunication,
Government of Albania.
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CONTENTS

PROJECT IDENTIFICATION

Name of Project: Sub-Component B.1: Coastal Solid Waste Management
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EXPLANATION OF ACRONYMS

BOD	Biochemical Oxygen Demand (BOD_5 is a five day incubation)
BSAP	Biodiversity Strategy and Action Plan
CARDS	Community Assistance for Reconstruction Development & Stabilisation (EU)
CDW	Construction and Demolition Waste
COD	Chemical Oxygen Demand
DFDD	Draft Final Detail Design (TEI& SWS for Bajkaj Landfill)
EA	Environmental Assessment
EFA	Environment and Forestry Agency (MEFWA)
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
EU	European Union
GEF	Global Environment Facility
HDPE	High density polyethylene
ICZMCP	Integrated Coastal Zone Management and Clean-Up Project
IUCN	International Union for Conservation of Nature
LEP	Law on Environmental Protection
MEFWA	Ministry of Environment, Forests and Water Administration Albania
MoH	Ministry of Health
MPWTT	Ministry of Public Works, Transport and Telecommunications Albania
MSW	Municipal Solid Waste
NEI	National Environmental Inspectorate
$N\text{-}NH_3$	Ammoniacal-nitrogen
OHS	Occupational Health and Safety
PCU	Project Co-ordination Unit (MPWTT)
p.e.	population equivalent
PHRD	Government of Japan International Development Aid
REA	Regional Environmental Agency (MEFWA)
REI	Regional Envionmental Inspectorate
sic.	as written
WB	World Bank
<	less than
>	greater than

1 NON-TECHNICAL SUMMARY

Activity description

Household waste from towns, settlements and rural areas is often thrown on to the side of roads, into streams, or in out-of-the-way places. This is because there is no provision for receiving such waste in controlled sites such as a sanitary landfill. Waste dumps are a source of pollution and contribute to disease in the community. They are also unsightly, smell and are frequently burning from being deliberately set on fire.

This proposal is for the construction of a new sanitary landfill, together with a new waste transfer station, served by upgraded and new access and perimeter roads. The landfill and transfer station will be constructed and operated under new Laws which are currently being written for Albania, and which are compliant with strictly enforced European Union Legislation and World Bank Guidelines.

LEGISLATION

This document is the Non-Technical Summary of the Environmental Impact Assessment (EIA) Report which details all impacts that the proposal could have on the natural, built and human environment as required by Albanian and European Union legislation and World Bank Guidelines. This Report addresses ways to minimise such impacts. Albanian legislation in EIA and in solid waste management is reviewed, and current changes to this legislation, which will make the rules compliant with requirements under EU laws, are described. This includes requirements for public consultation and participation, written permitting of the landfill activity, and correct design and operation of the landfill and waste transfer station.

WHAT IS INTENDED

The new sanitary landfill will occupy 9.5 hectares, although only 6 ha will be used for depositing waste, and this progressively in a series of smaller cells. A waste transfer station will be constructed at Himara and used to mechanically compact domestic waste which will then be trucked to the landfill. The landfill and transfer station will serve between 22,000 and 30,000 persons.

The landfill which will take about 15 months to construct will be used for 27 years, after which it will be closed, capped and rehabilitated as a vegetated site. It will be located in a natural depression surrounded by hills on three sides, not visible from Bajkaj 1.5 kms away but partly visible from Palavli 1.4 km away. Waste arriving at the landfill will be compacted and covered daily by earth to eliminate smell. There will be no burning of waste at the landfill. The landfill and waste transfer station, will only accept household (domestic) and commercial municipal solid waste, and institutional kitchen waste. Both the landfill and transfer station will be securely fenced with locked gates to prevent unauthorised entry.

Biodegradeable waste in the landfill will generate gases, and these will be collected by a gas collection system and incinerated on-site in a biotorch flame. The entire landfill will be sealed underneath by waterproofing membranes which will prevent any pollution of the underground water and soils from rainfall draining through the waste mass. This wastewater (leachate) will be conducted through pipes to a treatment system comprising a storage basin, 3 lagoons, and a constructed wetland planted with reeds.

A 5.5. km access road to the landfill will use the existing road starting at the junction on the main road between Bamatat and Stjanji. Reconstruction and resurfacing of the road will be done. A new 0.7 km road will be built from this to the landfill site. A new 0.85 km road will be built to the waste

transfer station in Himara. There will be no on-site construction workers compound. Instead, workers will be billeted either in Saranda or in Himara towns.

ALTERNATIVE SITES

The location of the landfill site was chosen from a long list of 13 other sites, which was short-listed to 7 based on comparative criteria including environmental, geology, land ownership, vulnerability, human population, public attitudes, infrastructure, management, institutional, public authority preference, and cost. From these, 3 sites were short-listed based on compliance to the legislation, and a ranking system of these three sites undertaken to identify that Bajkaj Site B was the most appropriate site for the landfill. A do-nothing option was not acceptable.

DESCRIPTION OF LOCATION

The proposed landfill site is surrounded by hills on three sides. The entire site is characterised by soils with low permeability, underlain with a base flysch rock forming a geological barrier. There are no protected geological objects or sites of geological interest in the locality. There is little likelihood of pronounced seismic disturbance. Natural vegetation in the area is low profile shrubs, grass and bracken. Land use is generally under exploited, comprising localised fruit, vine and vegetables but at some distance from the site. Most livelihoods revolve around agriculture and agro-industrial trades, and servicing agricultural activities. The nearest community is Palavli at 1.4 km away.

The site is located in a high rainfall area during autumn and winter, with hot, dry summers. It is not waterlogged, does not have marsh or wetland areas, and permanent surface water is absent. The Kalasa River is 900 m away at its closest point. Gjovarakës Creek, a small, temporal creek which has low flow after rainfall is more than 200 m from the proposed site. An underground watertable is present at 0.7 m depth after rain. Boreholes and wells for drinking water supply and agricultural irrigation are in the locality but not close to the proposed site. Wind direction is predominantly north to south. Air quality is high, although impairment from agricultural burn-off does happen seasonally.

Biodiversity in the wider area is high with common species of plants and animals. There are no plant species found only in this area, or species that are protected by national or international listings, or included in the Albanian Red List. The broader zoogeographical area supports a number of species that are listed (Albanian Red List approved by the MEFWA) but none of these species are threatened by the proposed development. There are a number of cultural, heritage, historical and archaeological features in the wider vicinity. A line of defensive bunkers built during the earlier regime is near the proposed landfill site and should be regarded as a heritage feature.

IMPACTS AND THEIR MITIGATION

This Non-Technical Summary should also be read alongside Table 12 in this Report. Table 12 lists all impacts from the proposal on the receiving environment, and ways in which these impacts can be minimised. An initial assessment of negative against positive effects of the landfill showed that there was a higher number and score of negative than positive impacts (27 : 19). However, no negative effect was found to have significant effect on a large area, or for a long period on the existing environment, or on human communities. There are no unacceptable impacts (i.e. with a scale of impact ranging 8 upwards for importance, together with 8 upwards for magnitude in Table 12) which cannot be mitigated in the program of work for the project.

Visually, the landfill under construction and in operation will be unpleasant to see and will intrude on the scenic aspect of the surrounding countryside and on views from distant high ridges, although near views of it will be restricted by surrounding hills. The landfill will be visible by persons traveling on the new national road from Tepelene to Delvine, and by residents of Palavli Village. This can be

mitigated by planting several lines of evergreen trees. Trees will also dampen the noise from construction machinery, and noise from heavy plant during landfill operation.

Risk management for worker safety, control and containment of hazardous and toxic substances used on-site during construction and operation, and chemical substances used during the construction phase will be limited by a Construction Management Plan and a Landfill Operational Management Plan. Risk to operators from handling waste at the landfill and transfer station could be minimised through training and a Landfill Operational Management Plan. Risk from handling flammable substances such as fuel could be minimised through correct storage of substances, training and a Landfill Operational Management Plan.

Wastewater from rainfall draining through the waste mass will be prevented from entering underground water by landfill liners. The wastewater (leachate) will be collected in pipes and diverted to the wastewater treatment system which will comprise a storage basin, 3 holding lagoons and a constructed wetland planted with reeds. There will be no impact of wastewater on groundwater, but the final discharge from the leachate treatment system outfalls to a temporal creek which eventually flows into the Kalasa River. Discharge conditions for this must be prescribed in the Environmental Permit which will be issued by the EFA and monitored by the National Environmental Inspectorate (NEI). In the unlikely event of a tear or leak in the liners, or accidental spillage, an Environmental Management and Monitoring program will identify any pollution of underground or surface water, and action taken to rectify this. A no-well-drilling buffer area should be established 500 m outside the landfill. Wastewater from on-site construction workers and operators will be treated in appropriate on-site wastewater treatment systems (e.g. Imhoff Tanks) permanently on-site at the landfill and transfer station, and emptied regularly using an appropriate sewage tanker.

Smell from the landfill will not exceed recommended limits set by WHO at the nearest residence. Odour can be dissipated by planting rows of evergreen trees (such as eucalypts) on the landfill boundary. Correct operational procedures will stop smell, and a complaints register will be established for the public to register any complaints. Prompt response from the operator and managing authority to public complaints will be mandatory under the Landfill Operational Management Plan and under the Environmental Permit for the landfill issued by the EFA. Environmental monitoring will determine the origin and location of any odorous materials.

Biogas emissions from biodegrading waste will be collected by underground pipework and incinerated at a biotorch flame. Noise from the burning flame will have a low impact beyond the boundary of the landfill, and can be mitigated by lines of evergreen trees planted on the boundary. Release of volatile organic compounds from the wastewater (leachate) treatment system will have a low impact. Dust from pre-construction clearing, construction and operation of the landfill will be controlled by good practice: watering dust sources during dry weather, correct on-site operational procedures, and effective site management. Vehicle emissions during construction and operation will have a low impact. Noise and vibration from machinery during construction and operation can be minimised by a Construction Management Plan. Increased traffic from waste vehicles in the area will not have a significant impact, particularly after national highway construction vehicles have completed their road construction work. There will be a low impact on local flora but biodiversity in the wider context will not be affected. The constructed wetland will increase habitat for birds and insects. There are no cultural, heritage or archaeological impacts. An Environmental Management and Monitoring Plan is proposed which details safeguards to the receiving environment through a program of daily, weekly and monthly sampling and analysis of air, water and land. A public consultation and participation strategy has been assembled to address the concerns of the local communities.

Creation of employment for local communities should be pursued during the construction and operation periods. Waste picking must be stopped, but employment of local communities in setting up units to receive recycled materials at the landfill gate should be considered. The increased cost of

improved waste services to the targeted communities is not addressed in this EIA Report, and has been weakly addressed in previous studies. It requires separate attention.

2 INTRODUCTION

The Integrated Coastal Zone Management and Clean-Up Project (ICZMCP) incorporates the following components:

A. Integrated Coastal Zone Management Policy and Institutional Capacity Strengthening
B. Coastal Environment Infrastructure and Rehabilitation
C. Porto Romano Hot Spot Clean-Up
D. Project Management and Monitoring.

Under Component B, the Project includes Sub-Component B.1: Coastal Zone Waste Management which will support the development of modern waste management facilities and services in Southern Albania including:

- the development of a Sanitary Landfill with ancillary facilities sited north of Bajkaj village located in Vergo Commune close to the Municipality of Saranda within the administrative area of Delvina,
- a Waste Transfer Station with ancilary facilities within the Municipality of Himara, and
- access and peripheral site roads for the landfill and waste transfer sites.

Following site investigation and design preparation undertaken by TEI Environmental Engineers and SWS Consulting Engineers, Italy the preferred location of the landfill was identified as Site B, subject to appropriate mitigation measures. Final completion of the Draft Final Detail Design (DFDD) was 5th May, 2009 (TEI&SWS 2009a).

A 'profound environmental impact assessment' compliant with existing EIA Albanian Law, and with proposed new EIA laws transposing EU EIA legislation, and World Bank Guidelines was required for the proposed sanitary landfill and associated structures.

Consultant A (International EIA Expert) and Consultant B (National EIA Expert) were engaged in mid-April 2009 by the client, Ministry of Public Works Transport and Telecommunication, to complete the required Scope of Work for the EIA. The Inception Report was completed and submitted on 16th May, 2009, public hearings were held in Saranda and Himara on 12-13th May, and the Draft Environmental Impact Assessment was submitted on 10th June 2009. A second public consultation meeting was held in Saranda on 15th July 2009. The revised Final EIA Report was submitted in late July, 2009.

3 GENERAL INFORMATION

3.1 PROJECT PROFILE

This Report is the Environmental Impact Assessment of the proposed development, construction, operation and eventual decommissioing of the Bajkaj landfill, Himara waste transfer site, associated support structures, access roads and peripheral site roads. This proposed development is the Coastal Solid Waste Management subcomponent B1 of the Coastal Environment Infrastructureand Rehabilitation component B of the Integrated Coastal Zone Management and Clean-Up Project (ICZMP) for Albania.

Funding is provided by The World Bank for the Integrated Coastal Zone Management and Clean-Up Project (ICZMCP); Government of Albania, European Union (EU CARDS), Government of Netherlands for Porto Romano clean-up activities; Government of Austria for solid waste management activities; GEF and Government of Japan through a PHRD co-financing grant

The beneficiary is the Ministry of Public Works, Transport and Telecommunications Albania.

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3.2 REGULATORY REQUIREMENTS

3.2.1 EIA legislation Albania

Law No. 8990 (23 January 2003) on Environmental Impact Assessment lists under Appendix 1 activities that undergo Profound Process of impact assessment on environment as

> *Landfill for deposit of non-hazardous waste with capacity higher than 30 tons per day.*

Under Appendix 2 activities that undergo Summary Process of impact assessment on environment as:

- *11(b) installations used for waste elimination (not included in Appendix 1)*
- *11(c) plants for treatment of polluted waters (not included in Appendix 1)*
- *11(ç) installations for collection of waste (not included in Appendix 1)*
- *11(d) landfills of industrial waste*

Law No. 8990 is currently being amended by a new Environmental Impact Assessment Law under Project Implementation of the National Plan for Approximation of

Environmental Legislation in Albania (EuropeAid/124909/C/SER/AL). A first draft was issued on 27 February 2009. Under the draft new law, the Scope of Assessment (Art. 2) required that an…

> *Environmental Assessment be carried out of likely impacts of the projects on the environment by virtue of their size, nature or location and which shall include assessment of the direct and indirect impacts on humans, fauna and flora, ecological systems, the soil, the geological environment, water, air, climate and landscape, natural resources, tangible property and cultural monuments, and on the mutual interactions between them (sic.).*
>
> *The assessment process should be general, integrated, in time, in an open manner and impartially administered through participation of central and local organs, the public, and environmental non-for-profit organisations, of the project developers and natural and juridical persons specialised in this field, in order to prevent and reduce significant impacts in the environment (sic.).*

Annex 1 No. 10 of the draft law identifies…

> *waste disposal installations … as defined in Annex IIA to EU Directive 75/442/EEC under heading D9 of non-hazardous waste with a capacity exceeding 30 tonnes per day (sic.)*

where, under Annex III

- *characteristics of projects,*
- *location of projects,*
- *characteristics of the potential impacts*

…as requiring an Environmental Impact Assessment.

Under the new draft Law, Article 16 required that information for the Environmental Impact Assessment should provide, as defined under Annex IV:

1. Description of the project, including in particular:
   - A description of the physical characteristics of the whole project and the land-use requirements during the construction and operational phases,
   - A description of the main characteristics of the production processes, for instance, nature and quantity of the materials used,
   - An estimate, by type and quantity, of expected residues and emissions (water, air and soil pollution, noise, vibration, light, heat, radiation, etc) resulting from the operation of the proposed project.

2. An outline of the main alternatives studied by the developer and an indication of the main reasons for this choice, taking into account the environmental effects.

3. A description of the aspects of the environment likely to be significantly affected by the proposed project including, in particular, population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the inter-relationship between the above factors.

4. A description of the likely significant effects of the proposed project on the environment resulting from:
   - The existence of the project,

- The use of natural resources
- The emission of pollutants, the creation of nuisances and the elimination of waste, and the description by the developer of the forecasting methods used to assess the effects on the environment.

5. A description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment.

6. A non-technical summary of the information provided under the above headings.

7. An indication of any difficulties (technical deficiencies or lack of know-how) encountered by the developer in compiling the required information.

8. This description should cover the direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the project.

The format for the Environmental Impact Assessment Report is given in Annex 2, with the Final EIA Report scheduled for submission in July.

3.2.2 EIA legislation EU

Environmental Impact Assessment (EIA) Directive (85/337/EEC as amended by 97/11/EEC) sets out the requirements for undertaking environmental impact assessments before development consent is granted for public and private projects which are likely to have a significant impact on the environment. Projects are classified in two groups: projects listed in Annex I are subject to compulsory EIA while for projects in Annex II, the assessment is discretionary. The application of EIA to Annex II projects shall be determined by the Member States either through a case-by-case examination or by setting thresholds and criteria for specific types of projects or by a mixture of the two methods. The assessment covers direct and indirect effects of the project on humans, fauna and flora, soil, water, air, climate and the landscape, material assets and cultural heritage as well as the interactions between these factors.

The draft new EIA law for Albania transposes all requirements under EU 97/11/EEC for an environmental impact assessment of projects.

The implementation of the EIA Directive in reference to waste landfill should be considered in conjunction with a number of other legal instruments including:

- EU Directive on landfill of waste (Council Directive 99/31/EC), and
- EU Waste Framework Directives. From 2010 the Waste Framework Directive and Hazardous Waste Directive will be repealed into a single directive, but currently exist as Framework Directive on Waste (Council Directive 75/442/EEC as amended by Council Directives 91/156/EEC and 91/692/EEC and Commission Decision 96/350/EC) and Hazardous Waste Directive (91/689/EEC).

3.2.3 EIA guidelines World Bank

The World Bank Operational Manual, Operational Policies O.P. 4.01 (January 1999) defines Environmental Impact Assessment as an instrument to identify and assess the potential environmental impacts of a proposed project, evaluate alternatives, and design appropriate mitigation, management, and monitoring measures. It notes that projects and subprojects need EIA to address important issues not covered by any applicable regional or sectoral EA or REA.

The Operational Policies notes that projects have an area of influence including all ancillary aspects such as power transmission corridors, pipelines, canals, tunnels, relocation and access roads, borrow and disposal areas, and construction camps, as well as unplanned developments induced by the project (e.g. spontaneous settlement, logging or shifting agriculture along access roads). The area of influence may include, for example:

- the watershed within which the project is located,
- any affected estuary and coastal zone,
- off-site areas required for resettlement or compensation tracts,
- the airshed (e.g. where airborne pollution such as smoke or dust may enter or leave the area of influence)
- migratory routes of humans, wildife, or fish, particularly where they relate to public health, economic activities, or environmental conservation, and
- areas used for livelihood activities (hunting, fishing, grazing, gathering, agriculture, etc) or religious or ceremonial purposes of a customary nature.

The World Bank Operational Manual, Bank Procedures B.P. 4.01, Environmental Assessment (January 1999) requires that major project components identify:

- project location (besides geographic location, information about the key environmental characteristics of the area likely to be affected by the project, and proximity of any protected areas or sites or critical natural habitats,
- major environmental issues either identified or suspected for the project,
- other environmental issues of lesser scope associated with the project,
- proposed actions to mitigate environmental issues described above, and
- justification / rationale for the environmental category which presents reasons for environmental category selected and explanantion of any changes from initial classification, including whether any changes relate to alternatives.

The World Bank also provide Operational Manual Good Practices G.P. 4.01 (January 1999) which are advisory for types of projects and their classification, noting that it is the extent of the impacts not the sector that determines the extent of the environmental assessment and hence the category.

The EIA Report will be commensurate with the World Bank Environmental Category A Project, Operational Policy 4.01.

3.2.4 Solid waste management legislation Albania

A number of changes in Albanian legislation concerning solid waste management have taken place over recent years. A SIDA project drafted a number of normative Acts relevant to solid waste management including:

- Draft Law on Waste Management which partially transposes EU Directive 2006/12/EC on waste, EU Directive 91/689/EC on hazardous waste, and EU Directive 2000/76/EC on the incineration of waste,
- Draft Regulation on the Endorsement of the Regulation Concerning the Environmental Management of Urban Waste partially transposed EU Council Directive 1993/31/EC on the landfill of waste, and
- Draft Regulation on the Endorsement of the Regulation Concerning the Incineration of Waste partially transposes EU Directive 2000/76/EC on the incineration of waste.

The EU legal view of the above draft Laws is that they still do not fully transpose the relevant EU Directives (comment from International Legal Expert, CARDS Project Implementation of the National Plan for Approximation of Environmental Legislation in Albania EuropeAid124909/CSER.AL). In addition, a number of gaps and problems in these draft Laws have been identified and include:

- Some technical details are lacking,
- Links to other Albanian legislation have to be clarified,
- A number of pieces of secondary legislation have to be included to complete the transposition process such as:
    - technical standards for waste management,
    - a format for a waste site permit and application,
    - a format for consignment notes for transfer of hazardous waste,
    - applications and permits for import and export of waste,
    - requirements for packaging and labelling of hazardous waste, and
    - financial guarantees for waste site permits.

3.2.5 EU principles for waste management

The EU requires that waste management strategies must aim primarily to prevent the generation of waste and to reduce its harmfulness. Where this is not possible, waste materials should be reused, recycled or recovered, or used as a source of energy. As a final resort, waste should be disposed of safely (e.g. by incineration or in sanitary landfill sites). Wastes should be disposed of as close to the source as practicable.

Economic operators, and particularly manufacturers of products, have to be involved in the objective to close the life cycle of substances, components and products from their production throughout their useful life until they become a waste. Those responsible for generating or for the generation of waste, and consequent adverse effects on the environment, should be required to pay the costs of avoiding or alleviating those adverse consequences.

3.3 PERMITTING FOR WASTE MANAGEMENT ACTIVITIES

3.3.1 Environmental permit

The permitting process is currently under review by CARDS Implementation of the National Plan for Approximation of Environmental Legislation

(EuropeAID/124909/C/SER/AL), with a three tier system of permits proposed for activities within particular thresholds of production capacity, and with an environmental consequence identified under the revised Environmental Protection Law as:

- Environmental Permit –for Class A activities identified in EU IPPC Directive Annex 1 with production/capacity thresholds shown, and with a substantial environmental consequence.

- Environment Permit – for Class B activities identified in the EU IPPC Directive Annex 1 but below production/capacity thresholds shown with an environmental consequence. These are installations and activities that do not fall within the IPPC regime but must still be regulated – thus there is a need to ensure that this will still be the case after IPPC legislation is adopted. These non-IPPC installations are already regulated in Albania under the Environmental Protection Law (and other Albanian legislation) by either the environmental permit or the consent/environmental authorisation.

- Environmental Permit – for Class C activities with an insubstantial environmental consequence such as vehicle maintenance or petrol stations..

The waste landfill at Bajkaj would fall into the category requiring a Class A Environmental Permit as defined in Annex 1, EU IPPC Directive, namely:

> *5. Waste management*
>
> *5.4. Landfills receiving more than 10 tonnes per day or with a total capacity exceeding 25,000 tonnes, excluding landfills of inert waste*
>
> (definition of inert waste is waste which is neither chemically nor biologically reactive, and will not decompose)

The conditions of the environmental permit shall provide best solutions for the environment overall. Therefore, permit conditions must include:

- description of the installation and its activities, site, topography, and vicinity
- use of raw materials and chemicals, water and energy (the input)
- the source of emissions to air, water or land
- waste generation and the need for waste minimisation through recycling
- noise and vibration
- prevention of accidents, occupational health and safety (OHS)
- conditions of the site (housekeeping)
- proposed technology and other techniques to prevent or reduce emissions
- self monitoring (monitoring the efficiency of the process equipment, the abatement equipment and the emissions)
- measures to be taken when the activity ceases, including remedial action.

The permit shall also include provisions for:

- regular inspection by environmental inspectors from the NEI to the site, activity, staff and paperwork,

- regular reviews and updating of the permit held by the activity to ensure compliance,
- obligation for the operator or person-in-charge to report all changes to the activity, and for the EFA to update the permit where there have been substantial changes,
- obligation for the operator or person-in-charge to immediately report situations of breach of permit conditions (non-compliance) to the NEI, and to immediately undertake actions to minimise or prevent any environmental impact,
- allowing public access to applications, permits and monitoring results.

3.3.2 Institutional arrangements for permitting

The application for the Environmental Permit (as a Class A activity) would have to be completed and submitted to the National Licensing Centre, and from there to the EFA for writing the permit and permit conditions. Verification of the application form for the permit would be discretionary and done by the EFA if required. Any environmental compliance inspection of the landfill, or as a result of complaints from the public, would be undertaken by Environmental Inspectors of the NEI.

3.4 KEY STAKEHOLDERS IN IMPLEMENTATION OF WASTE MANAGEMENT PROJECTS

The key ministry with responsibility for waste management infrastructure is the Ministry of Public Works, Transport and Telecommunications (MPWTT). The MPWTT also manages a capital investment program which contributes to the development of communal environmental infrastructure including drinking water supply, wastewater collection and treatment, and solid waste management.

The Ministry of Health has responsiblities for hospital waste. The Ministry of Economy Trade and Energy has certain responsibilities for industrial waste, drafts waste management policy and collects statistics on industrial waste generation, recycling and disposal. The Ministry of Agriculture Food and Consumer Protection has certain responsibilties for agricultural waste.

The key ministry with responsibilities for the environment is the Ministry of Environment, Forests and Water Administration (MEFWA). The MEFWA has responsibilities for pollution prevention, forests, fisheries, and nature protection which also includes water management. The 12 Regional Environmental Agencies (REA) under the MEFWA are responsible for permitting local activities, while MEFWA is responsible for permitting larger activities, including waste landfills.

At local level, municipal government is responsible under Article 73 of the Law on Environmental Protrection for defining the sites for collection and treatment of waste generated within the municpality, organising the deposit of hazardous waste and substances (*sic*.), and managing urban waste activities, wastewater and solid waste treatment installations. Under Law No. 8652 Organisation and Functioning of Local Government (31 July 2000) the administration, services, investment and regulatory control for the collection, transport, processing and disposal of waste is the responsibility of Communes and Municipalities.

3.5 PUBLIC CONSULTATION REQUIREMENTS UNDER THE LEGISLATION

In compliance with Albanian Law No. 8053 (30 June 1999), the project must permit appropriate public access to information. In addition, the project must provide stakeholder consultation, including local communities and the public, appropriate to a World Bank Environmental Category A Project, and in accordance with the World Bank Environment and Social Safeguards Framework. Two public consultation rounds are advised, one at commencement of the work to give opportunity to express concerns and requests for inclusion of issues in the assessment work, and one consultation to present results and obtain comments.

Public hearings with the targeted communities for improved waste management services was organised prior to the EIA Consultants commencing the Environmental Impact Assessment study. A strategy for improved public participation and consultation is described in Sections 9.2.9 and 9.2.10.

4 PROJECT SPECIFIC DATA

4.1 SITE DATA

4.1.1 Description of proposed landfill site

The proposed landfill site is situated in the Commune of Vergo, within the administrative area of Delvina. It is sited north of Sarande within a rural area. A household waste collection system currently exists in the cities of Vlore and Sarande, but there is no municipal waste collection in the rural areas except at Himara. No sanitary landfills exist in the area, and illegal waste dumping and fly-tipping is common throughout Delvina. Although there is legislation in Albania to control waste, including the Law on Waste and the Law on Environmental Protection (as amended 2008), regulatory control of illegal dumping is weakly enforced by the authorities. Waste dumping in the project area primarily comprises household waste, animal waste, vegetable residues, and construction and demolition waste.

The proposed Bajkaj landfill site is located approximately 12.0km north of Saranda, and about 1.5 km northwest of Bajkaj village. A hilly area with 100 – 150m elevation will obscure the proposed landfill site from the village (TEI&SWS, 2008). The landfill is designed to have a capacity in the order of 600,000 tonnes with a lifetime of 27 years. It is designed with a disposal area of 6.3 ha, and internal roads and service surfaces of 3.2 ha occupying a total site area of 9.5 ha. In addition, leachate will be managed on-site within an integrated wetland system constructed on an additional area of 3.0 ha. The Bajkaj landfill occupies 9 plots, of which 7 are are in public ownership and 2 are in private ownership. More private plots are occupied by ancillary facilities such as access roads, leachate treatment system, and service area. It has been selected based on previous studies by the World Bank supported by detailed technical assessments (TEI&SWS 2009a) from 13 alternative sites (Section 6.3).

4.1.2 Description of proposed waste transfer station

The waste transfer station will serve as cost-effective link between solid waste collection in the Himara municipality and the landfill located in Bajkaj. The transfer station will function as the receiving area where waste collection vehicles discharge their loads. The waste is compacted, then loaded into larger vehicles for haulage to the final disposal site at Bajkaj. No long-term storage of waste will occur at the transfer station. The fenced, waste transfer station will be located about 1km north of the town of Himara, in a hilly area with an overall elevation of about 90 m above sea level. It has a total surface area of 2,500 m^2.

The transfer station is designed to accommodate a daily solid waste through-put of up to 20 tonnes. Individual loads up to 6 tonnes municipal solid waste will be transferred from collector trucks to larger compacting-containers. In this way, the density of the waste will be increased and the number of trips from the Himara transfer station to Bajkaj landfill will be reduced. The waste transfer facility is designed on two levels: the ground floor about 1,010 m^2, the second floor of 715 m^2. A 6 m wide and 29.7 m length ramp links the two levels. External works are necessary for the soil remodelling comprising a total surface area of about 595 m^2.

The Himara waste transfer site land is fully in public ownership.

4.1.3 Description of proposed access roads

Landfill site

The three options for provision of access to the proposed landfill site are described in Section 5.9. Selection of the Preferred Option, to be incorporated in the Final Design and Tender Documents, is a decision for the MPWTT.

Waste transfer site

The proposed access road to the Himara waste transfer station exists as rural road with an overall distance of approximately 0.85 km. The road will require strengthening and rehabilitation, and resurfacing. Reshaping or re-excavation of roadside ditches are required in places.

4.1.4 Catchment served by proposal

The Bajkaj landfill will serve all the population in Saranda Municipality and Lukove and Vergo Commune. The landfill and waste transfer station at Himara will provide waste collection and disposal services about 22,000 to 30,000 p.e. (although these figures may require review from new government data yet to be released) The waste transfer site will serve the Himara municipality only, providing waste collection and transport for a 3,000 p.e. which has anticipated to include a rising percentage of tourists during the summer season as shown below.

Municipality name		**Population equivalent**
Himara	Himare Municipality	3,214
Saranda	Sarande Municipality	15,259
Lukove	Lukove Commune	3,396
		TOTAL 21,869

The Commune of Vergo has its administrative office in the village of Vergo. The Commune comprises (number of households given in brackets) the villages of Vergo (75), Bajkaj (146), Tatzat (42), Fushë Verri (80), Kalasë (95), Kopaçëz (82), Palavli (61) and Senicë (31) with a total population of 612.

4.1.5 Extension of catchment served by proposal

The design (TEI&SWS 2009a) does consider purchase of further land adjacent to the proposed landfill to extend waste disposal capacity. If this happens, the conclusions and recommendations for mitigation in this EIA Report remain the same. Also, there are good reasons for extending the waste management collection area to include Ksamil and Delvine. Ksamil is part of the catchment along the south coastline and it is appropriate that this is included with Sarande and Himare for waste management interventions. Delvina and the surrounding area should also benefit from this landfill because the landfill itself is situated in the Delvina administrative area. There may also be a need to consider placing further waste transfer stations at both Ksamil and Delvina, although these options would require an EIA and public participation process to address all issues.

4.2 WASTE MANAGEMENT

4.2.1 Waste acceptance at proposed landfill site

Landfill site Bajkaj

The landfill has a design life of 27 years, with a total volume capacity of 818,000 m^3. Annual waste collection is 11,000 tonnes based on an estimated annual rate of increase of 3.5% with a per-capita generation of 1.26 kg/inh/day (although these values are currently under review on request from The World Bank). The proposed landfill will accept only:

- household (domestic) municipal solid waste,
- commercial waste that can be assimilated as household MSW
- commercial waste collected at hotels, shopping centres, street cleaning, market waste with waste separation at source to remove non-MSW, and
- institutional kitchen waste for example from hospitals or schools.

The landfill will not accept:

- hazardous and non-hazardous hospital or veterinary waste,
- industrial waste
- quarantine ship waste
- wastewater, waste in liquid condition or mud
- inflammable and explosive materials
- radioactive materials including medical radionuclide's.

At the landfill, in-coming trucks will discharge waste according to the directions of the Operator-in-Charge of landfill operation on-site. The Operator-in-Charge will inspect and verify category, weigh and record in-coming loads and content, and proportion waste to the correct dedicated areas within the active disposal zones. When doubts arise concerning real content, the truck will be directed to a holding area and isolated to have the contents checked and then either accepted or rejected.

Waste transfer site Himara

Daily municipal solid waste generation in Himara has been calculated as 3.79 tonnes rising to a daily 9.27 tonnes by the 27th year of operation (TEI&SWS 2009a). This is based on an estimated annual rate of increase of 3.5% with a per-capita generation of 1.26 kg/inh/day (although these values are currently under review on request from The World Bank). The waste transfer station will only accept waste in the same category as the landfill. Municipal solid waste will be collected and transported to the Himara transfer station for compaction, and taken for disposal to the Bajkaj landfill. The waste flow in volume, after compaction at the Himara transfer station is calculated as 12.36 m^3/day (for the 27th year), considering a density of the compacted waste as 0.75 tonnes/m^3 (TEI&SWS 2009a) (although these values are currently under review on request from The World Bank).

4.2.2 Waste compaction

Waste compaction density at the waste transfer station and landfill is calculated as 0.75 tonnes/m^3, with an additional component from debris and coverage spoil of 15% of total.

At the landfill, municipal solid waste is disposed in layers of 30 cm thickness, and then compacted in order to obtain a minimum density of 0.75 t/m^3.

4.2.3 Waste generation

After the change of the political and economic regime in 1991, the volume of domestic municipal solid waste generated in agglomerations has increased annually because of changing lifestyle and consumption patterns. In addition, the movement of families from rural to urban areas over the past decade has greatly increased waste generation in urban areas, with an annual increase in the last five years in household and commercial waste estimated at 8 to 10% (MEFWA 2006).

There is also a difference between rates of waste generation in urban compared with rural areas. From data provided by the MEFWA (2006) annual municipal waste generation was 550 kg per resident in urban areas compared with 170 kg per resident in rural areas, although this direct comparison probably does not reflect actual amounts and disposal destinations. Estimated urban waste generation for 2006 totalled 722,000 tonnes in the 6 major cities in Albania (Table 1).

Table 1. Estimated waste generation in urban centres Albania (MEFWA 2006)

Urban centre	Tonnes of waste generated
Tirana	225,190
Durres	78,712
Fier	73,712
Elbasan	66,518
Vlora	59,808
Korca	53,749
Shkodra	48,668

However, it should be noted that all values detailing waste generation volumes are estimates as the recording and retrieval of such data is currently difficult in Albania. This is because there is no established waste data recording or retrieval procedure at local government level, no equipment to weigh municipal waste delivered to waste sites, but also because a high percentage of waste is dumped illegally or burnt locally. Many waste sites are uncontrolled dumps, often with continuous burning which poses a health risk to nearby residents and impairs air quality. An example of this is the deliberate burning of dumped cable sheath to remove plastic or rubber coatings to recover the metal cable which contributes to smell, smoke and public health concerns. Such sites are also easily accessed by large numbers of people who earn a living by waste picking, although this practice frequently carries the risk of disease been transported from waste sites into the wider community.

At such sites there is neither drainage installed nor barriers to prevent runoff and leachate contaminating phreatic water or polluting surface water. Dump sites are often located by the sea, adjacent to rivers or in river valleys, posing a threat to water resources, habitats, fauna and flora. Rural areas lack any waste collection or controlled disposal facilities, and are littered with fly-tipping and illegal waste dumping which promotes infestations of pests, scavenging birds and vermin which contribute to disease in the community, is visually unsightly, and impacts the environment. Waste dumping in scenic areas diminishes the potential for tourism, and negatively impacts on economic benefits.

The proposal for waste collection in the Saranda and Himara area, and transport and disposal to a controlled, sanitary landfill at Bajkaj will eliminate the problems generated by MSW described above.

4.2.4 Waste categories and composition

A preliminary study by Solid Waste Consultancy (2005) noted that solid waste generation in the targeted area was ‘mainly from inhabitants (sic.), commercial enterprises, passing travellers and tourists arriving by road and ship. Nearly no industrial activities were identified in the coastal zone. The places of waste generation are households, shops, restaurants, hotels, markets, streets, shopping and cultural centres, green/parks, beaches and kitchen and packaging waste from institutions such as hospitals and office buildings. The majority of the generated waste is urban waste, and construction and demolition waste.’

Capacity to accommodate tourists in the Himara-Saranda area is high, and will no doubt rise rapidly over the 27 year period. Solid Waste Consultancy (2005) noted that tourist numbers are set to double over the next few years (Table 2) although this forecast is somewhat ambitious in light of the various costs and multiple constraints on travel that have arisen since 2008.

Table 2. Number of tourists in the coastal area in 2004 (Solid Waste Consultancy 2005)

District	Municipality/commune	Number of tourists	Tourist capacity
Vlore	Vlore	60,000	90,000
	Himare	20,000	30,000
	Orikum	2,000	3,000
Sarande	Sarande	48,000	120,000
	Lukove	1,800	4,500
	Total	**131,800**	**247,500**

Waste separation

Recyclable materials include glass, both hard and film pastics, wood, ferrous and non-ferrous metals, packaging and packaging waste. Although such materials are collected on a casual basis by the Roma community or others, usually destined for markets in Bulgaria, there is no waste separation or recycling organised at municipal level in the Saranda-Himara area. As Albania moves towards accession into the European Community waste separation and recycling will be a mandatory requirement by the EU.

Construction and demolition waste

CDW waste is generated from excavations, construction and demolition. Although much of it is building rubble, there is a component of hazardous waste from demolished asbestos sheeting and lagging, lead piping, zinc roofing, and treated timbers. Solid Waste Consultancy (2005) estimated CDW volume in the Himara-Saranda area as 1,700 kg/person/year, which is about 3.5 times higher than the average in Europe (481 kg/capita/year), and is a reflection of the current intensity of construction work along the Ionian coast and elsewhere in urban Albania.

Panariti (2009) recommended that the regulatory authorities should prevent CDW going to landfill, introduce a fine in the order of □50 per tonne for generators and carriers of CDW when it is taken to landfill, but more punitive action when it is dumped illegally. The competent authority should explore possibilities of crushing CDW for reuse after removal of hazardous demolition wastes such as asbestos.

Hazardous industrial waste

Hazardous industrial waste generation is not considered to be a significant problem in Albania (Grontmij-CarlBro 2008) at present simply because industrial activity is very dormant throughout the nation, and waste material is not being generated. In the Saranda-Himara area particularly, industrial acitivity and therefore hazardous industrial waste generation is non-existent. Nevertheless, considerable volumes of hazardous industrial waste from past activity is contained elsewhere throughout Albania on waste sites or

derelict industrial sites, many identified by UNEP (2006) and UNDP (2008) as hot-spots. No hot-spots are identified in the study area.

Healthcare waste

Hospital waste comprises non-hazardous material including kitchen and packaging waste, and hazardous material including sharps, infectious waste and medical radionucleides. In addition there will be infectious waste from health centres and clinics, antenatal and maternity clinics, ambulance centres, dentists, and pharmacies. Certain animal waste from veterinary centres should also be included under infectious waste. Again, imprecise information is available on the production of hospital waste in the collection area, and only an estimate of the total health care waste is shown in Table 3. Hazardous hosptal waste throughout Albania requires urgent intervention.

Table 3. Estimated accumulated infectious waste for the period 2005 - 2030

Minimum (tons)	Medium (tons)	Maximum (tons)
2,754	4,978	8,543

Although infectious hospital waste is reported to be incinerated by the hospital, no accurate date is available for percentage volumes of hospital waste going to incineration against volumes going to land fill, or whether the incineration process is efficient and non-polluting. No healthcare waste will be permitted at the landfill. Hazardous and infectious healthcare waste will not be permitted, and is required to be contained and disposed correctly by the health authorities regulated under the Ministry of Health.

Ship waste

There are two ports, Sarande and Vlore in the study area. Both function on a small scale. Shipping waste generated at the port is primarily from vessels visiting the port and consequently must be regarded as quarantine ship waste. It comprising solid waste from cargoes and kitchen waste, and liquid waste including sewage, oily wastes (mainly bilge water and estimated as 7 – 8 m^3 per month at Saranda), and ballast water. No reception and treatment facilities are available in either of the two ports. Under EU Directives and Regulations, solid quarantine waste should not be mixed with municipal solid waste. Quarantine, non-hazardous solid ship waste will not be permitted at the landfill. Hazardous or quarantine ship waste will not be permitted at the landfill.

Future waste trends

Table 4 provides trends in waste composition in the Balkans over the period 2004 to 2028 which is applicable to the Saranda-Himara area. The following assumptions were made in estimating the composition of future waste. These assumptions reflect the general trend, as an economy develops and consumer habits change towards a decreasing proportion of organics and increasing proportion of non-glass packaging in the waste stream:

- decrease of organic waste quantity by 1% per year,
- increase of paper and cardboard waste quantity by 3% per year,
- increase of plastic waste quantity by 2% per year,
- decrease of glass waste quantity by 1% per year,
- constant trend of ferrous materials quantity,

- increase of textile waste quantity by 1% per year.

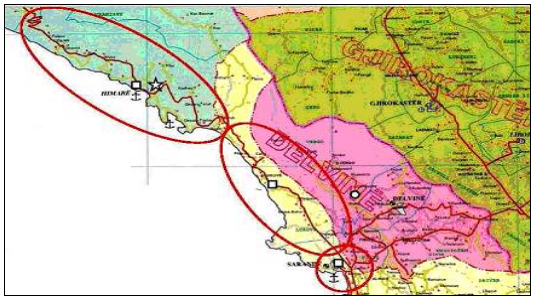
Table 4. Trend of waste composition

Waste composition	2004	2006	2010	2015	2020	2025	2028
Organic	64%	63%	60%	57%	54%	52%	52%
Recyclable waste	28%	29%	31%	33%	36%	39%	39%
paper and cardboard	7%	7%	8%	10%	11%	13%	13%
plastics	9%	9%	10%	11%	12%	14%	14%
glass	4%	4%	4%	4%	3%	3%	3%
ferrous materials	3%	3%	3%	3%	3%	3%	3%
textile	5%	5%	5%	6%	6%	6%	6%
Other	8%	8%	9%	10%	10%	9%	9%

4.2.5 Waste collection and transport

Capturing waste from across Saranda, Himara and Lukove into the Bajkaj landfill is the most fundamental strategic priority. It represents a significant change in the practice of how waste is being currently managed by municipalities in the collection area. It also requires a firm and binding commitment from municipalities to engage in regional waste strategies, and to apply cost recovery for the services rendered. It will also require an enhanced level of monitoring, control and enforcement at the municipal level to ensure that non-hazardous solid waste generated by construction and demolition, vegetable residues, healthcare, and commerce is also treated and disposed with minimal public health and environmental impact within the regional system. The waste collection zones, the location of the waste transfer station, and the landfill site are shown in Figure 1.

Figure 1. Waste collection areas, waste transfer and disposal locations



Waste collection areas

Site of landfill

Site of waste transfer

4.2.6 Closure of existing waste dumps

The proposal does not describe plans to close the existing waste dump at Saranda. The competent authority (MEFWA with MPWTT) Government of Albania should approach this in a timely way, and be planning now for closure of waste dumps and the impact this will have on waste management and disposal options.

5 TECHNICAL DETAIL

5.1 SCHEDULE OF WORKS

The workplan (TEI&SWS 2009a) describes the schedule of works to develop Bajkaj landfill, Himara transfer station and all ancillary facilities. Earthworks will be accomplished in sequence, with construction of the two landfill cells preceding the leachate treatment lagoon basins. These works will take about 6 months, after which the contractor will lay the waterproofing membranes across the flat and sloping surfaces on Cell 1, and the treatment lagoon basins. When earthworks are completed at the Bajkaj site, the workers, machinery and equipment will be moved to Himara in order to start the transfer station construction. From then on, the Contractor will work concurrently on both the landfill (Bajkaj) and transfer station (Himara). Construction from start to finish will be over a 58 week period and comprise the following sequence of actions:

Landfill

1. Start-up works and organisation of landfill yard
2. Construction of Access roads
3. Site clearance for Cells 1 and 2
4. Earthworks for Cells 1 and 2
5. Foundation and concrete well-trap
6. Embankment for Cells 1 and 2
7. Construction of internal roads
8. Construction of landfill fence and gates
9. Waterproofing layer flat and slope surfaces
10. Drainage network for leachate and rainwater
11. Earthworks for lagoon basins
12. Leachate treatment plant
13. Arrangement of the facility for extraction of landfill gas
14. Landfill gas treatment plant
15. Construction of service area
16. Electrical and lighting plant
17. Road sign system
18. Perimeter planting

Transfer station

1. Organisation of transfer station yard
2. Construction of access roads
3. Earthworks
4. Foundations and concrete structures
5. Embankment and protection walls
6. Drainage network for leachate and rainwater
7. Construction of wide ramp
8. Construction of service and manoeuvering area
9. Construction of discharge floor and covering roof
10. Electrical and lighting plant
11. Construction of transfer station fence and gates

12. Purchase of transfer station facilities comprising a charging hopper and compacter containers
13. Delivery of transfer station facilities

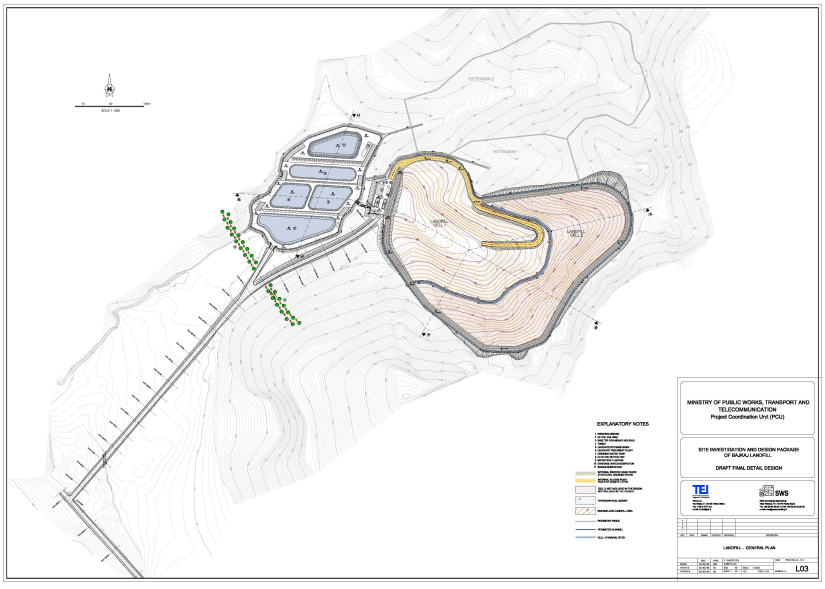
5.2 LANDFILL

5.2.1 Landfill configuration

The proposed Bajkaj landfill configuration is:

- Generally above-ground, with minor excavations, as the ground is mainly composed of alluvial soils that cannot be used for daily or intermediate cover, or for dykes and liners. The excavations aim to provide the proper base grading as well as an appropriately uniform base. Dykes are necessary around the entire disposal perimeter and will utilise local excavated soils, on-site borrow areas (where feasible) or off-site borrow-pits. There are also some natural, on-site slopes affected by erosion which should be reshaped and they will be kept to form an upslope landfill configuration.
- Two cells separated by a constructed earth embankment, although on landfill commissioning, implementation will initially utilise only the first cell. Cell 1 is approximately 30,500 m^2 and Cell 2 approximately 27,650 m^2. The size of Cell 1has been calculated in order to have an operational period of at least 15 years. Both cells have approximately the same capacity in terms of both construction and disposal.
- The general shape was chosen in order to follow the natural ground morphology, the property boundaries and the access roads.

Figure 2. Landfill and leachate treatment configuration (TEI&SWS 2009a)



5.2.2 Landfill base liner

A base layer will be established with compacted clay by first remodelling the existing underlying layer of clay or flysch, which has a very low permeability. After remodelling, the clayey-layer, will be levelled and compacted by dozers to an acceptable thickness and permeability coefficient less than 10^{-9} m/s (compacted state) to meet all technical specifications and requirements. On top of this will be layered 2.0 mm HDPE and two layers of 500 g/m^2 geotextile barriers covering the whole surface of the landfill basin with a waterproofing barrier (TEI&SWS 2009a).

With flat surfaces, about 9,000 m^2 of Cell 1, the landfill base liner from top to bottom will comprise:

- Gravel layer 40 cm, as a draining layer,
- Geotextile 500 g/m2, as a protection for the polyethylene layer,
- HDPE thickness 2 mm, as a waterproofing agent,
- Geotextile 500 g/m2, in contact with the soil.

With sloping surfaces, about 21,500 m^2 in Cell 1, the waterproofing layer from top to bottom will comprise:

- HDPE thickness 2 mm, as a waterproofing agent,
- Geotextile 500 g/m^2, in contact with the soil.

On the top of the waterproofing layer on sloping surfaces, the HDPE liner will require protection from rupture using a clayey soil protection layer. This intervention is normally made during the operational phase, due to the technical problems during construction to lay the clay layer without any waste opposition (due to the lack of friction between the HDPE and the clay). The waterproofing layer will also be positioned over Cell 1 and the separation embankment between Cell 1 and 2, and anchored in 80 cm wide and deep trenches then filled with concrete.

5.2.3 Fencing and Gates

The fence of the landfill will be a perimeter metallic plasticized grid with a height of 2.2 m, square meshed (30 x 30 cm). The fence will be fixed to zinc-coated steel posts. For each access a 6 m wide, locking gate will be installed. Gate arms will be covered with 0.4 m wide reflective red and white sheeting. The gate will be firmly connected to the fencing so that the unauthorised entry into the landfill by persons or vehicles is not permitted.

5.2.4 Utilities

The service area will be asphalted and equipped with the following:

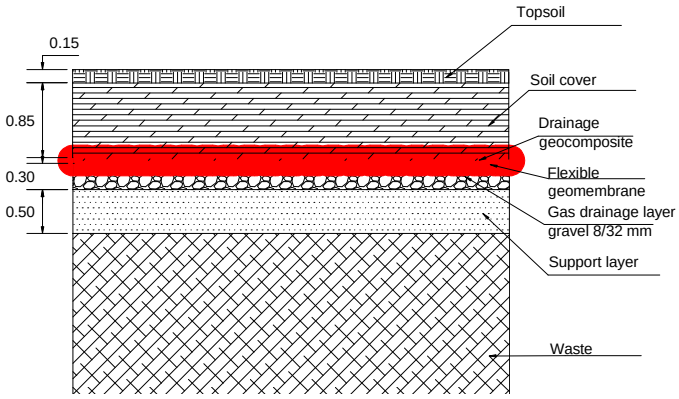
- office building (15 x 6 m) for incoming waste registration and weighbridge log, with workroom, W.C., handbasin and protective clothes rooms for operators, with all wastewater discharges to an appropriate on-site wastewater treatment system (e.g. Imhoff Tank),
- weighbridge, including access ramps (14 x 3 m),
- machinery storage (16 x 10 m),
- power generator (210 kVA) to supply the service area,
- parking area for 4 vehicles,
- appropriate lighting system for the Service Area;
- non-toxic polyethylene and anti-UV drinking water tank with 3,000 litre capacity raised on a metal trestle.

5.2.5 Capping system

Figure 3 shows the capping system which will be installed at the landfill on de-commissioning, namely::

- support layers of 0.50m thickness, made of sand, construction waste, demoliton waste or other granular materials with maximum particle size 10 cm, with a permeability coefficient of at least $1x10^{-4}$ m/s in order to allow gas drainage. This layer will be laid directly over the leveled compacted waste,
- a gas drainage layer made of 8/32 mm gravel of 0.30 m thickness,
- a geomembrane, rough on both faces, preferably low density polyethylene (LDPE) 1.5 mm thickness,
- drainage geocomposite for rainwater collection, made of geotextile + drainage core + geotextile. The drainage geocomposite was preferred to the classical solution with granular material due to the space savings that will be obtained by using it, and
- soil cover made of 0.85 m local soil and 0.15 m topsoil.

Figure3. Capping system



The geosynthetic materials installed on 1:3 slopes will be fixed in channels located on the berm level: +117.00 m and +127 m and on the landfill crest. A temporary cover of waste with inert materials will be provided, the final capping system being installed after the waste landfilling process is completed.

5.3 WASTE TRANSFER STATION

The proposed waste transfer station is located 1 km north of Himara, and provides waste services for 3,000 beneficiaries in the Himara municipality. The waste transfer station is designed to receive 3,300 tonnes/year maximum annual waste representing 1.26 kg/inh waste per capita. Total surface area is 2,500 m^2. It will be commissioned about 6 months after the landfill site, and has a design lifetime of 27 years.

The purpose of the waste transfer station is to transfer municipal solid waste from loose roadside collection to larger compaction containers thereby reducing the number of travel times from Himara to Bajkaj as a cost benefit. With a compacted waste density of 0.75 tonnes/m^3, an annual increase per capita in waste production of 3.5%, the maximum solid waste input density is 20 tonnes/day. This value is twice the amount of current waste generation for the area, and is estimated to easily accommodate any future increase from tourism (TEI&SWS 009a).

The waste transfer station will be constructed on two floors. The lower floor is 89.5 asl at 6 m wide for waste compaction receiving discharge of waste from vehicles above on the upper floor and allowing loading of containers to Bajkaj. The upper floor is 93.5 asl

with an access ramp and will allow discharge of waste collection vehicles into the compacters.

Utilities will comprise an asphalted service area equipped with the following:

- office building (6 x 3 m) with computing instrumentation, W.C. and dressing room for operators,
- Discharge floor,
- Retaining walls, for second level and ramp and stairwell,
- Parking, for operators, visitors and transfer vehicles,
- Perimeter fence comprising a square meshed (30 x 30 cm), plasticized grid height 2.2 m with entrance having a locking gate,
- power generator (210 kVA) to supply the utilities area,
- appropriate lighting system for the Service Area,
- non-toxic polyethylene and anti-UV drinking water tank with 1,000 litre capacity raised on a metal trestle.

The transfer station will be equipped with two 28 m^3 compactor containers, with a compaction value of 0.75 t/m^3 giving a final container capacity of about 21 tonnes each. Considering a daily average waste flow to the transfer station in each design year (27 year projection), the following flow-through rates apply:

year	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
t/d	4.70	4.86	5.03	5.21	5.39	5.58	5.78	5.98	6.19	6.41
year	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
t/d	6.63	6.86	7.10	7.35	7.61	7.87	8.15	8.43	8.73	9.04
year	**21**	**22**	**23**	**24**	**25**	**26**	**27**			
t/d	9.35	9.68	10.02	10.37	10.74	11.11	11.50			

The waste could remain in the transfer station about from 3 to 8 days, but to avoid environmental problems (smell, leachate generation, nuisance insects, etc.) the container will be transported from the transfer station to the landfill every two days even if they are not completely full. Below the compactor containers, a collection system will convey any wastewater to a holding tank by gravity which will be emptied peridoically and taken to the leachate treatment system located at the landfill site.

5.4 SITE MACHINERY

5.4.1 Machinery used during construction and operation

The following equipment will be used during landfill site and transfer station construction:

- Wheel loaders, track loaders, excavator, trucks to transport earth, articulated trucks to carry materials, and a truck mixer.

The following equipment will be used during landfill operation:

- Compactor, track loaders, wheel loaders, trucks to carry the earth for daily covering.

The following equipment will be used during waste transfer station operation:

- A truck to load the containers – compactors, waste collection vehicles from Himara.

5.5 WATER AND WASTEWATER

5.5.1 Wastewater treatment

Wastewater sources are administrative buildings, hard surface runoff from utillities and services area, staff toilet facilties, and landfill leachate. Wastewater is treated on-site, and reused to eliminate all discharges. Staff toilet facilties discharge to an appropriate on-site wastewater treatment system (e.g. Imhoff Tank). Leachate treatment is discussed in Section 5.5.3.

5.5.2 Rainwater collection system

Precipitation outside the active cell will be collected by a channelling system and diverted for infiltration to the surrounding vegetation outside the landfill boundary. In particular, perimeter channels will be made in order to collect stormwater runoff from the slopes next to the landfill site. Also, a channeling network will be put in place to collect rainwater to landfill Cell 2 prior to its completion. Rainwater channels will be engineered using a trapezoidal section common for this purpose, which will be covered with a geo-grid for surface protection.

Precipitation on to the active cell, infiltrates through the waste mass and is collected by the drainage and collection systems at the landfill base and slopes, to be treated as leachate (see Section 5.5.3). Collection of precipitation on the landfill area is provided by:

- drainage channels on the internal side of each berm,
- drainage channels on the internal side of the crest of the perimeter dykes, and
- perimeter drainage channels at the bottom of perimeter dykes.

Leachate composition depends on the waste composition, temperature, moisture content, depth of fill, stage of decomposition, ability of intermediate soil layers to remove contaminants and input water quality to landfill. However, this data is not available for the proposed Bajkaj landfill although indicative values can be extracted from published research (Ehrig, 1989). Leachate characteristics are separated into an acetic phase which occurs soon after waste placement, and a methanogenic phase which occurs after the waste has been compacted, breaks-down and decomposes.

Table 5. Estimate of leachate composition (Ehrig, 1989)

Parameter	Average concentration [mg/l]	Concentration [mg/l]
Acetic phase		
pH	6.1	4.5-7.5
BOD5	13000	4000-40000
COD	22000	6000-60000
SO4	500	70-1750
Ca	1200	10-2500
Mg	470	50-1150
Fe	780	20-2100
Mn	25	0.3-65
Zn	5	0.1-120
Methanogenic phase		
pH	8	7.5-9
BOD5	180	20-550

COD	3000	500-4500
SO4	80	10-420
Ca	60	20-600
Mg	180	40-350
Fe	15	3-280
Mn	0.7	1q0.03-45
Zn	0.6	0.03-4
(where no differences between phases could be observed)		
Cl	2100	100-5000
Na	1350	50-4000
K	1100	10-2500
Alkalinity (CaCO3/l)	6700	300-11500
NH4	750	30-3000
OrgN	600	10-4250
Total N	1250	50-5000
NO3	3	0.1-50
NO2	0.5	0-25
Total P	6	0.1-30
AOX	2000[ug/l]	320-3500[ug/l]
As	160[ug/l]	5-1600[ug/l]
Cd	6	0.5-140
Co	55	4-950
Ni	200	20-2050
Pb	90	8-1020
Cr	300	30-1600
Cu	80	4-1400
Hg	10	0.2-50

5.5.3 Leachate drainage and collection system

Landfill leachate will be collected at the landfill base using a drainage layer of 0.50 m depth gravel in which HDPE geo-composite pipes are embedded. Various diameter HDPE perforated pipes will be installed for leachate collection, which will be gravity conveyed by collection pipes to the leachate treatment system located on the lowest portion of the landfill.

The leachate treatment system comprises 1 storage basin outfalling to 4 treatment basins (Figure 2). The treatment basins comprise 3 earth lagoons outfalling to a single polishing subsurface flow constructed wetland planted with emergent aquatic vegetation. Such systems have been used succesfully in the past (Nuttall *et al.* 1997). The leachate treatment system will be wateproofed with a base liner comprisng:

- HDPE thickness 1.5 mm, as a waterproofing agent, placed in contact with the soil,
- Geotextile 100 g/m^2, as a protection for the polyethylene layer,

The constructed wetland will be planted with *Phragmites australis* at a density of 16 to 20 plants per square metre. Drying-out of the wetland will be avoided in summer (June-August) by impounding leachate in the holding lagoon during the rainy season and releasing into the constructed wetland during the dry season (TEI&SWS 2009d). Management criteria (TEI&SWS 2009d) for the wetland are scheduled below, although more precise guidance to operation and management is provided in Nuttall *et al* (1997).

Each week	moisture control in the wetland

	register the main operation parameters (leachate flow, air temperature, precipitation)
Every three months	sampling and analysis of inflow (leachate) and outflow (clarified water) harvesting of weeds around the basins by cutting above wastewater level sampling and analysis of the river where the purified water is discharged
Each year	cleaning of each part of the plant (sumps, pipelines, electrical plants) statistical elaboration of the main operation parameters registered during the year
Every three years	Where appropriate, harvesting of the canes in the wetland by cutting above wastewater level sludge extraction in the lagoon basin
Every ten years	removal of the superficial filter bed (about 30 cm) and vegetation replacement of the superficial filter bed re-planting *Phragmites australis* and more frequently where density becomes thin replacement of components (pumps, solenoid valves)

During the wet system and storm events, treated leachate could outfall from the system to a temporal creek. TEI&SWS (2009a) noted that the final outfall from the constructed wetland is expected to be in the order of :

- 26 – 36 mg/l BOD
- 103 – 208 mg/l COD
- 13 – 33 mg/l ammoniacal nitrogen.

The quality of this discharge needs to be monitored regularly under the Environmental Management and Monitoring Plan to ensure that it is in compliance with the EFA environmental permit conditions for the landfill.

5.6 GAS COLLECTION SYSTEM

It is anticipated that there will be a certain amount of biodegradable components in the waste stream going to the landfill area. Bacteria transform organics under anoxic conditions into biogas, consisting mostly of methane and carbon dioxide. The collection system has been designed to be in proportion to the volume of waste being deposited.

The laying of the landfill gas collection system is developed at the beginning of landfill operation for Cell 1. Landfill gas is extracted from the landfill through vertical extraction domes and transported up to the combustion flare through a pipe network. The system of landfill gas extraction is structured on 10 vertical extraction domes, installed in the waste body and having an average influence radius of 30 m. The system is kept at low pressure to assure that almost all gas produced is collected. Biogas will be conducted from the vertical domes to a combustion chamber for burning.

The system of wells connected to the blower station adopted for this landfill is adopted from the approach where individual connection of wells are made to the central blower station and will comprise:

- laying a vertical 300 mm steel cylinder liner on the gravel bed just prior to landfill commissioning,
- laying an internal fissured 160 mm HDPE pipe in the cylinder line,
- filling of the cylinder line with gravel,
- provisional covering of the dome through a flanged HDPE head to a 90 mm non-fissured HDPE pipe,
- 160 mm pipework to the secondary landfill gas extraction network laid provisionally over the ground covering,

- as soon as waste is deposited in the landfill, the cylinder liner is lifted, together with the provisional flanged dome head, a new section of the internal HDPE pipe is welded and further gravel is put inside.
- in order to avoid air getting into this space, the end of the pipe is placed in and covered with clay.

The capacity of gas collection is given by the depression created by the blower and the distance between wells. No calculations are made for the gas mass flow through the layer because the structure, compaction and macro-porosity variables are not known, and no assumptions can be made because there are large differences from one case to another. For this reason, the values given are those practiced in EU Member States in Central Europe. The basic data are:

- the average influence area of a well R = 25 m,
- the distance between 2 wells D = 50 m,
- four (4) wells are needed for every one (1) hectare.

Collected gas will be flamed on-site, at a temperature of more than 1,000 °C. After incineration, all vented methane and other organic components will be transformed into carbon dioxide and water. A low quantity of other gases will be produced, such as hydrogen sulphide (H_2S), although this is usually generated in recently disposed waste. The principle impact of biogas emission is an unpleasant smell, caused by small amounts of gases other than methane and carbon dioxide Such gases have caused problems and the risk of explosion in confined spaces such as sewers, but the risk of explosion in the open air is very unlikely due to high diffusion rates.

The combustion chamber will be cylindrical sheet steel, and the biogas torch *(250 Nm3 / h)* with the following values:

- Flow rate: 250 m3/h,
- Inlet pressure: -100 mbar,
- Outlet pressure: 180 mbar,
- Combustion temperature: 900 – 1.200° C,
- Flame retaining time: > 0.3 seconds,
- Combustion range: 50 - 250 m3/h,
- Pressure biogas input: 100 mbar,
- Minimum percentage of methane-burning limit: 25% volume and
- Noise level (at 15 m): 69 – 71 dB(A).

5.7 SITE MANAGEMENT

Aside from gas collection and management, the following measures are also planned for implementation:

- Maintain buildings, platform and containers in good repair and free of litter,
- Provide temporary cover of waste with inert materials or other suitable cover materials,
- Install the final capping system after use of the waste landfill has reached completion.

Dust monitoring at the construction sites will be performed regularly, as well as wetting the access roads and tracks through the landfill site in long periods of dry weather. Safe

storage of materials will also be regularly monitored. Any concerns will be acted upon immediately.

5.8 WORKER ACCOMMODATION

There will be no on-site workers compound. At night, the landfill site construction workers will be lodged in Saranda and the waste transfer station workers will be lodged in Himara. Sewage and wastewater from construction workers at both the landfill and the waste will be diverted to holding tanks and periodically collected by a septic tank pumper and taken off-site for treatment.

5.9 ACCESS AND NEW ROADS

There are three options for providing vehicular access to the proposed landfill. These are:

- **Option 1** involves the rehabilitation of the existing road from Stijari/Bamatati junction past the cemetery (i.e. a distance of 5.46 km) plus the construction of a new road to the landfill (i.e. a distance of 0.7 km);
- **Option 2** involves the use of the proposed new road from Tepelene to Delvine to access the landfill. This option necessitates the construction of a new link road to the landfill (i.e. a distance of 0.7 km). The rehabilitation of the existing road from Stijari/Bamatati junction to Bajkaj Village (i.e. a distance of 3.2 km) is included as part of Option 2. This option will provide some benefit to the local communities for 'hosting' the facility which will serve the wider region. In addition it will allow for 'improved' access pending completion of the new state road from Tepelene to Delvine.
- **Option 3** involves the construction of the new link road only to the landfill from the new Tepelene to Delvine road (i.e. 0.7 km link road).

Figure 4. Option 1

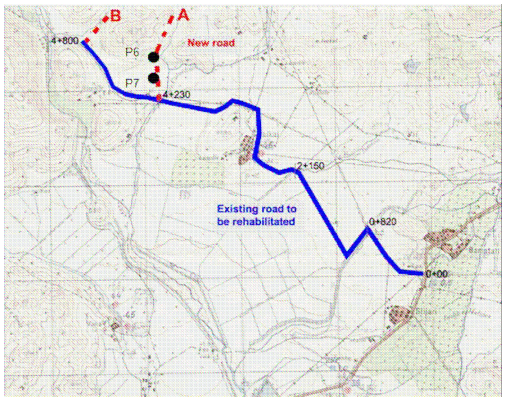
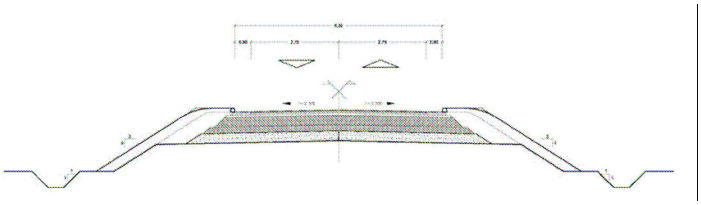


Figure 5. Typical cross section of the new road



The Albanian Government (General Road Directorate) has assigned a Design Company (ILIRIADA) to draft a new road connecting the main road Tepelenë - Gjrokastër to the coast. This new road will be constructed very close to the proposed site. The main access to the landfill will be via a link road (i.e. a distance of 0.7km) from the new national road which is currently being constructed from Tepelene to Delvine. As part of the project it is envisaged that the rehabilitation of the existing road from Stijari/Bamatati junction to Bajkaj Village (i.e. a distance of 3.2 km) will be included. This road may be used as a temporary access road for construction of the facility and in the initial stages of the operation of the facility, pending completion of the national road.

The proposed access road to the Himara waste transfer station exists as a rural road with an overall distance of approximately 0.85 km. The entire length of road is covered by crushed stone, with loose concrete at the road shoulder. The road will require strengthening and rehabilitation, and resurfacing. Reshaping or re-excavation of roadside ditches are required in places.

5.10 RISK MANAGEMENT

5.10.1 Work safety and fire protection

This project also addresses safety considerations through design checking, and supervision of works and safety training support, along with routine safety monitoring. During landfill operation, fire protection measures will be taken in accordance with the legislation. A reserve of about 100 m^3 of soil will be provided as fire extinguishing material. Staff training will also be undertaken on a regular basis.

5.10.2 Hazardous and toxic substances management

The landfill is not permitted to accept hazardous waste. This also applies to the transfer station. Penalties and fines will be applied to the producer and/or transporter found bringing hazardous or toxic substances to the landfill facility or to the transfer station. In the exceptional event that small quantities of hazardous and toxic substances are found to be present, they will be handled by trained workers.

The following will also be undertaken:

- Staff training on a regular basis,
- Daily inspection on-site,
- Informing potential offenders about the danger of hazardous and toxic materials which might arise,
- Implementing comprehensive guidance on operational health and safety issues (OHS),

- In any situation which is recognised to infringe OHS requirements, the workforce will be kept off-site until the issue is resolved.

5.11 OPERATIONAL LIFETIME AND CLOSURE

The operation time of the designed system is 27 years (2010-2037). The project includes the final closure of each of the 2 cells of the landfill. All cells will be completed within the designing period of at least 25 years (representing 27 years). The operation period for each cell will be:

- Cell number 1, will be 15 years
- Cell number 2, will be 12 years

In compliance with EU and Albanian legislation, and World Bank Guidelines, post-closure care and monitoring must be maintained for a period up to 30 years.

On closure of the landfill, there will be no further intake of waste. Infiltration of water into the waste mass will be stopped by capping. As water is one of the main elements needed for biodegradation it is estimated that gas production will diminish to a low level. Nevertheless, the gas extraction system will remain in place and functioning as long as gas is detected and the concentration of methane is high.

In the post-closure period, the drained leachate quantity decreases considerably, presenting a 50 year maximum of 317 m^3/2.9ha/year (0.35m^3/ha/day). The top drainage system collects a rainwater maximum of 3,726 m^3/2.9ha/year (3.5m^3/ha/day), representing 24% of the precipitation quantity. Consequently, the average is 14%, representing rainwater drained from the total precipitation quantity.

Only after the last section is filled, will the landfill be closed. In the landfill closure period, rehabilitation and re-vegetation of the landfill, removal of construction works not required during the control period, and consideration given for re-cultivation of the area beyond any active zones will be undertaken. Closure will include land rehabilitation and re-vegetation with native grasses endemic to the area. A new registration of use may be assigned in accordance with the legislation in force at that time.

6 MAIN STUDIED ALTERNATIVES

6.1 ZERO ALTERNATIVE

A "do-nothing" option would have continued the unacceptable situation of partial and interrupted waste collection, transport and disposal of municipal solid waste, and fly-tipping throughout Saranda and Himara. The zero alternative would not change the present unsatisfactory situation with the existing non-compliant waste dumps and illegal dumping of waste throughout the municipalities and communes, with a higher risk of pollution to the environment. The legal requirements are that waste dumps which are not in line with European and Albanian Standards have to be closed. Consequently, a "do-nothing" option would not be acceptable.

6.2 CHOICE OF LANDFILL SITES

There were 13 locations initially proposed and assessed for possible landfill location (Table 6). Main access road means the main road in the immediate vicinity of the landfill location, but that a local access road to the landfill needs to be either upgraded from existing or built from new.

Table 6. Initial choice of landfill sites Saranda / Delvina (Solid Waste Consulting 2005)

Site no	Name	Travel time for a truck (mins.]	Distance to village (m)	Main access roads
1	Romanza	40	250	present
2	Kakodiq	35	400	reconstruction necessary
3	Shelegar	12	350	present
4	Qafa e Gjinos	15	300	present
5	Volloder	15	300	present
6	Bajkaj A	35	1000	present
7	Kandhikaq	45	600	present
8	Shën Vasil	45	500	present
9	Cerkovicë	80	1000	reconstruction necessary
10	Hardhasovë	60	2000	acceptable road
11	Bajkaj B	35	1500	present
12	Vunoi	40	1000	present
13	Vamblo	90	2000	reconstruction necessary

When selecting a site for the landfill (TEI&SWS 2008) it was critical to find a site which would ensure environmentally sound waste disposal, minimise environmental impact on the environment and human health, preserve the quality of the air, the subsoil, ground water and surface water, and provide no inconveniences for the inhabitants and economic entities in the vicinity of the landfill. Land ownership must not provide excessive difficulties over purchase or acquisition. In addition, the site must comply with any existing or projected national waste management strategies and the waste management plan of the specific region serviced. The size of the proposed site must be sufficient to justify the costs of landfill design, construction, operation and post-closure supervision.

Selection of sites for both landfill and waste transfer station were based on the following criteria, in order of priority:

1. Costs. It is assumed that the investment costs for the implementation of new sanitary landfills and collection and transportation equipment will be financed from a grant. However, the waste collection companies should pay for the operational (transport and disposal) costs. This will depend on the volumes to be transported. The development of any waste collection, transportation and disposal system on a regional level should bring savings as compared to the municipal system.
2. Infrastructure. The transport time of waste to the landfill will decrease the collection capacity per day. This will result in more equipment and thus in higher investment costs. Moreover, maintenance will increase especially when roads are badly or not paved at all. Therefore, the regional landfill concept should only be considered if transport over asphalt roads is possible.
3. Management capability. The introduction of new equipment and procedures for transfer and transport over long distances should meet the capabilities of the local workforce. Introduction of sophisticated systems might lead to breakdowns and mis-use. Substantial training will be needed to guarantee proper operations for the transfer/transport of waste.
4. Environmental impact. The introduction of a regional system should bring improvements as compared to a municipal system.
5. Institutional aspects. Agreements between the parties especially the municipalities should support the introduction of the regional landfill concept. The success will depend on the full co-operation of all parties involved (municipalities, regional authorities, communes, villages, waste collectors, landfill operators). In general the concept should never lead to a monopoly position of one of the parties e.g. the landfill operator.

The sites were also investigated on the following issues:

- land ownership and availability of required land area
- geographical, geological and geotechnical conditions
- proximity to sensitive water sources and impact on phreatic water
- proximity to environmental areas of significance, and impact on receiving environment including air, water and land
- cultural heritage and archaeological importance
- vulnerability to natural calamities including earth movement and flooding
- nuisance to human populations, and proximity to residential settlements
- available infrastructure and access roads
- expected public attitude
- public authority preferences

Vlore Municipality, which is outside the catchment area considered for either the Himara transfer station or Bajkaj landfill, is already receiving assistance for the identification of a new landfill. For Sarande there are 13 sites selected in close cooperation with the Sarande municipality (Table 6).

6.3 SHORT LIST OF SITES

After applying the above criteria a short list of 7 locations were acceptable, and after applying existing Albanian legislation and requirements under EU waste management directives the short list was reduced to three acceptable locations (Table 7).

Table 7. Short list of landfill locations in the region of Sarande/Delvina

Location no	Short list	Selected acceptable locations
7	Kandhikaq	
8	Shën Vasil	

9	Cerkovicě	
10	Hardhasově	
11	Vunoi	Vunoi
12	Bajkaj A	Bajkaj A
13	Bajkaj B	Bajkaj B

6.4 Review of Vunoi Site

Location of the Vunoi site

The proposed landfill site is adjacent to an existing waste dump located near the tourist road from Vloré to Saranda on the northern slope of a saddle ridge. Its distance to the nearest village of Vunoi is 1 km. and to Himara further south 7 kilometres. The waste dump at Vunoi is constructed in an erosion trench which runs along the tourist road. Therefore special care would need to be taken to avoid both visible impact and further erosion. No access road needs to be constructed.

Geology

Drilling and excavation confirmed that most of the gulley consists of sandy erosion material with some gravel in several locations covered with thin (0.3 m) of clay. The amount of clay present is not in agreement with the EU-landfill directive, therefore the base of the landfill requires installation of waterproofing membranes as an additional layer of clay or equivalent layer with low permeability.

Hydrology

The site is north of Himare in a mountainous area on the top of a saddle ridge from where an erosion gulley stretches to the north. This erosion gully is formed by runoff water from the eastern mountain ridge east to the gully. The water table is at least 20 m. below ground level. The nearest water channel on the north side of the site is a lagoon which outflows to the sea through a 1 km. channel. The wet season lasts three months from December up to early March. The general precipitation figures for the Sarande area can be applied to the Vunoi site as well. The long term average deviation from the long term average is unknown (data on evaporation are not made available within the short term of this pre-feasibility study). Erosion fro the site could be stopped if runoff is diverted southward into the other valley, south of the saddle ridge.

Cultural heritage and archaeology

No important archaeological site is present near the Vunoi site.

Socio-economic situation in the Vunoi area

The Vunoi village is a typical Albanian mountain village. The existing landfill does not contribute to employment.

Disadvantages

The site offers engineering difficulties particularly in containment of landfill leachate and treatment. Transport and disposal cost are high.

Advantages

The site offers less road repair and maintenance to the coastal road. The estimated capacity of the site is sufficient and exceeds the required waste disposal.

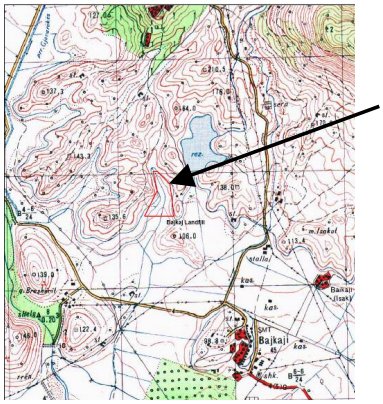
6.5 REVIEW OF BAJKAJ A

The main characteristics of Site A are:

- The estimate capacity of the site is sufficient for the required
- waste disposal;
- The access road to be reconstructed and the new road to be designed have
- almost the same length for both Site A and B,
- Presence of marshland above and around the proposed site,
- Absence of permanent flowing surface water except in stormwater events,
- Valley morphology,
- Good soil consistency, but large volumes of clay would need to be brought in at a significant cost,
- Visual impact from Bajkaj Village.

The site is in the lower foothills of the second inland mountain ridge. Most of the runoff water from the mountains and higher foothills is diverted northwards to the river. The local water table is believed to be at least 1 to 2 meters below ground level. This is based on a visual geomorphic assessment in relation to the surrounding visible surface water tables and the small catchment area at the proposed site.

Figure 6. Location of Bajkaj A site



No important archaeological site is present near the Bajkaj A site. There are permanent streams of water crossing the landfill area and marshland. The access road to be reconstructed and the new road to be designed have almost the same length for both Bajkaj A and Bajkaj B sites.

6.6 REVIEW OF BAJKAJ B

The main characteristics of Site B are:

- The estimate capacity of the site is sufficient and exceeding the required
- waste disposal;
- The access road to be reconstructed and the new road to be designed have
- almost the same length for both landfills;
- Absence of an almost permanent stream of water crossing the landfill area;
- Amphitheatre morphology and optimal natural slopes;
- Good soil consistency,
- Obscured visual impact from Bajkaj Village.

6.7 RANKING OF ALTERNATIVE SITES

A comparative ranking of the three sites is shown in Table 8. It was concluded that the Bajkaj B site was the most appropriate location. Advantages of this site are the availability of land with additional acreage if required, the relatively remote location, and to develop other opportunities near the landfill. Disadvantage is the fact that the landfill is located above between 20 and 25 km from the middle point of the waste production. The site has the advantage it is close to the centre of waste production in the county, however is more close to the nearest living areas and it requires a time taking procedure to acquire the land in order to have sufficient surface. The choice was consulted with the beneficiary and they approved the choice for the Bajkaj site.

Numerical ranking (Table 8) is useful for simplifying a diversity of information into numbers which can easily be comprehended. Although it is not the intention in this instance, numerical ranking can introduce an element of subjectivity. Consequently, it is often argued that the selection of weightings for various criteria and ranking (i.e. scoring) under each criteria involve value judgements.

Table 8. Ranking of alternative sites
(reverse order ranking with a high score less favourable than a low score) (total = score x weight)

Criterion	Location Score								
	Vunoi			Bajkaj A			Bajkaj B		
	Score	weight	total	Score	weight	total	Score	weight	total
Location and geographical conditions	1	2	2	1	2	2	1	2	2
Ownership / Availability land area	1	3	3	1	3	3	1	3	3
Geology and geotechnical conditions/ proximity to sensitive water sources	3	3	9	2	2	4	1	2	2
Pedology, current land use	0	1	0	0	1	0	0	1	0
Hydrology	2	2	6	3	2	6	1	2	2
Nuisance/ Proximity to residential settlements (people and environment)	2	2	4	1	2	2	1	2	2
Biodiversity	1	1	1	1	1	1	1	1	1
Cultural heritage and archaeology	1	1	1	2	1	2	2	1	2
Socio-economic	1	1	1	1	2	2	1	2	2
Vulnerability/ Natural calamities	0	1	0	0	1	0	0	1	0
Available infrastructure and access roads	1	1	1	1	2	2	1	2	2
Expected Public attitude	1	1	1	1	1	1	1	1	1
Public authority preferences	1	1	1	1	1	1	1	1	1
TOTAL			**30**			**26**			**20**

6.8 ALTERNATIVES FOR GAS COLLECTION

For the gas collection systems three solutions were considered (TEI&SWS 2008), all using drilled wells:

Ring header system

The wells are connected by individual piping to a flow control station located on the ring header which is a collector pipe placed outside the landfill area. The advantage of this system is that the ring header pipe is located on a surface placed on undisturbed soil. The main disadvantage is that it requires a higher consumption of regulation equipment which must be placed at each connection joint on the ring piping.

System with individual connection of wells to the central blower station
The wells are connected with individual pipes to the central station where the individual pressure and flow control takes place. The advantage of this system is the possibility to control and regulate every well individually. The disadvantage is the long distance between some of the wells and the station in larger landfill sites.

System with groups of connected wells
The wells are connected in clusters to intermediate gas collection stations. The advantage of individual control and regulation is given by connecting the wells groups (maximum 20) to intermediary stations and further to central collection station. The disadvantage is cost and unsuitability for smaller landfill sites.

7 DESCRIPTION OF ENVIRONMENT

7.1 SITE LOCATION AND SURROUNDING ENVIRONMENT

The proposed landfill site at Bajkaj is a former tank training location where manoeuvres were held, but ordnance are not expected (Solid Waste Consultancy 2005). It is located 1.5 km distance from Bajkaj Village and 1.4 km from Palavli Village, within the Delvine adminsitrative zone.

The surrounding topography has been reported as being very suitable for landfill construction and operation (TEI&SWS 2009b) bounded by natural slopes of ***25 –*** 30° to the east, north and south. The narrow valley depression contains underlying semi-impermeable Palaeocene flysch deposits. Further west the lower sections of the area are covered by a thin layer of alluvial deposits probably originating from an older flood plain of which a small, temporal stream beyond the area is the only remaining feature. The western limit of the site is bound by construction of the new national highway, and indications of other construction works in the past including raised concrete irrigation channels.

7.2 LAND

7.2.1 Soils

Studies have shown the selected site is characterised by low permeability of soil. The entire area is underlain with clay, siltstone and sandstone characterised by low permeability in the order of 1 x 10^{-9} m/s. The basement flysch rocks of Bajkaj landfill are characterized as a typical natural geological barrier.

The covering Quaternary deposits of proluvial – diluvial origin has a thickness about 1.5 m in the lower part of the valley and 2.4 m in the upper part of the valley (Solid Waste Consulting 2005). The top soil layer of covering deposits which is less than 1 m thick, is represented mainly of silty-clay with a permeability in the order of 10^{-7} m/s in the lower wider part of the valley and of the order of 10^{-5} m/s in the upper and very narrow part of the valley. The soil layer in the lower part of the valley is represented by 0.5 m thick silty-clay with gravel. This layer is water saturated, with a permeability in the order of 1 x 10^{-5} m/s.

According to these results, the site complies with condition established in Annex 1, EU Directive 1999/31/EC (26 April 1999) on the landfill of non-hazardous waste (K□1.0^{-9} m/s thickness □1m).

7.2.2 Sites of geological interest

There are no protected geological objects or sites of geological interest at, or within 2 kms, of the proposed site.

7.2.3 Land use

Land use patterns have changed significantly over the past two decades, with previously established communities choosing to move out of the rural environment away from

subsistence agriculture in the area. Most families which remain sustain a living from livestock and growing crops. Larger tracts of land are given to fruit, vines, cereals and vegetables (Table 9).

Overgrazing has allowed domination of a grass monoculture (*Brachypodium ramosum*), although in general, land use is under exploited. Where land is cleared for agriculture this includes fruit (olive, citrus and vine), root crops, cereal, vegetables, tobacco and fodder for livestock.

Table 9. Land use in Vergo Commune

Item	Area ($x10^3$ ha)	Item	Area ($x10^3$ ha)
Public property	406	Potatoes	0.07
Private property	697	beans	6.07
Fields	438	Tobacco	1.06
Fruit trees	272	Vegetables	15
Grain	3.2	Forage	43

Land use patterns in the study area are undergoing profound changes typical of a country in transition, namely: agricultural land is under-exploited compared to the situation before 1990. Agriculture-dependant settlements are faced with depopulation and residential use is decreasing in parallel with agriculture use. In the Vergo Commune almost half of the land is under utilised, and low in the other two communes. A considerable area is covered by fruit trees, while in other communes it is not so important. In the Vergo commune there are about 500 ha of abandoned land.

7.2.4 Seismic activity

Academy of Science (1986) maps seismological conditions of Albania (scale 1:500.000) and describes Saranda, including the proposed area of Bajkaj landfill, as belonging to the seismic zone of earthquake intensity of 8 degrees. Consequently, there is no likelihood of pronounced seismic disturbance or active tectonic disturbance near the landfill site which could create a problem or a risk for the landfill construction (TEI&SWS Inception Report).

7.3 WATER

7.3.1 Precipitation

The area is a high rainfall zone with annual averages of between 1.600 and 1.800 mm. About ¾ of this amount falls during the winter and autumn, while summer is almost dry. Precipitation is mainly in the form of rain, snowfall is unusual. The number of days with rainfall (> 1.0 mm) varies between 98 and 100 days per year. Only 40% of precipitation is transformed into surface runoff, while 60% is to infiltration and evapotranspiration (TEI&SWS 2008).

7.3.2 Groundwater wells

There are a number of boreholes in the vicinity of the proposed site. Underground water provides household drinking water and water for agricultural irrigation. The Health Authority (MoH) has responsibility for water quality analysis of small water supplies, although whether this is undertaken on a regular basis from wells in the Saranda – Bajkaj

area is doubtful. The nearest downgradient well was identified at a private house in Bajkaj. The population of Bajkaj receives water from an untreated, centralized water supply (groundwater source), but households also have their own private shallow wells used for drinking or other activities (again untreated water).

However, no baseline groundwater quality data are available for the area of the site, because no monitoring is performed. During the operational phase, the quality of groundwater in the site area should be monitored by the Health Authority. The recommended WHO strategy of Water Safety Plans for safeguarding rural drinking water supply should be implemented. Even though groundwater data is not available, fly tipping and accumulations of waste in the immediate locality have the potential to contaminate the groundwater. Therefore, before operation of the new landfill starts, water samples should be collected from any nearby wells as a baseline statement of evidence (baseline).

The legislation requires that no landfill should be constructed within 500 m of any water supply well. The Bajkaj landfill site is in compliance with this criterion. It is strongly suggested that a No Well Drilling Buffer Area will be instituted within 500 m down-gradient from the landfill. Special permissions from the Regulatory Agency may be needed if a new well will be excavated within the restricted area (subject to a specific geological study).

7.3.3 Underground water

At the proposed Bajkaj landfill site, a groundwater aquifer is present at 0.7 to 0.8 m below ground level during the rainy season. This upper level groundwater is seasonal in nature, is located in the quaternary layers and is therefore not regarded as of particular significance. TEI&SWS concluded that the aquifer was not present during the dry season, and that following construction of the landfill the underground aquifer would disappear during the rainy season because of lack of rainfall infiltration at the site because of sealed base liners.

7.3.4 Surface water

Generally, no landfill should be constructed within 200 m from standing or flowing water. Because of concerns regarding runoff of wastewater, a surface water monitoring program should be established if a landfill is sited less than 200 m from permanent water bodies. The Kalasa River, which supports a diverse population of fish (including *Barbus sp., Salaria fluviatilis*, and *Alburniodes bipunctatus)* amphibia, molluscs (*Helix pomata)* and crustacea, drains the southwestern area and, at its nearest point, is about 900 m from the proposed landfill site. A temporal creek, Gjovarakës Creek, comes near the landfill site (TEI&SWS 2008). The creek carries low flow only following heavy rain, but is normally dry with no flow. The area has been used for agriculture in the past, and irrigation channels and low profile derelict concrete aqueducts traverse the area, although these no longer carry flowing water.

7.4 AMBIENT AIR QUALITY

7.4.1 Wind direction

Records going back 23 years are available from a meterological station at Saranda airport, located 6 kms from the landfill site. These indicate that the location of the landfill at

Bajkaj is characterized by a relative variation of wind direction. This is an important parameter that effects the distribution of the smells, noise, small particles (particle matter – PM 10), and atmospheric deposition. The predominant wind direction is from north to south with a frequncy of 45%, while the south – north direction has a frequency of about 14 percent. There has not been a meteorological observation station in Bajkaj, but from 2002 a small station has been installed which has provided rainfall data for the last 6 years.

7.4.2 Air quality

The REA monitors air quality in the area at different points although sampling is infrequent and usually in response to particular requirements at central level from MEFWA, while data are difficult to access. The closest control points from the landfill site are in Saranda and Delvina.

Nevertheless, visits to the proposed site have always noted the clear air quality, and the lack of air quality impairment from industrial or other sources. Seasonal agricultural burn-off during the year, contributed to by land clearing and forestry activity, does impair air quality at times.

7.5 BIODIVERSITY

Although the County is generally recognised as having areas of natural beauty, and endemic fauna and flora, the proposed site has no significant natural value. The site is a grazing area and there is some agricultural land in the vicinity. The proposed site is located in the alluvial plain of the Kalasa River where previous biological studies (Solid Waste Consultancy 2005; TEI&SWS 2008) have shown native flora and fauna is low in species richness and abundance. Species diversity and community patterns are characteristic of the geographical zone, comprising medium altitude steppes about 100 m above sea level. The prevailing plant species in the area are grasses.

The Site Suitability Report (TEI&SWS 2008) noted that the south coastal area of Albania is distinguished for its diversity of habitats and its richness in flora and fauna species. Many animal and plant species have conservation status at international, national or regional levels. The Biodiversity Strategy and Action Plan (BSAP), adopted by the Albanian Government in 1999, defined eight Environmentally Sensitive Areas in the southern part of the country, but none of these are in the proximity of Bajkaj site. The definition of these areas is based on the integration of the characteristics of the terrestrial and marine systems into unified environmental units. The main threats to the biodiversity of the study area are:

- habitat loss and fragmentation,
- over-harvesting and non-sustainable use of natural resources,
- animal disturbance and illegal hunting,
- burning pastures for grazing,
- over-fishing.

Major contributory causes of such threats are the following:

- low environmental awareness in the local communities and general public on biodiversity issues,
- lack of legal enforcement,
- poverty,

- lack of management and knowledge of the best practices in sustainable use of natural resources, and
- slow implementation of nature and biodiversity conservation policies by the government competent authorities.

The principal type of vegetation in the area of the proposed landfill site is low-density, low-profile Mediterranean herbaceous flora. Species of medicinal, and flavoured and oil bearing plants are also present. However, based on a preliminary environmental assessment undertaken by TEI&SWS (2009) there are no plant species endemic only to this area or other species that are protected by national or international listings or included in the Albanian Red List.

Environmental Sensitive Areas.
The proposed Bajkaj landfill site is not sited on or within close proximity of any of the 8 defined environmental sensitive areas identified under the Biodiversity Strategy and Action Plan (BSAP) adopted by the Government of Albania 1999.

Environmental Protected Areas
The Scientific Reserve of Kardhiqi, which has biodiversity components listed under IUCN categories, and the 14000 ha Landscape Protected Area of Rrëzomës, are both located on the western slopes of the mountain Mali i Gjerw to the northeast at a considerable distance from the proposed development.

Wildlife
Existing biological records indicate that the geographical area is characterised by low animal biodiversity. Established populations of fox (*Vulpes vulpes*), European wolf (*Canis lupus*), marten (*Martes foina*), weasel (*Mustela nivalis*), rabbit (*Lepus europea*) and hedgehog (*Erinaceus concolor*) are endemic in the area. Reptile populations, including common turtle (*Testudo hermani*) and some lizards (grass-snake *Pseudopus apodus*), chickenhead (*Anguis fragilis*), green lizard (*Lacerta viridis*), common lizard (*Radarcis muralis*), grass lizard (*Podarcis taurica*), and snakes including long arrow (*Coluber caspius*), copperhead (*Malpolon monspessulonus*) and viper (*Vipera ammodytes*).*)* are present in localised groupings associated with habitat types. The broader zoogeographical area supports a number of species that are listed (Albanian Red List approved by the MEFWA) but none of these species are threatened by the proposed development. Terrestrial invertebrates include common species of arthropods (insects, collembolans, coleoptera, lepidoptera). A thriving population of butterflies (Rhopalocera) and beetles (Coleoptera) is also found in the broader zoogeographical area

Ornithology
The broader zoogeographical area is habitat for a number of common bird species including, turtur (*Streptopelia turtur*), goldfinch *(Carduelis carduelis*), blackbird (*Turdus merula*), wood pecker (*Pica sp.*), cuckoo (*Cuculus canoris*), magpie (*Pica pica*), gay (*Carrulus Glandarins*), cornix (*Cornus corone cornix*), troglodyte (*Troglodytes troglodytes*), sparrow (*Passer alosrestica*), robin (*Erithacus rabecula*) and galer (*Galerida cristata*). Snipe (*Scrolopax rusticola*) is common in lowland areas. The area is located on trans-migratory flight route corridors for a number of bird species moving between Northern Africa and Eastern Europe, with aquatic bird species moving through to the Butrint lagoons in the south of Saranda.

Trees and Shrubs
The area has extensive stands of forest trees including Macedonian fir (*Abies borisii-regis*), horse-chestnut (*Aesculus hippocastanum*), oak (*Querus ilex, Q. macrolepis, Querus spp., Ulmus sp.),* acer *(Acer campestre), ash (Fraxinius ornus),* buxus *(Buxus sempervirens),* sage *(Saturea montana),* drizzle *(Origanumvulgare)* and orchid species. Notably, endangered species of tilia is also present in the area (*Tilia platyphyllos* and *T. temontosa*). Shrub species are dominated by Mediterranean species primarily *Paliurus spina-cristi.*

Vegetation
Vegetation in the vicinity is typically Mediterranean containing a richness diversity of species but present in low numbers and density. Medicinal plants grow in the vicinity and are harvested by local communities and community health persons. In the area of the proposed landfill site, vegetation biodiversity is low and dominated by herbaceous plants. Floral surveys did not reveal the presence of any protected or threatened species (Albanian Red List approved by the MEFWA).

7.6 HUMAN COMMUNITIES

7.6.1 Public health

No epidemiology studies have indicated diseases related to the quality of the environment in this area.

7.6.2 Socio-economic factors

Saranada and Himara offer extensive employment opportunities in hospitality industry, hotels, construction and services industry. However, in the wider vicinity of the proposed site, most livelihoods centre around agriculture and agro-industrial trades, and servicing agricultural activities. In Bajakaj most employed persons are in agricultural activities, or work private land as subsistence farming. A considerable number of the population is unemployed, seeking work outside their home residential area, or within Europe. According to the regional newspaper, unemployment rate is relatively low 2.9%, due to the fact that many persons are employed overseas. Bajkaj Village is one of the least developed parts of the Vergo commune and suffers from a high unemployment rate. The 35 hectare plain around Bajkaj village was once covered with vineyards but after the reform in Albania many of these vineyards were abandoned. Some remaining vineyards in the commune produce wine under the Delvina label.

There may be opportunities for employment through recycling shops and waste management units based at the landfill. Waste picking will be stopped, to prevent disease being carried into the community from the waste site. Local persons might be gainfully employed at a waste recycling facility located in the general vicinity. However great care must be taken to select a suitable location for such a facility in order to ensure that it does not cause any visual or environmental impact.

Families living have found it increasingly difficult to gain a livelihood because of a number of factors including:

- poor agriculture land causing low rates of production,
- designated protected areas including forest and pasture zones as strict scientific reserve based on IUCN categories.

7.6.3 Public awareness and participation

The overall present public attitude to centralising and managing regional waste is positive. The mayoralties in the municipalities are eager to implement the proposed project. The public participation and public hearing organised in the communities and described in Section 9.2.9 did receive antagonistic views and concerns, but the numbers of persons expressing rejection of the waste management initiative were a low percentage of the population who would benefit. Nevertheless, their view are important and their comments have been addressed in the minimisation of impacts (Table 12).

Following project implementation, the local population will benefit from:

- improvement in home environment from collection and removal of waste,
- improvement in rural and urban environments from collection and removal of waste,
- improvement in public and children's health resulting from reduction and elimination of smell, pests, flies, and other factors associated with unregulated accumulations of household solid waste,
- cessation of smoke coming from burning waste at the roadside,
- improved access along roads, footpaths and entrances where there has been unregulated tipping of waste in the past,
- revitalised local economic activity from employment in waste management activities, and
- improvement in tourist investment at regional and local level.

7.7 CULTURAL, HERITAGE AND ARCHAEOLOGY

The landfill site is visible from the Feniqi ridge at a distance of 9 kilometres. The ridge has undisturbed Illyrian - early Greek - Roman archaeological remains which it is believed have the potential to become an important site. There are intentions to develop the site into a major tourist attraction, although the archaeological evidence to support this remains obscure. The ridge is also in the plane of the former Butrint lake and approximately 20 kilometres from the northern edge of the current lake Butrint and Butrint World Heritage Site. There is no reason to suspect that the proposed landfill site will impinge visually, or in any other way, on the Butrint site. Indeed, curtailing fly-tipping or waste dumping in the area by improved waste management in Saranda as a result of the Bajkaj landfill can only help tourism intentions both at Butrint and Feniqi.

Outside the proposed landfill site, there is a line of Albanian defense bunkers built during the Enver Hoxha period. Although many similar such structures are found elsewhere throughout Albaniain, the line of bunkers do represent the historical past of Albania and should be recognised as having heritage value. The line of bunkers would benefit from a Rapid Assessment Report to assess and record them as a cultural heritage site prior to the proposed works. Currently, there are no requirements under Albanian legislation to preserve such structures, although other EU Member States are presently introducing initiatives to protect comparable World War bunkers such as 'pill-boxes' in the U.K. The rapid assessment would require a written description, photography and recording on maps, which would then be lodged with the local authority.

An existing cemetery is located near Bajkaj Village within 1.5 km of the access road to the landfill site.

There are a number of other listed structures in the same vicinity as the landfill site, namely:

- Vergo Castle probably V century A.D. in Vergo village about 7 km from Bajkaj Village,
- Remains of a cemetery in Vergo dating from the II-III century A.D.,
- Three Ottoman bridges dated XVIII century in Tatzat Village, about 10 km from Bajkaj village, respectively the Bridge of Tatzat, Bridge of Jeziri and Bridge of Cina,
- The mediaeval Castle of Senica that was occupied in the XIII century A.D.

There are no other sites or objects of cultural heritage, historical or archaeological value in the surroundings of the Bajkaj landfill or of the Himara transfer stations known to date.

8 POTENTIAL IMPACTS OF PROPOSAL

8.1 RAW MATERIALS AND CHEMICAL SUBSTANCES USED ON-SITE

8.1.1 Construction phase

During the construction phase the following chemical substances will be used on a limited and temporary basis:

- flammable substances: liquid substances with a low burning point, and vehicle fuels,
- hazardous substances: - substances which can present an immediate or delayed risk comprising mineral oils, industrial oils, and bitumen,
- asphalted concrete which will be used for the access road during a short period of time (one month).

8.1.2 Operational phase

In the proposed activity, the storage and handling of raw materials will be mostly of waste. The waste to be disposed is non-hazardous waste. Flammable substances will also be used and stored at Bajkaj and Himara comprising fuels for on-site power generators.

8.2 WASTEWATER GENERATED ON-SITE

8.2.1 Construction period

During the construction period of time, up to 60 employees will be working in the emplacement. The wastewater resulted from the working personnel will be approximately 1.6 cu.m./h (wastewater produced = 20 litres/person per day). The quality of this wastewater is typical domestic wastewater. There are no wastewater treatment and disposal facilities in the Bajakj or Himara sites, at present. The nearest surface water in the zone are temporal streams and runoff following stormwater events. The nearest permanent waterbody downstream from the landfill site is some 5 km distance. That is why transportable toilets are to be provided for the employees working during the construction period.

8.2.2 Operational period

Water pollution sources associated with the landfill are:

- leachate,
- domestic wastewater,
- the landfill site and waste transfer station if not properly operated,
- stormwater runoff from the platform of the waste transfer station, and
- stormwater runoff from the access and perimeter roads.

In the post-closure control period only leachate management will continue to be operated and environmental monitoring will be performed as described under Section 9.3. After the closure of the landfill there will be no further intake of water into the landfill. The post closure care has to take place over a period of 30 years.

8.3 GROUNDWATER AND SURFACE WATER

8.3.1 Impact on receiving environment

Domestic wastewater from operators at the landfill site and waste transfer station located at both the landfill and waste transfer station will be collected and treated in appropriate on-site wastewater treatment systems (e.g. Imhoff tanks).

Landfill leachate will be collected and treated in the leachate treatment plant, then either pumped or gravity-fed for recycling to vegetated lagoons for treatment and discharge into a temporal creek, or through evapo-transpiration. The basic element in the wastewater management system in the leachate treatment system is the constructed wetland / red bed. Due to varying climatic conditions throughout the year, the effect of temperature change in the wastewater in the leachate storage basin is considered in the design. Generally speaking, these facilities have a low wastewater input in the winter (lower leachate discharge under freezing temperatures) and a higher input in the summer mostly due to the climatic conditions. Consequently, the flow variation for these facilities generally parallels the evapotranspiration processes since evapotranspiration rates are lower in winter and higher in summer. Leachate which is generated in the landfill under normal operation conditions must not be allowed to enter and pollute the groundwater.

Maintenance and control measures to be taken, including cleaning of the platform at the waste transfer station and perimeter roads are sufficient to maintain the quality of rainwater site runoff.

8.3.2 Impact on drinking water wells

Concern has been expressed by the Regional Officer Ministry of Health Saranda about pollution from the landfill escaping into underground water and contaminating any drinking water wells in the area, and this is addressed under Section 9.2 on minimisation of impacts using WHO Water Safety Plans. The Pre feasibility study by Solid Waste Consulting (2005) and the field site investigations by TEI&SWS (2008, 2009a, 2009b) did not identify drinking water wells within close proximity of the proposed sites.

8.3.3 Sewage sludge dewatering

As Albania progresses towards accession into the EU community and accepts compliance to the environmental acquis, eventually there will be a question of what to do with sewage sludge from (yet to be constructed) urban wastewater treatment plants. The Bajkaj landfill site cannot accept semi-solid dried sludge. The preferred option for sewage sludge will be to rehabilitate agricultural land at approved sites throughout the County according to agreed strategies for disposal or reuse of sewage sludge.

8.4 ODOUR

The maximum concentration of pollutants in the most unfavourable period of time, namely at the full completion of landfill use, should not exceed recommended limits in the nearest resident location, namely:

- 5 mg CH_4/m^3, less than 1,500 mg/m^3 proposed by WHO,
- 10 CO_2 mg/m^3, insignificant compared to natural CO_2 air content, 5,800 mg CO_2/m^3

The unpleasant effect of landfill odour will be alleviated over distance by the green belt buffer zone around the proposed site and by air dispersion. Odour levels are expected to be acceptable during the construction and operation of the landfill. However, the following are the values to be used as odour limits (in the absence of other applicable regulations) for NH_3, SO_2 and NO_2. These are:

- 0.1 mg NO_2/m^3
- 0.1 mg NH_3/m^3
- 0.25 mg SO_2/m^3

Nevertheless, if the landfill is operated correctly, it is unlikely that these levels will be exceeded at the nearest resident location. A public complaints register will be set up under the Environmental Management and Monitoring Plan, and a prompt response to odour complaints will be required from the operator and managing authority.

8.5 AIR EMISSIONS

8.5.1 Construction phase

Construction work involves activities that generate sources of dust emission into the air. These operations include earthworks, handling ballast and ballast-like materials, and disturbance of ground cover. Wind blown dust from exposed areas will occur. The main activities that represent dust emission sources are:

- digging and excavation works,
- filling works,
- pavement works (laying the ballast), and
- carrying out other construction works.

Other sources of air emission during the construction phase include exhaust emission from the use of heavy construction plant. Equipment and vehicles run on diesel engines and the exhaust gases, discharged into the air, contain the entire range of pollutants specific for internal combustion engines namely nitrogen oxides (NOx), non-methane volatile organic compounds (VOC), methane (CH_4), carbon oxides (CO, CO_2), ammonia (NH_3), and particulates. These air emissions are considered acceptable because the resulting concentrations at the nearest residential area would not exceed the maximum acceptable concentrations under current legislation.

8.5.2 Landfill gas emissions

During the operating phase, the annual emission of volatile organic compounds (VOC) from the landfill do not exceed 0.1% (TEI&SWS 2009a). Also, except for CO_2 and CH_4, the compounds of the emission gases do not exceed 0.1%. Among them there are hydrogen sulphide, methanol, carbon monoxide, ammonia, nitrogen, and ethane acetone.

8.5.3 Leachate treatment system air emissions

Non-methane Volatile Organic Compounds (VOC) emitted by the leachate treatment plant is estimated by taking the emission factor of 0.36 kg VOC per thousand m^3 of wastewater. The VOC emission and other gases are not significant at the leachate treatment plant.

8.6 NOISE AND VIBRATION

8.6.1 Sources

The site is regarded as likely to generate certain noise levels during pre-construction and construction, and operating phase throughout the working day (normally Monday to Friday 0800-1800 h, and Saturday 0800 – 1800 h, depending on the specific operational contract for the facility) associated with construction vehicles, refuse vehicles and compactor trucks arriving and unloading, heavy plant machinery moving and compacting waste, and so on. A comprehensive list of on-site equipment is provided below.

8.6.2 Pre-construction and construction phase

Construction at both landfill and waste transfer site will generate noise and vibration from:

- Mobile equipment (excavator, bulldozer, compactor, dump-trucks pick-hammers, concrete trucks, loaders),
- Fixed equipment (concrete mixers, cranes),
- The traffic for material supply, and movement of excavated soil at the proposed site.

8.6.3 Operating phase

During operation at the landfill site, vehicles and heavy equipment will comprise:

- Vehicles transporting solid waste estimated at most 60 arrivals per day,
- One waste compactor used intermittently per working day,
- One bulldozer used intermittently per working day,
- One front end loader used intermittently per working day.

During operation at the leachate treatment plant mechanical equipment will comprise:

- one pump for recirculating leachate to the landfill. A small, reagents dosing pump will also operate.
- A front-end loader used intermittently in the evapo-transpiration basin.

During operation at the waste transfer site at Himara, vehicles and heavy equipment will comprise:

- Vehicles transporting solid waste estimated at most 60 arrivals per day,
- Two waste compactor used intermittently per working day,

8.6.4 Admissible levels

The noise level produced during loading and unloading cycles, and during waste transportation, is expected to be within the admissible noise value of the specific equipment used. The admissible noise values produced by equipment used outdoors are presented in Table 10.

Table 10. Maximum allowable noise levels

Equipment type	Power (kW) - P Mass (kg) - m	Maximum acoustic level (dB)
Compactors, vibrators	P </= 8	105

Equipment type	Power (kW) - P Mass (kg) - m	Maximum acoustic level (dB)
	8 < P </= 70	106
	P > 70	86 +11 lg P
Bulldozers, excavators, caterpillar	P </= 55	103
	P > 55	84 +11 lg P
Bulldozers, excavators, trash compactors, dumpers, loaders	P </= 55	101
	P > 55	82 +11 lg P
Fork-lifts, etc.	P </= 15	93
	P > 15	80 +11 lg P
Pick-hammers	m </= 15	105
	15 < m < 30	92+11 lg P
	m >/= 30	94+11 lg P
Compressors	P </= 15	97
	P > 15	95 +11 lg P

8.7 SITE CONSTRUCTION WORKFORCE

8.7.1 Pre-construction and construction phase

During this phase, the workforce will be exposed to noise and vibration from heavy plant and equipment use (excavators, bulldozer, compactor, pick-hammers, etc.).

8.7.2 Operating phase

During the operating period, the following impacts on the workforce are expected. The importance and magnitude of such impacts are discussed in Section 9:

- Noise: the on-site workforce may be exposed to high, short-term noise levels during unloading and compacting the solid waste,
- Dust: the on-site workforce may be exposed to high levels of dust during new cell construction, compaction, and when cells are capped,
- Gas emissions: biogas emissions generated may affect the on-site workforce,
- Hazardous waste: there is always a risk of the workforce being exposed to undeclared hazardous materials in the general waste (such as medical sharps, pesticide containers, or asbestos in CDW) at the landfill site,
- Odour: the workforce may be exposed to long periods of working in landfill site odour resulting from inadequate waste management.

8.8 HUMAN COMMUNITIES IN THE AREA

8.8.1 Creation of employment

An analysis of the socio-economic effects determined by the achievement of the Project has identified positive impact by creating a supplementary number of jobs, both in the period of construction phase and also during the operational phase. These jobs will be for different professions, and for various levels of training, from labourers to experienced engineers.

The project may increase the economic activities of the locals in different sectors such as transportation, commerce, repair maintenance, etc, as a result of new job creation, waste collection, treatment and landfill in accordance with legal requirements.

8.8.2 Improvement in public health

The overall urban environment and the public hygiene will be improved by introduction of the new waste management system. Collection points will be modernised and controlled. A more efficient waste collection will be implemented, preventing the spreading of leakage from waste containers.

8.8.3 Occupational health and safety

Occupational health and safety of the sanitation workers will be improved, especially through the provision of safe equipment and improved facilities at the landfill. The existing uncontrolled waste dumping and fly-tipping throughout Saranda, Himara and Lukova will diminish and eventually be stopped.

8.8.4 Waste scavenging

Waste picking and scavenging carries disease from the waste site into the community. These activities will not be permitted.

8.8.5 Livelihoods

There will be no displacement of persons, households or livelihoods from the proposed site. There are no persons currently working within or in close proximity to the proposed site.

8.9 LANDSCAPE

8.9.1 Pre-construction and construction phase

The proposed site for the landfill has no special landscape value. The area already has been used for military purposes as a tank training ground, although there are no visible indications of this remaining in the area and no ordnance remains on site.

Landscape and visual townscape will not be significantly affected by the construction of the landfill. The proposed site is visually obscured from Bajakaj Village by low hills. However, the following is visible from the new national road also currently under construction:

- site clearance and ground excavation,
- heavy plant and construction equipment movement,
- construction material storage,
- soil excavations,
- construction traffic,
- building construction to a single storey and roof height.

However, the impact on landscape and visual townscape during the construction period is considered to be low.

8.9.2 Post-Construction and Operating Phase

During the post-construction and operating phase, landscape impacts are generated by:

- arrival of refuse-trucks and disposal of waste,
- waste spreading, land-filling and compaction,
- on-site plant and land processing equipment,
- buildings for landfill administration and operating,
- perimeter industrial fencing.

It is accepted that the construction and operation of the landfill will deteriorate some of the aesthetic resources of the immediate vicinity. At many poorly operated and maintained landfill sites this is exacerbated by wind-blown litter, illegal dumping of waste outside the landfill perimeter or on access roads, scavenging birds, and burning of waste. Dust from landfill sites can also be caused by movement of heavy plant machinery including compactors and bulldozers, as well as trucks, during periods of hot, dry weather.

8.10 TOP SOILS AND SUB-SOILS

8.10.1 Construction period

During construction, the upper soil layer will be removed and stored on-site as indicated in the Construction Management Plan. This soil stored during construction will later be used for rehabilitation and re-vegetation of the closed waste dump and of finished cells within the landfill site. Soil may be polluted from packaging wastes, oil from vehicles and vehicle maintenance. Impact from accidental spillage of oils is considered low magnitude because it will be controlled by implementing rules for vehicle maintenance and operation, as well as workshop practice.

8.10.2 Operational period

Soil pollution may result from the spread of refuse at the landfill site, from poor operation and management at the site, or possible leakage from the wastewater and leachate collection and treatment network.

8.11 BIODIVERSITY

8.11.1 Construction period

During construction, impact on the existing flora and fauna will be limited to Bajkaj where the main earthworks are developed. The access road will be upgraded, and a new access road constructed. Perimeter roads will also be constructed at the landfill. Grasses and low profile vegetation will be cleared. Nearby fauna will be disturbed by noise and dust emissions during construction works. There will be no intrusion on bird flight paths, or obstruction in the form of cables or wires.

8.11.2 Operational period

Flora and fauna around the emplacement is poor in species richness and abundance. Floral species are grasses or opportunist species, faunal species are common to the region. It is concluded that biodiversity values will not be negatively impacted by the operational works carried out within 20 hectares of the existing landfill, and is insignificant during the

construction and operational periods. The construction wetland will increase habitat for birds and insects.

8.12 DESIGNATED SENSITIVE AREAS

The location of the landfill and waste transfer site were identified in accordance with land use regulations. Neither site is located within proximity of a designated sensitive area, or in a locality which could impact on any designated areas in the vicinity.

8.13 TRANSBOUNDARY EFFECTS

The proposal will not have any international cross boundary impacts from water, air or land in pre-construction, construction or operating phases.

8.14 RADON

The proposed landfill site is sub-soils of flysch rocks, sands and clays. There are no sources of radon which can be released from construction work on hard volcanic or metamorphic rocks.

8.15 SCAVENGING BIRDS AND VERMIN

Exposed waste at landfill sites attract scavenging birds, often flocks of crows or gulls, which are a nuisance not only at the waste site, but also along the routes which they fly in from their roosting areas. Bird faeces is high in gut worms, with huge numbers of faecal coliform bacteria, and camphylobacter bacteria which can quickly contaminate water resources. Evidence suggests that birds, not sewage effluent, are responsible for camphylobacter in bathing water and drinking water. There is also the potential hazard to people from CDC Avian Influenza when large numbers of infected birds gather in areas associated with waste disposal. Waste sites also attract vermin, including rats, which are themselves disease vectors. Consequently, proposed landfill sites are required to be a specified distance from residential areas in order to reduce the impact of scavenging birds, and the likelihood of vermin entering residential properties.

8.16 BLOWN LITTER

Wind blown waste packaging, paper and plastics are a nuisance at landfill sites because it is carried for some distance from the site. Normal practice of installing industrial fencing around the landfill site goes some way in reducing the incidence of wind blown litter on the surrounding area, although large amounts of litter clinging to a perimeter fence is unsightly. However, the preferred strategy is to implement reduction in paper and cardboard packaging waste alongside recycling and reuse initiatives, as well as improved operation and management at the landfill site to enforce effective landfill cover and reduce exposed paper and plastic waste.

8.17 CULTURAL, HERITAGE AND ARCHAEOLOGICAL

Apart from a line of defence bunkers which are ubiquitous to Albania, there are no cultural, heritage or archaeological sites in the vicinity of the landfill site. There are a

number of low order impacts on such sites at some distance from the landfill site and their mitigation is described in Section 9.

8.18 INCREASED TRAFFIC

It is estimated that 55 tonnes will be taken to the landfill site daily. Trucks will carry approximately 6 tonnes of waste . Consequently, on average 10 or less trucks will deposit waste at the landfill on a daily basis.

8.19 INCREASED COST OF WASTE SERVICES TO THE COMMUNITY

8.19.1 Vergo

The Bajkaj site is located in Vergo commune. Discussions with the mayor of Vergo commune disclosed that the implementation of environmental tax in the Vergo commune is impossible due to the low income and the high unemployment within his commune. The costs of waste management must be borne by the government or municipality. The environment in Vergo commune will not profit from the landfill activities which consume some of its rural land.

Municipalities and communes set tariffs for collection and disposal of waste. The issue of gate fees and tarriffs will be the subject of separate detailed discussions and agreements. Payment of the tariffs is obligatory and collection of payment is organised by the municipalities/ communes. The costs for waste management are covered partly by the tariff revenues and partly from state budget allocations.

8.19.2 Vlore

The waste collection fee for households is 3.9 USD/year and commercial establishments pay a fee of Lek 500 per square meter per year. The contract value for the waste collection service is LEK 6,500,000 plus VAT per month. (About USD 65,000 per month or USD 2,166 per day).This would result in a total cost of USD19.5/ton.

8.19.3 Saranda

The inhabitants of Sarande have to pay a cleaning fee of 6.5 USD/year per household to the finance department of the Municipality. In total the finance department collects an amount of about 13 to 15,600 USD/year from households which is about 50% of the expected revenue. Many households are not even paying the electricity bill showing the incapability or unwillingness to pay and the lack of enforcement. Commercial and industrial entities are also paying fees. The tax office establishes the list with the fee for each entity. In total 156,000 USD/year is collected through the waste fees. Taking into account that the contract value for waste collection is USD 260,000/year it can be concluded that 40% is subsidised by the municipality. It can be concluded that the total costs would be 260,000/8400=USD 31/ton.

Taking into account that the average fees for waste collection, for street cleaning and for landfilling in a low income country will vary between USD 15-30, USD 30-60 and USD1-3 respectively or in total USD 46-93, it can be concluded that the costs in Albania are rather low. This is resulting in a poor condition and quality of the infrastructure

(uncontrolled dumpsites, old equipment) and lack of professional services (waste spilling on the streets, damaged containers, no daily covering at dumpsites).

8.19.4 Conclusions

TEI&SWS (2009c) summarised the existing financial situation for waste management in the community as:

- Fee per household is low
- Total collection/cleaning/disposal costs are low
- Fee collection coverage is low
- Municipal waste management is subsidised out of state budget donations
- Enforcement is weak

The Waste Management Consultant advised that gate fees and tariffs at the landfill will be the subject of separate detailed discussions and agreements.

TEI&SWS (2009c) described the waste budget for the landfill and waste transfer station and concluded that minimum transport costs will result from the configuration of services, location of waste transfer station, and the landfill site at Bajkaj. Easy access to national roads will also contribute to keeping transport costs low.

9 ENVIRONMENTAL MANAGEMENT PLAN

9.1 APPROACH

There are differences in approach between EU and Albanian EIA requirements for identifying the importance and magnitude of environmental impacts, and presenting measures to mitigate such impacts. EU legislation additionally requires possible unacceptable impacts which cannot be mitigated to be listed and described, and this requirement has been included in this EIA.

The approach taken within this Report is firstly to identify potential impacts and their mitigation in accordance with national requirements, Albania. Secondly, the Scale of Impacts are identified in line with the EU EIA approach which is also compliant with World Bank Guidelines, and strategies to mitigate such impacts described using a Leopold Matrix. Potential impacts which cannot be mitigated are also identified.

9.2 POTENTIAL IMPACTS AND THEIR MITIGATION

9.2.1 Approach

The identification of the environmental impact issues was based on the information taken from the Pre-feasibility study (Solid Waste Consulting 2005) and from later technical feasibility studies (TEI&SWS 2008, 2009a, 2009b, 2009c), but also on existing environmental conditions observed in recent site visits.

All effects on the environment caused by the project during construction and operational periods have been evaluated according to the provision of European and domestic legislation described in Section 3.2, and Nuttall & Sulce (2009).

For each environmental key issue the measures for prevention, mitigation or elimination of negative impacts are identified and described below, and summarised in Table 12. The positive effects of each project activities are also described. Evaluation is based upon general proposed conditions and characteristics of this project with each impact quantified in terms of its magnitude, whether zero, insignificant, moderate or significant according to the following definition:

- Zero = there is no impact = 0
- Insignificant = the impact is possible, but at a very low level, or for a very short period of time = 1.
- Moderate = the impact is regarded as undesirable (negative) or desirable (positive) and able to have a moderate effect on the existing environment or on human communities = 2.
- Significant = the impact is regarded as having significant effect on a large area or for a long period on the existing environment or on human communities = 3.

Table 11. Summary of potential impacts from landfill

Environmental factors	Possible forms of impact	Positive impact (+)	Negative impact (-)
Risk of spills	Chemical substances for construction work	**0**	**1**
	Flammable substances	**0**	**1**
	Leachate treatment system	**0**	**0**
	Constructed wetland	**2**	**0**
Air	Unpleasant odour, smell of waste	**0**	**3**
	Emissions of methane gas from landfill	**0**	**1**
	Emissions of CO_2	**0**	**1**
	Emissions of VOC from leachate plant	**0**	**1**
	Dust from construction	**0**	**1**
	Vehicle emissions	**0**	**1**
Water	Groundwater	**0**	**0**
	Surface water	**0**	**0**
Wastewater	Leachate	**0**	**0**
	Wastewater from toilets	**0**	**0**
Noise	Heavy machinery during construction and operation	**0**	**2**
	Biogas torch flame	**0**	**1**
Vibration	Heavy machinery during construction and operation	**0**	**2**
Landscape	Utilisation of the site	**1**	**0**
Biodiversity	Natural vegetation/fauna	**0**	**0**
	Scavenging birds and vermin	**0**	**2**
	Quality of the crops around	**0**	**1**
	Constructed wetland	**2**	**0**
Visual impression	Elimination of uncontrolled depositing of waste	**3**	**0**

	Unsightly	**0**	**2**
	Blown litter	**0**	**1**
	New landfill	**2**	**2**
	New roads	**3**	**1**
Human communities	Effects on public health	**3**	
	Increased road traffic	**0**	**1**
	Level of noise	**0**	**1**
Socio-economics	New jobs	**1**	**0**
	Improved waste management	**2**	**1**
	Overall assessment	**19**	**27**

From Table 11, it can be seen that there is a higher score for negative impacts than for positive impact from the landfill. Mitigation must therefore focus on reducing impacts. Table 12 lists options for minimising environmental impacts.

9.2.2 Air

Construction phase
During this phase, mitigation of impacts on air quality will be specified in the works contract.

Operational phase
Gas emission from the landfill will be reduced by collection of biogas generated from methanisation.

Odour control
Mitigation measures will incorporate:

- installing and maintaining the gas recovery system,
- providing a monitoring data recording and reporting procedure,
- providing a system of recording complaints from the public and appropriate response procedures,
- preparing a response plan to address conditions which might lead to odour, or potential odour problems,
- placing emphasis on pre-acceptance screening and on the rejection of specific waste, ensuring that rejected wastes are transported and disposed in compliance with the legislation,
- where odour becomes a problem on occasions and there are complaints from nearby residents, the landfill operator will use appropriate abatement measures to address the problem. These include, but are not limited to, improved compaction and covering of the waste, and the use of odour misters.

9.2.3 Water

Rainwater collection
Rainwater quality is controlled by maintaining clean platforms at both Bajkaj and Himara. Daily cleaning of the waste transfer station platform will be performed using a sweeping

vehicle and water sprinkler. Collection of rainwater (precipitation) falling on the landfill site will be achieved by outside perimeter drainage diversion channels.

Landfill runoff
Rainwater which falls on and infiltrates through the waste mass is collected by the drainage and collection systems at the landfill bottom and slopes as leachate, and is treated in the leachate treatment system. Rainwater as leachate will not penetrate the underlying waterproof membranes which line the entire site.

Collection and treatment of water following landfill closure
After landfill closure, rainwater collected by the top drainage system together with runoff water from the landfill slopes is transported to the evacuation system. A reservoir for collecting the rainwater will be provided. Collected water is unlikely to be contaminated and therefore will not require treatment. Any prevailing water impacts will be reduced with the final closure of the existing landfill.

9.2.4 Waste separation

Controlled operations at the landfill site (gate control, surface mounted weighbridge, fencing), an Operational Management Plan (prepared prior to commissioning for both the landfill and transfer station), landfill site and waste transfer station operator training, will permit only disposal of non-hazardous municipal solid waste. The landfill is not permitted to accept hazardous waste, including clinical or infectious waste. In addition, other than for road construction and for covering pruposes the facility will not accept construction and demlition waste

The Ministry of Health is responsible for the handling of hospital waste. Hospitals, health centres, clinics, etc should have clear instructions on what is infectious waste and how to treat it. An instruction manual should be prepared and distributed by MoH.

9.2.5 Noise and vibration

Although noise and vibration is considered not significant due to the fact that activities will not impact on any residential or commercial properties, noise abatement will be regularly maintained during construction and operation of the landfill and waste transfer site.

9.2.6 Biodiversity

Construction phase
To avoid unnecessary depletion of fauna and flora, the construction site will be limited to the minimum area that is needed for the works. The dumping or storage of soils and excess material will be done within the construction site. Construction vehicles will operate within the construction site, and not leave the site boundaries until works completion.

Operational phase
In order to minimise disturbance of activities on fauna, working will be undertaken within the prescribed time and area. Where there are established native animal crossings,

warning signs will be mounted to reduce any danger to wildlife. The warning signs will be installed with the support of local authorities.

9.2.7 Site management

The following mitigation measures should be included in the Environmental Management and Monitoring Plan for the waste transfer site and landfill to be written by the proponents.

Construction phase
During the construction phase, the following mitigation measures will be required and routinely monitored:

- Avoid spreading construction material,
- Avoid extension of the working area,
- Controlled excavation in order to avoid dust generation,
- Cover trucks with fine mesh netting when carrying loose materials,
- Clean up all areas after completion of work and bring surroundings back to the condition prior to commencement of works.

Operational phase
Undertake all landscape measures required under mitigation (Table 12) on completion of construction. The slopes of the landfill embankments will be grassed, and a green buffer zone established around the landfill. Planting of vegetation will start during the construction phase in order to be ready for the operational phase.

The following measures are also planned. These measures will be specified in contracts and routinely monitored, and will involve co-operation with the local authorities:

- all vehicles and containers will be maintained and cleaned either at the waste transfer station or landfill site,
- platforms and containers are to be kept in good repair, and in a clean and tidy condition,
- access roads will be kept open during winter,.

To mitigate surface soil contamination, the following measures are proposed:

- avoid storage of materials and waste on soil as this would contribute to infiltration following storm events,
- any scattered or wind-blown litter inside or outside the waste transfer site and landfill compounds must be gathered up by the operators at the end of the day.

Site management for soil protection
The following measures should be taken:

- all leachate must be collected and diverted to the leachate tratment sytem at the landfill site,
- fuel pumps located at the waste transfer statio and landfill site must be mounted on a concrete platform, and the platform will have bunding around the edge high enough to contain any spills,
- fuels and oils must be stored in a separate and suitable roofed area with a concrete floor, and the floor have bunding around the edge high enough to contain any spills,
- there shall be no waste scattered beyond the landfill cell of operation,

- regular long-term monitoring will be done as part of the Environmental Management and Monitoring Plan and as specified in the integrated permit conditions for the landfill site.

Site management for minimising environmental pollution

Additional measures to be taken for minimising pollution of the environment are:

- correct management of waste in compliance with waste management legislation,
- sufficient on-site inert material or other suitable materials for covering waste on a daily basis,
- employment of on-site trained personnel,
- occupational health and safety control for workers,
- risk assessment and management for areas where public access is permitted, with safety warning labels in all places with a recognised risk,
- perimeter fence, with an entrance gate which is locked during periods that the landfill is unmanned or outside working hours, and
- warnings and fines for persons entering the waste transer station or landfill site without authorisation.

Environmental Management and Monitoring Plan

An environmental management plan and monitoring system will be implemented at the waste transfer station and landfill site. The Plan will comply with the integrated permit conditions and requirements set by the MEFWA.

9.2.8 Seismic risk management

The probability of seismic activity is very low. However, the possibility can be minimised through seismic activity risk management which comprises:

- prevention of steep slopes.
- flexible materials are to be used in connections between steel-and/or concrete structures and engineering networks (water/gas/electricity lines).

9.2.9 Public hearings

During the Inception Period, two public hearings were held:

- 13 May Himara 0930 – public meeting and presentation by project team, open floor discussion and airing of any concerns by residents and interested parties,
- 13 May Saranda 1400 – public meeting and presentation by project team, open floor discussion and airing of any concerns by residents and interested parties.

Public concerns raised at the Himara meeting were:

- Waste transfer station was not big enough to deal with the volume of incoming waste
- Was this the best site as the present proposal impacts on surrounding villages,
- Is waste recycling and waste separation foreseen,
- How will the effects of site runoff be controlled
- Will the transfer site accept hospital waste

Public concerns raised at the Saranda meeting were:

- The area would be turned into a garbage bin, the smell and sight would be unacceptable,
- The area cultivates vines, vegetables, fruit, and trees which would be polluted by the waste,
- The democratic process in agreeing to the proposal was unrepresentative, and unrepresentative decisions were being taken in reference to the proposal,
- The 25,000 people served by the waste management system was an under-estimate because 75,000 people resided in the area (it was agreed that the total population served by the waste collection and disposal system needs to be reviewed by the designer) ,
- The proposal did not bring any benefits to the community,
- Nearby underground drinking water wells would be polluted,
- The landfill site would be located at the junction of Bajkaj Village and the new road and this would impact on visuals,
- Were other proposed landfill sites considered,
- An additional public meeting should be held at Bajkaj village.

There were no questions raised on the cost to individuals of the new waste collection and disposal system.

A second public consultation meeting was held in Saranda on 15th July 2009. A Non-Technical Summary was translated into Albanian and circulated two weeks before the meeting to the communities in Himara, Saranda and Bajkaj through the mayors and village elders

9.2.10 Public consultation strategy

The strategy adopted by the EIA process is set out as follows:

1. Public Meetings

Public meetings were held in Himara, Saranda and Vergo Commune as follows:

- ③ First Public Consultation Meetings: These meetings were held on 12th May 2009, 13th May 2009 and 15th June 2009 in Sarande, Him,ara and Vergo Commune, respectively, to summarise and discuss the proposed landfill facility and transfer station and to obtain the views of the local communities:
- ③ Second Public Consultation Meeting: This meeting was held on 15th July 2009 in Sarande, to summarise and discuss the content and findings of the Draft Environmental Impact Assessment for the proposal, namely:

2. Circulate Non-Technical Summary

A Non-Technical Summary is part of the EIA Reporting process. This was translated into Albanian and circulated two weeks before the second puiblic consultation meeting to the communitie in Himara, Saranda and Bajkaj through the mayors and village elders.

3. List all concerns of residents to the proposed waste transfer station and landfill site

At each of these meetings, an outline of the EIA Non-Technical Summary was given followed by a discussion with the attendees. These concerns were addressed at the time verbally and by illustration at each of the meetings.

4. Visit to proposed sites

Where concerns remain unresolved, a site meeting will be held at the proposed waste transfer station Himara and waste landfill site Bajkaj to address the concerns. Those wishing to attend (determined at the public meetings in Saranda, Himara and Bajkaj in June) will be taken there at no cost in pre-arranged public transport.

5. Visit to a good example of well operated small landfill site
Where concerns remain unresolved, a visit to a well run, well operated small municipal solid waste landfill site will be arranged to address the concerns.

6. Form a Community Monitoring Group
Where concerns remain unresolved, a Community Monitoring Group should be formed which has the remit to monitor construction and operation impacts at both sites, pre-arranged accompanied access to both sites, access to documentation and analytical results for both sites, and a voice in the control of actions carried out at both sites through regional and central government level.

7.Register of complaints
The site operators and REA for the Himara waste transfer station and Bajkaj waste landfill site, must:

- keep a public complaints register, and allow public access to the complaints register which records all public complaints and actions undertaken by the appropriate authority in addressing these complaints. This would also need to make sure that everybody perceived and reported the process as consultations led by the government on a government and not World Bank investment, and
- the managing authority for the waste transfer station and landfill site will prepare a response plan to conditions which might lead to public complaints.

9.2.11 Public consultation strategy

The Non-Technical Summary in this Report was released to the public two weeks in advance of the second public consultation meeting. The draft Environmental Impact Assessment and Environmental Monitoring and Management Plan was reviewed by the PCU, the Ministry and the World Bank before being released to the public. The strategy will incorporate:

- identification of different stakeholders to be consulted,
- tailored approach for different groups, making sure to have meaningful consultations; and
- need to expand list of communications tools.

Two groups of stakeholders are recognised, despite differences within the same group:

- Directly (affected community/villagers which are again differently affected for example from Himara, Bajkaj, local government in Saranda, and local government or commune), private companies.
- Indirectly affected: environmental NGOs, CBOs, media.

For each of the groups there is need for a different approach: Himara and Saranda communities and mayors are generally positive about the investment and there is less ground for convincing/preparatory work. It is necessary to ensure that among the affected communities everybody is represented and heard, and the powerful village members or head of communes do not dominate the consultations.

9.2.12 Public Health

Public health will be safeguarded by:

- Control of dust during construction activities and during transport of construction materials using a coarse water spray (not a fine droplet spray),
- proper handling of dispersed solid waste during transportation and storage,
- safety requirements of collection and storage of solid waste to prevent odour,
- washing and disinfecting vehicles after depositing waste materials at the waste transfer station or landfill site,
- periodic vermin control at transfer stations and landfill,
- applying daily or continuous cover over the cell during the operation to prevent odour,
- waste scavenging and waste picking prevented by control of access to the landfill,
- prevention of waste burning practices.

9.2.13 Occupational Health and Safety

Waste handling health and safety will be emphasised by:

- control of dust during construction activities and transportation of materials,
- implementation of safety procedures and availability of safety equipment for workers,
- training and awareness for drivers and workers on the proper handling of waste and personal protective equipments,
- undertaking regular medical inspection for workers,
- training of employees to identify hazardous waste and proper safety, handling and reporting procedures.

9.3 MONITORING PROGRAM

An environmental monitoring program will be implemented to continuously assess the impact of the landfill upon the environment. Monitoring is to be paid for by the owners or operators of the activity. Monitoring of the landfill and receiving environment, including surface and groundwater, landfill gas and leachate will be carried out in accordance with the requirements set out in the legislation (Section 3.2). The following items shall be included in the monitoring program:

- monitoring of environmental quality,
- technological monitoring,
- monitoring after landfill closure.

The Environmental Monitoring Program will incorporate the following:

- Surveillance Monitoring, long-term monitoring of the general environmental quality, carried out over the long term and over a larger domain than the landfill footprint area to assess the effects occurring even after the closure and restoration of the landfill site.
- Site Specific Monitoring, medium-term monitoring, primarily carried out to check that the environmental impact assessment predictions of the project are correct.
- Operational Compliance Monitoring of selected indicators at a pre-determined frequency during the operation of the facility

Groundwater monitoring

The purpose of groundwater monitoring is to protect groundwater resources in the area of the landfill. The monitoring program including frequency, number of samples, and parameters (as recommended below) must be agreed with the competent authority MEFWA Albania. Groundwater monitoring sites at the Bajkaj landfill should consist of 3 monitoring wells with Well 1 placed upstream of the landfill, and Wells 2 and 3 placed downstream. The wells will be a minimum of 30 m depth. Full chemical analysis of water samples and determination of content of dissolved polycyclic aromatic hydrocarbons, phenols and chlorinated organic compounds will be performed by an accredited laboratory.

Before the landfill is commissioned, groundwater chemical analyses will be made using piezometric drills. One will be made upstream of the cells and two will be made downstream in the expected groundwater flow direction,

Chemistry monitoring parameters (4 times a year) for Well 1 are:

- full chemical analysis including iron (Fe), total nitrogen (N) and COD,
- heavy metals,
- phenols,
- polycyclic aromatic hydrocarbons.

Chemistry monitoring parameters (4 times a year) for Well 2 and 3 are

- full chemical analysis including iron (Fe), total nitrogen (N) and COD;
- heavy metals;
- phenols;
- polycyclic aromatic hydrocarbons;
- chlorinated organic compounds (1.2–dichlorethane, tetrachlorethane and trichlorethane).

The monitoring will consist of the following interrelated procedures:

- measuring the level of water in the monitoring wells and the surface water control station;
- water sampling from the monitoring wells and the ditch;
- laboratory analyses of water samples;
- processing and accumulation of monitoring data;
- reporting on long-term monitoring.

The level of water in the monitoring wells will be measured to determine the dynamics of filtration flow of water (changes in the water filtration speed and flow direction) and to assess the possibilities of dilution of pollutants getting into groundwater from the waste cells (so-called self-cleaning). Possible pollution by landfill is most intense during spring floods and autumn rains when the level of wash-out of pollutants from municipal waste is highest. The results of groundwater monitoring will be recorded in a database of the owner or operator of the landfill responsible for conducting the monitoring program. At the end of each calendar year, summary data will be provided to the REA for information and for release to public information or enquiry.

Surface water monitoring

Where permanent or temporal surface water is within 500 m of the landfill boundary, water quality will be monitored during construction, during landfill operation, and after closure for.

- full chemical analysis including iron (Fe), total nitrogen (N), BOD_5 and COD,
- heavy metals,
- phenols,
- polycyclic aromatic hydrocarbons.

Monitoring of landfill gas

Landfill gas monitoring is required only if gas emission is smelled or observed away from the biogas burner. This is in order to control the intensity of gas migration from the landfill to the environment, but particularly where the workforce are located to avoid risk of explosion (methane may explode when its concentration in the air reaches is 5 - 15 %). Based on accepted practice, the following provisions are to be applied to the Bajkaj landfill in case any emissions are observed:

- monitoring points (or wells) must be located on and at the foot of the landfill,
- other monitoring points must be placed in the most important places, first of all in the area between the landfill and the buildings and on each side of the landfill site,
- monitoring must include all closed spaces around the landfill where gas is collecting and where an explosion potential exists,
- annual landfill gas measurements must be conducted not less than quarterly.

Gas monitoring will be conducted at all monitoring points 4 times a year, on a quarterly basis. A Landfill Gas Analyser will be used to measure the concentrations of methane (CH_4), carbon dioxide (CO_2) and oxygen (O_2). The atmospheric air and landfill gas pressure in the wells will be measured by means of a barometer. At selected monitoring points, samples of gas will be collected for hydrogen sulphide, chlorinated organic compounds and mercury for analysis in an accredited laboratory.

Compliance with the safety at work and health standards will be ensured during landfill gas monitoring.

Monitoring of leachate

Leachate monitoring should consist of three monitoring points, namely:

1. depth of leachate (i.e. above the liner) on a regular basis (e.g. once per week during the dry season and more frequently during the wet season),
2. chemical analysis from leachate monitoring point 3 in the leachate/wastewater pumping station,
3. chemical analysis of treated leachate discharge from the final outfall into the receiving environment – a temporal creek.

Chemical analysis determination should be made for the following parameters:

- total mineralisation, pH, Cl, SO_4, NO_2, NH_4, CO_2, Fe
- physical indicators (colour, odour, transparency)
- suspended solids

- BOD_7 and COD
- total N and total P
- heavy metals (Mn, Zn, Ni, Cu, Pb, Cr, Cd)
- phenols
- chlororganic compounds

A recording and reporting procedure must be implemented based on the Environmental Inspectors Handbook (MEFWA 2009), and the results of monitoring should be submitted, together with an annual report, as specified in the Permit.

Waste monitoring

A waste accounting system with a weighbridge and computerised system is necessary for accounting waste acceptance at the landfill. All waste disposal vehicles entering the landfill will be included in the waste accounting register. All vehicles delivering waste will be weighed when arriving at the landfill and when leaving it.

Dust

Monitoring for dust, noise generation, flies, odours will respond to operator initiative and public concern. Mitigation is described in Table 12.

Other monitoring

Other technological monitoring will be performed in accordance with the minimum requirements of the EC Landfill Directive and national legislation, as follows:

- Access roads and buildings;
- Operation of landfill drainage system;
- State of covering layer of isolated parts;
- State of slopes;
- Operation of waste water treatment plant;
- Operation of rainwater and leachate collection and discharging system
- Destruction of isolation layer of landfill cells;
- Clogging of drainage system.

Post-closure monitoring

Post-closure investigation and monitoring activities will include:

- Destruction of isolation layer of landfill cells;
- Clogging of drainage system;
- Non-uniform sedimentation of waste after closure of landfill;
- Saturation phenomenon by rainwater flooding.

Permit conditions

All emissions and discharges, including wastewater, biogas, odour, noise, and dust should be compliant with the conditions set in the Integrated Environmental Permit issued for the landfill site by the EFA.

9.4 SCALE OF IMPACT

The Leopold Matrix is a qualitative method used to identify the scale of potential impact of the proposed project on the environment. The system is essentially a simplification of discussion from the preceding Sections. It is hoped that this provides decision makers with a non-technical basis for mitigation of environmental impacts.

The system (Table 12) consists of a matrix with the environmental impacts, and the intersections filled in to indicate:

- the importance (from 1 to +10) of each environmental impact (where 1 is the least important and 10 the most important).
- the magnitude (from 1 to +10) of the environmental impact (where 1 has the least magnitude and 10 the most magnitude) , and

Using this approach, the most significant environmental impacts can be identified according to the importance and magnitude of scale, as shown in bold in Table 12, and from this it can be determined:

- the mitigation of environmental impacts,
- possible unacceptable environmental impacts which cannot be mitigated.

9.5 POSSIBLE UNACCEPTABLE IMPACTS WHICH CANNOT BE MITIGATED

From environmental impact assessment detailed in Sections 8, there are no unacceptable impacts (i.e. with a scale of impact ranging 8 upwards for importance, together with 8 upwards for magnitude) which cannot be mitigated in the program of work for the project as shown in Table 12.

Table 12. Environmental Impacts and Mitigation Measures

Environmental impact	Importance	Magnitude	Mitigation
Raw materials and chemicals substances used on-site			
Flammable substances used on-site during construction	6	1	Correct storage and handling. Mitigation of impacts will be specified in the works contract and/or in the Construction Management Plan.
Hazardous substances used on-site during construction	6	1	Correct storage and handling. Mitigation of impacts will be specified in the works contract and/or in the Construction Management Plan.
Asphalted concrete used on-site during construction	4	1	Correct application and handling. Mitigation of impacts will be specified in the works contract and/or in the Construction Management Plan.
Waste materials handled and disposed on-site during operational period	6	6	Landfill use restricted to disposal of non-hazardous municipal solid waste. Training of operators in correct handling of waste, and best practice for landfill site.
Air emission			
Dust from construction works and operational activities on-site	7	4	Dust control by wetting from water truck spray. Mitigation of impacts on air quality will be specified in the works contract and in the Operational Management Plan. .
Vehicle exhaust during pre-construction and construction works on-site	3	2	Emissions will not exceed maximum acceptable levels to nearest residences. Mitigation of impacts will be specified in the works contract and/or in the Construction Management Plan.
Landfill gas emission principally methane and carbon dioxide	8	3	Biogas emission generated from methanisation at the landfill will be collected and burnt. Installing and maintaining the gas recovery system will minimize odour emissions.
Leachate treatment lagoons emissions	4	1	Impact not considered significant provided the system is constructed effectively, and maintained and operated efficiently (see Nuttall *et al.*, 1997). Evapotranspiration will have no impact.
Precipitation			
Stormwater runoff from platforms and perimeter roads	4	5	Maintain clean platforms by cleaning as necessary using appropriate equipment. Collection of rainwater (precipitation) falling on the landfill site will be achieved by drainage channels on the internal side of each berm, by drainage channels on the internal side of the perimeter dyke crest, and by perimeter drainage channels at the bottom of perimeter dykes.
Stormwater to hard surfaces within landfill site	4	6	Stormwater collected by series of drains laid at the start of construction above the waterproofing membrane and conducted by gravity to the separate stormwater system.
Stormwater from new access roads	4	6	Stormwater diverted to parallel drains on each side of road and to infiltration through roadside vegetation. No stormwater runoff to soakaway pits. No soakaway pits to be constructed alongside roads.
Rainwater falls on and infiltrates through the waste mass	9	2	Runoff and percolation is collected by the drainage and collection systems at the landfill bottom and slopes as leachate, and is treated in the leachate treatment system.

Environmental impact	Importance	Magnitude	Mitigation
Rainwater falls on and percolates through site after landfill closure	5	1	Final closure, doming of finished landfill site, and revegetation ensures no percolation of rainwater runoff into closed waste cells.
Wastewater			
Site construction workforce of approximately 40 persons generating kitchen and sewage wastewater	4	6	Collection of kitchen waste and wastewater and removal off-site. Transportable toilets emptied and waste removed off-site to a wastewater treatment plant.
On-site operation workforce generating sewage and kitchen wastewater	3	5	Domestic wastewater directed to appropriate on-site wastewater treatment system and regularly emptied and removed off-site.
Landfill leachate pollutes underground water	8	6	Fully collected and treated in on-site leachate treatment system prevents pollution of underground water. Environmental monitoring program regularly samples and analyses underground water quality and would identify any problems in containment of landfill leachate. Control of leachate, including regulating the height of leachate above the liner system, will be set out in the Environmental Management and Monitoring Plan.
Landfill leachate or wastewater contaminates well drinking water	9	2	Fully collected and treated in on-site leachate treatment system prevents pollution of underground water. Environmental monitoring program regularly samples and analyses underground water quality and would identify any problems in containment of landfill leachate.
Final discharge from landfill leachate treatment system does not comply with emission limits in National legislation	8	4	Discharge conditions for this will be prescribed in the Environmental Permit which will be issued by the MEFWA. The Environmental Management and Monitoring Plan will set out a program of regular sampling for the discharge point and would identify any situation of non-compliance with the Permit.
Wastewater transmission			
Failure of transmission lines and spillage	7	4	The Environmental Management and Monitoring Plan will set out a programme of regular sampling and analysis of underground water and surface water quality and would identify any problems in containment of landfill leachate or leachate transmission lines.
Failure of waterproofing membranes lining base and sides of landfill site	9	2	The Environmental Management and Monitoring Plan will set out a program of regular sampling and analysis of underground water and surface water quality and would identify any problems in containment of landfill leachate or leachate transmission lines.
Failure of waterproofing membranes lining base and sides of leachate treatment system	8	2	The Environmental Management and Monitoring Plan will set out a programme of regular sampling and analysis of underground water and surface water quality and would identify any problems in containment of landfill leachate or leachate transmission lines.
Hazardous waste			
Arrival of mixed hazardous with non-hazardous solid waste	6	6	The landfill is not permitted to accept hazardous waste. Penalties and fines will be applied to the originator (polluter pays) where illegal mixing of hazardous and non-hazardous waste has been discovered. Persons discovered delivering such wastes to the landfill shall be required to reload and remove all such materials.

Environmental impact	Importance	Magnitude	Mitigation
Arrival of small amounts of hazardous or quarantine ship waste	5	5	The landfill is not permitted to accept hazardous waste. Penalties and fines will be applied to the producer and/or transporter found bringing hazardous or quarantine ship waste to the landfill facility or to the transfer station.
Arrival of large amounts of hazardous or quarantine ship waste	9	1	The landfill is not permitted to accept hazardous waste. Penalties and fines will be applied to the producer and/or transporter found bringing hazardous or quarantine ship waste to the landfill facility or to the transfer station.
Seismic activity			
Earth movement ruptures engineered structures	4	2	Avoidance of steep slopes on landfill batters. Where appropriate flexible materials are to be used in connections between steel-and/or concrete structures and engineering networks (water/gas/electricity lines).
Landscape			
Impact on landscape within and around proposed landfill site	2	2	No special landscape values within proximity of proposed landfill site or waste transfer station.
Visuals			
The landfill can be seen from Palavli Village	8	5	Natural slopes will provide a degree of visual secreening to mitigate visual impacts from the village. In addition appropriate tree planting at the earliest opportunity, in particular on the northern side of the facility will address any residual visual impacts
The landfill can be seen from tourist routes through to Butrint.	8	2	The distance of the landfill site from these routes together with appropriate tree planting will reduce any visual impact from roads
The landfill can be seen from new road Tepeline – Delvine	7	3	The proposed planting programme, including the lines of trees in the NW to SE axis across the access road to the landfill, will reduce any visual impact from this road
The landfill can be seen from the Feniqi ridge at a distance of 9 kilometres.	6	1	The distance of the landfill site from these routes together with appropriate tree planting will reduce any visual impact from the Feniqui ridge
Soils			
Covering of soils on proposed site would be degraded by waste operations	2	2	Soils will be removed and stored for covering and for subsequent use in site re-vegetation.
Odour			
Generation of odour at the landfill site	7	4	All waste to be compacted and covered with soil or other cover materials on a daily basis. Develop an inventory of odorous materials at the landfill. A Public Complaints Register will be established at the landfill site and the landfill operator will respond positively to complaints, and to suggestions from any Public Monitoring Group established in relation to odour problems from the landfill site. In addition the landfill operator shall carry out a regular Odour Patrol at specified locations around the landfill site. These practices will be set out in the Environmental Management and Monitoring Plan. Green belt around landfill site will partly contribute to

Environmental impact	Importance	Magnitude	Mitigation
			minimising any impact from odour
Generation of odour at the waste transfer station	5	3	All waste to be compacted and removed within 2 days of arrival. Full compactor containers should be removed as soon as practicable. A Public Complaints Register will be established at the waste transfer station and the site operator will respond positively to complaints. These practices will be set out in the Transfer Station Operational Management Plan.
Generation of odour at the leachate treatment system	7	6	Ongoing monitoring of the performance of the leachate treatment system as set out in the Environmental Management and Monitoring Plan.
Generation of odour from burning biogas at the landfill site.	7	3	The release and burning of biogas will be related to the rates of methanisation within the landfill site. Routine monitoring to assess the odour exposure of sensitive receptors. A Complaints Register will be established at the landfill site and the landfill operator will prepare a response plan to conditions which might lead to odour or potential odour problems. Place emphasis on pre-acceptance screening and on the rejection of specific waste, ensuring that rejected wastes are transported and disposed in compliance with the legislation.
Noise			
Construction involving heavy plant machinery at the landfill site	3	2	Expected to be within acceptable levels. Workforce to wear ear protection. Mitigation of impacts will be specified in the works contract and/or in the Construction Management Plan
Construction involving heavy plant machinery at the waste transfer station	3	2	Expected to be within acceptable levels. Workforce to wear ear protection. Mitigation of impacts will be specified in the works contract and/or in the Construction Management Plan.
On-site machinery during operation at the landfill site	4	2	Expected to be within acceptable levels. Workforce to wear ear protection.
On-site machinery during operation at the waste transfer station	4	2	Expected to be within acceptable levels. Workforce to wear ear protection.
Waste collection trucks and compactor trucks along access roads	4	2	Because of low waste generation rates in the collection area, the number of trucks per hour is estimated to be low. Current high level of trucks is related to national highway construction in the vicinity of the landfill site. After highway construction is completed, the frequency of trucks will diminish.
Power generators at the landfill site and waste transfer station	4	2	Expected to be within acceptable levels. Workforce to wear ear protection.
Biodiversity			
Animal and plant communities within and in proximity of proposed site would be impacted	6	1	No cables or wires would interfere with bird flight pathways. Construction work and operations would occur within pre-defined limits. Existing animal and plant communities within and around the proposed site are poor in species richness and abundance, and are unlikely to be impacted.
Vermin			

Environmental impact	Importance	Magnitude	Mitigation
Waste landfill attracts vermin, rodents and scavenging birds	6	4	No residences within 1.4 km of proposed site, impact from vermin is not considered to be significant. Periodic vermin control on-site to reduce populations. The control of vectors (flies, rodents, vermin and scavenging birds, etc.) will be addressed in the Landfill Operational Management Plan.
Sensitive areas			
Sensitive environmental areas impacted by waste disposal and transport	3	1	Sensitive environmental areas are beyond the required 500 m
Litter			
Litter accumulation on surrounding district to proposed site	4	4	As Albania progresses with acceptance of the EU Environmental Acquis, enforcement of packaging and packaging waste directive, the collection and recycling of paper and cardboard will reduce the volume of packaging waste at the landfill. Correct covering of waste on a daily basis. Periodic gathering up of wind blown litter around site. Enforcement of laws preventing casual disposal of waste outside the fenced landfill site and along access roads with fines to all who break these laws.
Human communities			
Communities residing beyond the proposed landfill site, and on access roads to the site, are exposed to excess levels of noise, dust, smell, litter, and traffic	4	4	Provide a monitoring data recording and reporting procedure, provide a complaints register and prepare a response plan to conditions which might lead to increased impact on human communities. Respond positively to any community monitoring group established.
Workforce exposure to noise, dust, gas emission, hazardous waste and odour	4	4	Mitigation of impacts will be specified in the Landfill Operational Management Plan.
Cultural heritage			
Some impact from increased heavy traffic during construction and operation on cemetery near road access to landfill site	4	2	Mitigation of impacts by driver training will be specified in the works contract and/or Landfill Operational Management Plan.
Defense bunkers near landfill site	3	1	No impact from landfill site clearance and development. Consideration might be given to the preparation of a Rapid Assessment Report to assess and record the adjacent bunkers in the context of cultural heritage and to determine their structural condition prior to construction work..
The landfill can be seen from an archaeological site located on the Feniqi ridge at a distance of 9 kilometres	6	1	The distance of the landfill site from these routes together with appropriate tree planting will reduce any visual impact from the Feniqui ridge
Staff resources			
Waste landfill operation - worker occupational	6	2	OHS practice by staff and management

Environmental impact	Importance	Magnitude	Mitigation
health and safety (OHS)			Periodic health inspection and medical check-up of all staff handling municipal waste
Staff training – training in broad aspects of environmental management	6	2	Regular training and certification
Staff training in weighing, recording and reporting of waste to landfill site, operation of landfill site, use of machinery for correct waste management	6	2	Regular training and certification
On-site operation and performance			
Operation and management of landfill would require an on-going performance assessment	8	3	On-going monitoring program to determine and report on environmental quality, groundwater, landfill gas, leachate, waste composition and volumes, meteorological and technical, and post-closure.

10 DESCRIPTION OF DIFFICULTIES

The difficulties encountered were:

- Public participation process was organised prior to commencement of the EIA in which there was a failure to arrange a public hearing on site at the Village of Bajkaj for the first round of public hearing on the proposal. The consequence was that the Bajkaj Village community felt that their opinions were being deliberately ignored. A subsequent meeting was held in June in the offices of Vergo Commune which was attended by representatives of local communities, in particular Bajkaj Village, Palavli Village and Vergo Commune. In addition, a comprehensive public consultation strategy was formulated as described in Sections 9.2.10 and 9.2.11.

- There is an inherent difficulty in Albania in obtaining reliable information on which to accurately determine projected waste generation in the area and in particular the likely demand for the landfill facility. This is because of the lack of archival data, an historical resistance within government to release the little information that is available, but also that recording and retrieval of such data is currently very difficult in Albania.

- All assessments, including pre-feasibility study (Sold Waste Consulting), feasibility study (TEI&SWS), environmental baseline studies (TEI&SWS), and design specifications (TEI&SWS) were subject to uncertainties associated with potential impact predictions and assumptions. Under such uncertainties, assessment of environmental impacts tend to be conservative, meaning that the conclusions can veer towards the safe side under the precautionary principle.

- Some of the benefits of the Project can only be assessed in a general manner. This covers aspects like the possibility of employment, the closure of the existing landfill, and roads and lighting, where a clear benefit is offered but to what extent remains obscure, or to the reduction of waste dumping and fly-tipping in the area as a result of improved waste management services but again to what extent remains conjectural.

- Precise predictions would require extensive measurements of the existing situation (ambient air, soil, groundwater, etc) and detailed modelling which is beyond both the scope of an EIA study and the funds made available to accomplish this.

- New government data on population figures for the Saranda-Himara area are not yet available.

- Obtaining accurate and/or reliable information from official sources on domestic and commercial waste data (i.e. waste arisings, etc.) proved difficult in the area in question.

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12 LIST OF OUTPUTS FROM FURTHER STUDIES

The following documents, which are expected outputs from further studies or actions, are referred to throughout this EIA Report:

- Public Consultation and Participation Strategy
- Report on increased cost to the targeted communities for improved waste services – recommended in this EIA Report
- Construction Management Plan
- Landfill Operational Management Plan
- Transfer Station Management Plan
- Environmental Management and Monitoring Plan
- Rapid Assessment Report (Cultural, Heritage and Archaeology) – recommended in this EIA Report
- Class A Environmental Permit for the landfill installation and activity to be issued by the Environment and Forestry Agency, Albania.
- Class B Environmental Permit for the waste transfer station installation and acitivity to be issued by the Environment and Forestry Agency, Albania.

ANNEXES

1. Criteria in national and EU legislation regulating new landfill sites

This EIA addresses all the following considerations.

International landfill siting considerations are as follows:

- Transport distance
- Distance boundary of the site from residential and recreational areas, water bodies, agricultural sites
- Location restrictions such as airports, flood plains, wetlands, fault areas, seismic impact zones, unstable areas, nature protective areas
- Available land area
- Site access
- Soil conditions and topography
- Climatologic conditions
- Surface water hydrology
- Emission limit values for treated discharges to receiving water
- Geologic and hydro-geologic conditions
- Local environmental conditions
- Ultimate use for completed landfills
- Investment and operational costs.

The criteria in Albania legislation are:

- Distances:
    a. to a village or commune at least 500 m
    b. to scattered buildings used for housing 100 m
- Noise
    c. Acceptable with some mitigating measures is 100 dB at the source, 54 dB at 500m, 50 dB at 750 m 46 dB at 1000 m and 40 dB at 1500 m;
- Dust: No limits found but dust mitigating measures such as spraying water at the landfill is done in some cases.
- Leachate: must be separated from penetration into groundwater by physical barriers
- Wastewater discharges into receiving water must comply with Decision No.177 (31.03.2005) Allowed norms of Liquid Releases and Their Zoning Criteria of Receiving Water Environments
- Odour: protection from odour is done by mitigation works using screens or barriers.
- Soil:
    d. Landfills are not allowed in Karst topography
- The location of landfills is prohibited under the Albanian legislation in areas with natural beauty and heritage sites as well as other category I to VI areas.
- Municipal/tourist criteria
    e. Not present in vision lines of major tourist attractions;
    f. Site as close to town as possible;
    g. Not visible from main tourist roads.

2. Public consultation and participation strategy

The Public Consultation and Participation Strategy Report (Sulce 2009) is a separate document from this EIA Report and contains the following information:

1. Introdution (Concepts, Benefits, Interested groups from SWM plan)

2. Policy and Legislative framework (Albanian, European legislation on public participation and World Bank approach)

3. Project Cycle (Project design and formulation, Project identification, Preparation appraisal, negotiation).

4. Formulation of Participation Strategy (Public participation plan on Solid Waste Coastal Zone Management, Public Participation Strategy during proposal site design and Participation strategy during EIA preparation).

5. Public hearing, consultation, participation and information steps and Assessment of Public participation.

6. Measures to public awareness

7. Recommendation

QUALITY ASSURANCE SHEET

TITLE OF REPORT	Environmental Impact Assessment Report Bajkaj Landfill and Associated Structures
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