



Project Antea Environmental Statement:

Development of Cement Production Plant and Associated Quarrying Activities, Albania

Environmental and Social Impact Assessment (ESIA)

NON-TECHNICAL SUMMARY

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NON-TECHNICAL SUMMARY

Introduction

Antea Cement, part of the Greek owned Titan Group, proposes the construction of a cement production facility in Albania, built and operated to world class design and technological standards. The facility will be capable of producing 3 300 tonnes per day (tpd) of clinker (the main component of cement) and will incorporate the development of two quarries associated with producing the main raw materials for this operation. The location of the proposed development is near the communities of Burizana, Picrraga and Brett in Albania. This *Non-Technical Summary* describes the key impacts of the proposed development on the environment and local people through construction, operation and decommissioning phases.

It is possible that the development will be partly funded by the European Bank of Reconstruction and Development (EBRD) and the International Finance Corporation (IFC). This project is categorised as 'A' by the EBRD and the IFC. Projects in category 'A' require an *Environmental and Social Impact Assessment (ESIA)*. The findings of the ESIA are published in the *Environmental Statement*, of which this Non-Technical Summary is a part. A Public Consultation and Disclosure Plan (PCDP) has also been produced which acts to drive the process of public consultation.

As the investment banks are considering their participation in Antea Cement they are particularly interested in the following issues:

- All potential environmental and social impacts have been taken into account and appropriately assessed, where they are reasonably foreseeable;
- The proposed development is environmentally and socially sound and sustainable in light of the potential environmental and social impacts; and
- Appropriate public consultation of the project and its impacts has been undertaken for a minimum of 60 days. This is done through the publication of the Environmental Statement.

The contents of the Environmental Statement are as follows:

- Description of the proposed facility and the existing environmental conditions at the proposed development site;
- Assessment of the impact of the proposed development on the existing environment and the local people;
- Recommendations for measures to limit these impacts (the mitigation measures); and
- Description of the extent of the residual environmental impact following the implementation of the proposed mitigation measures.

Availability of the ESIA Documentation

The documentation relating to the ESIA will be available at the following locations:

- The Non-Technical Summary will be placed on the EBRD website (www.ebrd.com) and the IFC website (www.ifc.org), which will also contain information on where the full ESIA documents will be available and a link to Antea Cement's website.
- The full ESIA documentation and Non-Technical Summary will both be available in English and Albanian at the Antea office (Rruga e Durrësit, (Ish Uzina Tirana), Pallati "Lim-Em" Shkalla 4D, Zyra 1, Tirana, Albania) care of Mrs Teuta Dobi, Telephone +355 4 230402 / +355 692090547). Copies of the ESIA documentation will also be held at Kruja Municipal Council offices and the Thumana Commune Council offices.
- The findings of the ESIA will also be explained directly to the public through an exhibition and brief presentation to be held at two locations near to the proposed facility. The exhibition materials will be left in place for several days to provide the public with opportunity to view them. During that time a presentation and question and answer session will be arranged, attended by representatives of Antea and environmental and social experts.
- The PCDP will be available at the aforementioned Antea Cement office, at the World Bank Group Info Shop (www.worldbank.org), at the EBRD Business Information Centre in London and Resident Office in Tirana, on the EBRD website (www.ebrd.com) and also on the project sponsor's site (www.titan-cement.com).
- Hard copies of the materials will also be available at the EBRD regional office in Tirana.

Location of the Proposed Development

The cement plant and associated quarries will be situated within the municipality of Picrraga and close to the town of Burizana, to the north east of Tirana. The location of the two quarries has already been agreed with the local authorities and the ESIA has considered the

potential to locate the cement plant next to either quarry. The proposed location of the quarries and cement production facility is rural in character. There are a number of small residential communities within 10km of the sites, including the large community of Burizana and Picrraga. Figures 1 and 2 illustrate the location of the proposed cement plant and its associated quarries.

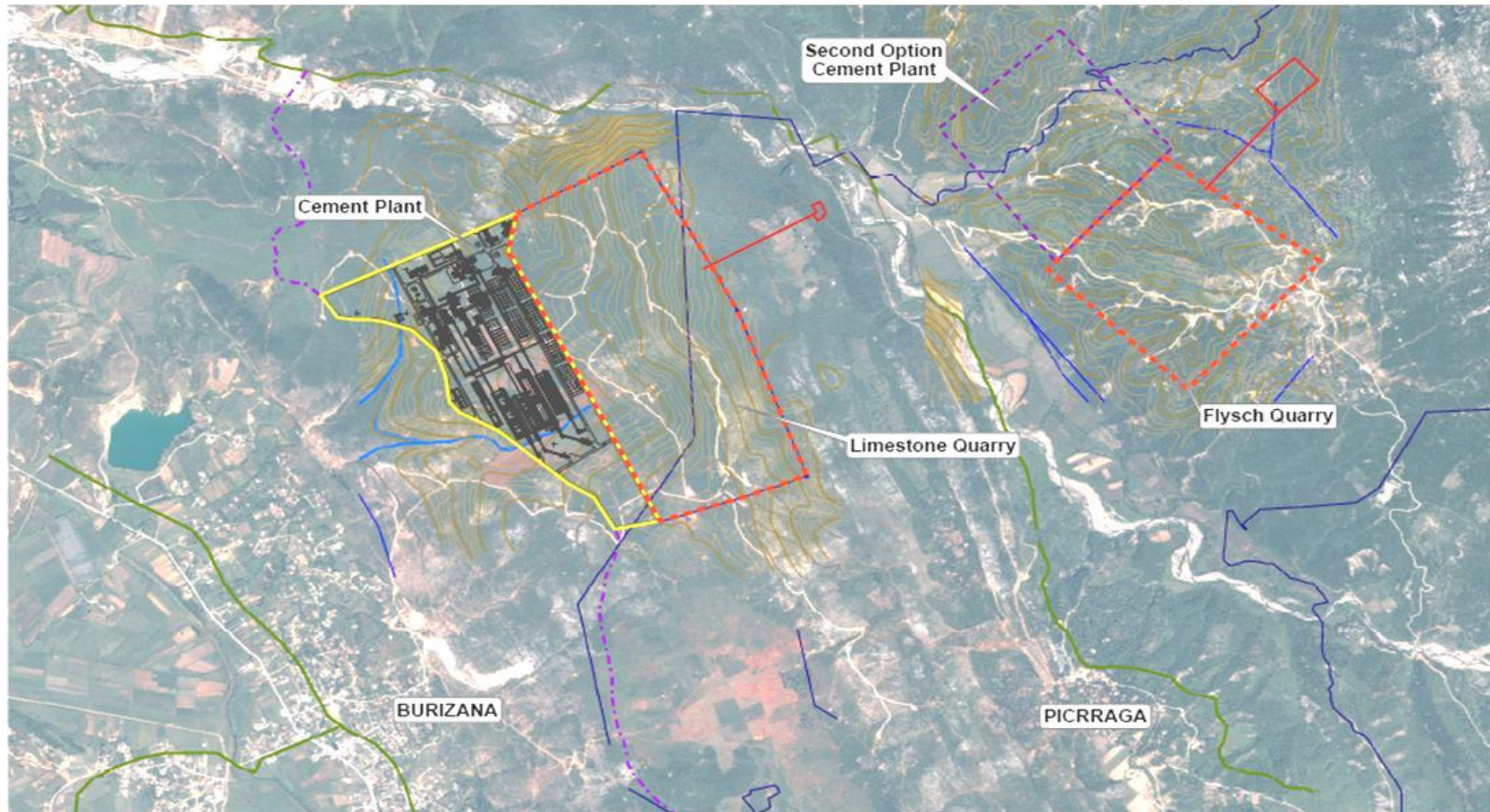
Vehicular access to Burizana is via a small road that winds through the town, past a local school. At present this route is used by a local quarry. This road leads to a rough track which has been opened up to gain access to the proposed limestone quarry area and cement plant. As part of the development plans, it is proposed that a new road is opened up from the main highway to the cement plant. The approach to this area is through a valley bordered by steep mountains across rough terrain. The area within which the plant is located has been designated as an area for industrial development by the municipal authorities. The route of the proposed road is illustrated in Figure 3. A road safety study has been undertaken as part of this ESIA to assess the potential hazards to the local communities posed by the development of new roadways and their use by traffic associated with the proposed development. The results of this assessment are discussed in the 'Social and Economic Issues' section of this summary.

Despite the designation as an industrial area there are no existing facilities in the immediate vicinity of the proposed plant. There is however another, large cement plant and an associated limestone quarry approximately 6 km to the east of the proposed plant, near the historic city of Kruja. The cement plant is situated on the plain and is of a similar scale to the plant proposed by Antea. This cement plant is not situated adjacent to its quarry but instead several kilometres north of it. The quarry is situated on the approach to the city of Kruja, whilst the cement plant is situated on the plain below Kruja.

Figure 1 - Location of Proposed Project: National Scale Overview



Figure 2 - Location of Proposed Project: Local Scale Overview



Overview of Cement Production

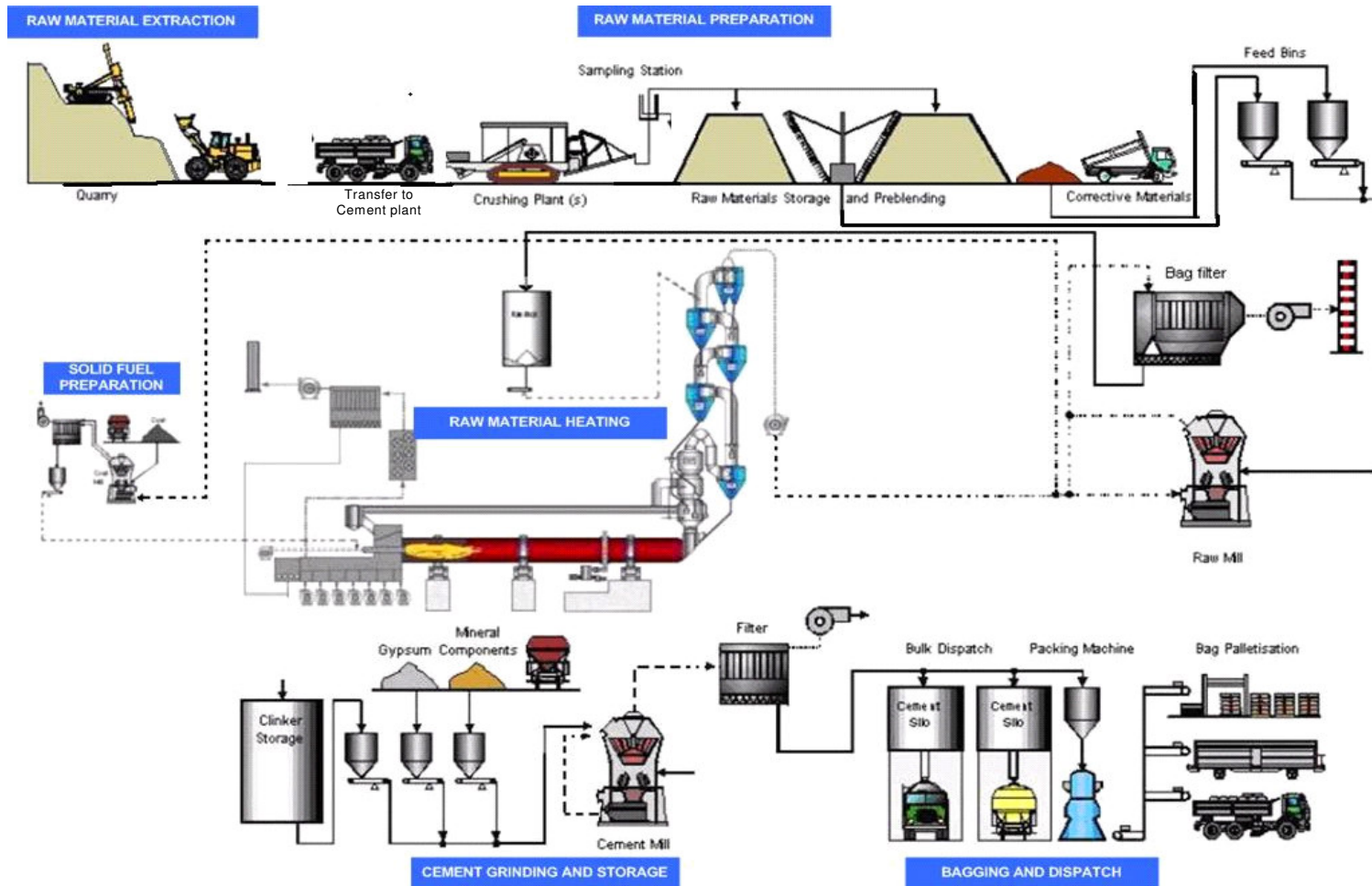
The proposed plant will produce cement from solid raw materials extracted from the adjacent quarries. The raw materials are heated to a very high temperature causing the thermal reactions which produce cement clinker. This clinker is then crushed to produce the cement for sale. A Process Flow Diagram illustrating the process is presented in Figure. A brief summary of each stage of the production process is as follows:

- **Raw Material Extraction:** Extraction of the raw materials is from local quarries. The main raw materials are limestone (chalk) and silica-aluminate (a clay-like material also known as “flysch”). The extracted materials will be loaded on to transporters and taken to the cement plant area. In order to prevent dust emissions during the transport of extracted materials, all raw material preparation will be place in a controlled environment at the cement plant. No crushing will take place at the quarries. In the event that incidental dust emissions do arise at the quarries or during transport of quarried materials to the cement plant, the quarried materials and roadways will be sprayed with water to prevent wind entrainment of the dust.
- **Raw Material Preparation:** Once the raw materials have arrived at the cement plant they are crushed in separate crushers to produce the correct size of stone for feeding into the cement production process. In order to minimise dust emissions at crusher inlets, water curtains will be used. Crushed materials will be stored in large covered stock piles. No crushed materials will be stored outdoors. The process of crushing, stacking and reclaiming for the purpose of feeding into the next stage of the process also achieves raw material ‘pre-blending’. The raw materials then fed in to separate feed bins.
- An iron source and bauxite are also required to make cement and these will be delivered to site from external sources and stored in silos. These materials will be needed in relatively small quantities.
- From the feed bins, the raw materials are fed to the raw mill, where they are ground to a fine powder. Before entering the raw mill, each material is weighed to adjust the chemistry of the raw mix. The ground raw material (raw meal) is transported to the homogenization silo, where it is blended (homogenized), by following a certain extraction sequence as the material leaves the silo.
- At all stages of raw material preparation, appropriate methods will be used to prevent escape of dust, including enclosed conveyors and storage, minimisation of material drops, use of bag filters at the raw mill. All bag filters will be designed and operated to ensure particulate emissions below 30 mg/Nm³, in accordance with industry standards.
- **Solid Fuel Preparation:** The production of cement requires a significant amount of energy. In order to provide this energy, conventional solid fuels are burned, e.g.

coal, petroleum coke or lignite. The fuels will be transported to the cement plant by lorry from local ports. In this case, most probably Durrës. The fuel used in the Antea cement plant will have been extracted overseas. Before being burnt, the fuels, like the raw materials, have to be crushed prior to feeding into the cement production process.

- **Raw Material Heating:** The raw materials are added and heated to high temperatures; the cement “clinker” being formed as a result of thermal reaction. The Antea cement plant will use the most modern and efficient design for undertaking this process. The raw materials are first fed into a 5 stage ‘pre-heater’ heated by hot gases from next stages of the process. The end part of the pre-heater is called the ‘pre-calciner’, where more than half the fuel is burnt and the chemical reactions are well underway. The raw material mix enters the large, horizontal kiln where the remaining fuel is burnt and the final high temperature chemical reactions take place. The produced clinker is then cooled before storage.
- **Cement Grinding and Storage:** The clinker is ground with additives (e.g. gypsum, limestone, fly ash) depending on the quality requirements of the final cement. The cement dust is then stored in large silos.
- **Bagging and Despatch:** Part of the cement will be sold in bulk and will be transported in specialised bulk road transporters. The rest will be bagged on site at a bagging plant, before being despatched to the customer.

Figure 4 - Process Flow Diagram: Cement Production and Associated Activities



Reasons Why the Cement Plant is Needed

The proposed cement plant is needed as:

- It will provide a valuable source of cement for use within the country to support infrastructure development and the national building programme.
- It will reduce the need for Albania to import cement from overseas and act as a source of production of cement that can be exported overseas. This will have a very positive effect on Albania's balance of payments, improving its financial standing.
- It will provide local jobs and improvements to local infrastructure.

Alternatives Considered

The main alternatives to the development of the new cement plant can be summarised as follows:

- Do nothing: This option would mean that the local environment would remain in its present condition, degraded by local land pressures. Choosing this option would also mean that there will be no economic growth as a result of the cement plant development.
- Locate the quarries and plant elsewhere: A location near Torovice, which has appropriate reserves of limestone and flysch, was considered. This location was rejected due to the sensitivity of the local habitat and issues associated with local infrastructure and materials transport.
- Locate the cement plant adjacent to limestone quarry: This is the most convenient location with regards to supply of the bulk raw material, limestone and ease of access to the main arterial road running north to south of Burizana. This area is also socially and ecologically not as sensitive as the Picrraga valley. However, the location high above the agricultural plain means that it will be possible to see some parts of the plant from many kilometres away from certain vantage points.
- Locate the cement plant adjacent to flysch quarry: This will result in more significant industrial development in the quieter Picrraga valley and transport of greater volumes of materials over longer distances because the plant will be located away from the source of its main raw material, limestone. It is usual for the cement plant to be located near the limestone quarry.

Main Parts of the Development

The main characteristics of the project are:

- Construction of an integrated 3 300 tpd clinker production line and cement production facility. Construction will be completed by 2010 and will be undertaken mainly by a specialist equipment supplier from China. The construction of the facility will require the presence of up to 700 Chinese workers on site.
- The opening of a limestone and flysch (silica-aluminate) quarry to supply the major raw materials for the production process.
- Opening of new roads and development of existing roads principally between:
 - The flysch quarry and cement plant
 - The cement plant and the main arterial highway running to Burizana.
- Transport of large volumes of materials along these routes as well as using the established transport infrastructure. Transport will be along roads, using heavy goods vehicles.
- Associated with the development will be the construction of a power line to connect the cement plant with the main existing power line importing energy into the region. The details of the power line, in particular potential routes are being considered at the time of writing this report. The procedures of assessment, as well as the design, construction and operation of the power line shall be in accordance with international standards, specifically those adopted by the EBRD and IFC.

Design and Operational Standards Followed in the Development

It is the commitment of the parent company of Antea, Titan Cement, to design and operate the proposed development to the same standard as its industrial developments in other parts of the world. This also complies with the requirements of the investment partners, the EBRD and IFC.

The design and operational criteria for the facility have been based upon guidance provided by the European Union and the World Bank. The European Union, under its Directive on the control of pollution (Integrated Pollution Prevention and Control (96/61/EC)) has established a benchmark standard for industrial activities. The standard relates to the main aspects of industrial design and operation and sets out the Best Available Techniques (BAT) for prevention and control of pollution. The BAT is detailed for each major industrial activity in a series of documents called the EU BAT Reference (BREF) notes. There is a specific BREF note for the production of cement, which details the suitable design and operational standard

for this industrial sector. This is the main standard adopted by the EBRD investment partner. Similarly, the World Bank Group through the IFC have issued the EHS Guidelines, which detail the requirements for the design and operation of industrial facilities. Within these guidelines are guidelines for the cement industry. This is the main standard adopted by the IFC investment partner. The two sets of guidance are complementary.

Of particular importance to this project are emissions to air and assurance that the plant will comply with the appropriate benchmarks for emissions to air. Oxides of nitrogen are of particular importance when controlling emissions from cement plants. The operator has stated that the plant will be designed and operated to meet World Bank emission limit standards as stated in the EHS Guidelines for Cement Manufacturing. Therefore, the emissions from the cement facility should not exceed:

- Particulates 30 mg/Nm³
- Oxides of Nitrogen (NO_x) 600 mg/Nm³
- Oxides of Sulphur (SO_x) 400 mg/Nm³

These emission limits are comparable with the emission limits required in the EU BREF with the exception of Oxides of Nitrogen. The BAT emission limit for Oxides of Nitrogen as stated in the EU BREF is stated as 500 – 800 mg/Nm³, dependent on the controls used.

Controls on all other pollutants also have to adhere to the guidelines laid out in the aforementioned standards. For all pollutants the maximum concentrations have to be achieved without dilution (i.e. main stack to contain only process gases), at least 95% of the time that the plant or unit is operating, to be calculated as a proportion of annual operating hours.

In contrast to the cement plant, there are no official standards published by the EU or World Bank for quarrying activities. For the purpose of assessing whether the proposed design and operation of the quarries is to a standard that is appropriate (i.e. BAT), an assessment was made using a number of documents issued from Europe, including some legal guidance. A key document used in this respect was entitled Good Environmental Practice in “The European Extractive Industry: A Reference Guide”, produced on behalf of the European Union.

In addition to the use of international design standards for the cement plant, Antea will operate the quarries to the same standards as its parent company does with its quarries in Europe and North America, taking into account local sensitivities in its operational activities. Similarly, the investment partners, the EBRD and IFC, expect the same level of operational management of the quarries as would be expected were the development to be taking place in Europe or North America.

The proposed design and operation provided by the operator indicates that the plant, quarries and associated infrastructure developments will comply with the appropriate World Bank design and operational standards. With regards to emissions of oxides of nitrogen the plant will operate in line with the requirements of Albanian Law and World Bank international standards, but fall short of the strictest BAT requirement stated in the EU BREF. The limits set in the EU BREF are usually achieved through the use of abatement technologies. Antea state that they will operate within the World Bank limits without the need for NO_x abatement technologies. Air impact modelling assessment indicates that there will not be an adverse impact on local air quality as a result of the proposed emissions of oxides of nitrogen. As part of the management plan, the operator will be required to undertake an assessment when the plant is operational of the air emissions impact and whether the installation of abatement technologies is necessary. The plant has been designed to ease the retrofitting of abatement technologies should this be deemed necessary at a later date. These issues are discussed further in this report in the sections relating to the assessment of the technologies proposed (Chapter 4) and in the section concerning the effects on local air quality (Chapter 7). A summary of the conclusions of the assessment are presented in this Non-Technical Summary.

Condition of the Existing Environment

The area surrounding the proposed development site is a semi-natural rural landscape of flat agricultural lowland fields contrasting with hilly or mountainous scrubland. The key characteristics are dramatic, deforested ridgelines with areas of soil erosion and scrub cover whose muted colour and rough texture greatly influences the landscape character. Small settlements and individual properties are scattered throughout the region. The predominant land use is agriculture. Hillier areas are used for grazing up to the point at which they become too steep.

The area of the proposed project development (cement plant and quarries) is open scrub land that is used partly for grazing, hunting, gathering and as a source of wood for fuel. This wood is also used as a fuel for burning limestone to produce material for whitewashing. Limestone burning is undertaken in dedicated pits which scatter the upland areas of this region. The result is an area partially denuded of vegetation other than low lying scrub. Degradation is most evident near villages and on agricultural land on steep slopes; once it has reached this extreme state (i.e. with soil erosion taking place), then floristic composition is affected and meaningful restoration of both soil and vegetation will take many years to achieve.

In order to identify what plants and animals are present at the proposed sites, an animal identification specialist from Atkins and a plant identification specialist from Tirana University undertook field investigations in March 2007. These field investigations were supported by extensive research of the background of the locally occurring plants animals based on previous assessments of the area and region.

Whilst the Burizana area is ecologically diverse the habitat is not unique in Albania. Similar habitats and species are found elsewhere in the region e.g. the Dajti National Park. Nevertheless, because of the phyto-climatic zone in which Burizana is situated and despite the degradation, a range of quite species-rich habitats are represented at each location and along the routes of the proposed access roads. Field visits did not reveal significant differences in fauna present at the two sites, but from the vegetation perspective the flysch area appeared to be the more diverse, while parts of the limestone site are entering a final and severe stage of degradation with soil erosion taking place. Both proposed quarry sites fall within the lowest (of four) altitudinal vegetation zones that have been distinguished in Albania, namely “Sclerophyllous evergreen forest and shrub” (or Typical evergreen Mediterranean vegetation). This zone can be divided further, into 5 well-recognised vegetation types (including macchia and garrigues), representing various stage of degradation.

There are no protected habitats within the proposed development areas nor are they considered to be “Critical Habitat” as defined by IFC’s Performance Standard 6 “Biodiversity Conservation and Sustainable Natural Resources Management” - these being areas with high biodiversity value, including habitat required for the survival of critically endangered or endangered species (according to the IUCN Red List of Threatened Species or as defined in national legislation). Though some plants, reptiles and amphibians found at or near project sites are of conservation concern and are on the Albanian and IUCN Red Lists, these species are widespread at a national and/or European level. The reptiles and amphibians that are on the IUCN Red List are in the “least concern” category, while the plants are not on the IUCN Red List at all.

Climatic conditions of the area are typically Mediterranean; characterized by hot and dry summers and mild, wet winters. The annual precipitation is high around Burizana; nationally the precipitation ranges from 750mm at the coastal areas to 4,444mm at the mountains. The terrain in the Burizana region is crossed by a well developed system of torrents, rivers and streams that discharge into the Adriatic Sea. The River Droje collects water from the Skenderbeu and Shengjergji mountains and, after the village of Shperdhëti, flows into an artificial channel, which consists part of the drainage system of the lowlands of the village Thumana.

Groundwater in Albania is extremely important as it is the only source of potable water. Due to the location of the proposed facility between the coastal delta plains and the rugged mountainous highlands, two types of aquifers are present in the sub-ground of the region. These are porous gravely aquifers and, carbonate, fissured, and karstified aquifers. There is a considerable number of water boreholes drilled and exploited by individuals in the wider area of Rinas – Thumane. Their maximum exploitation rate amounts to 500-600 l/sec or 15,768,000 – 18,921,600 m³ annually.

Effects During Construction

The main contractor for the development is CBMI, a Chinese-based company who has significant experience in similar construction developments. It is expected that a maximum of 700 workers will be on site at any one time and it is planned that they will live in a specially constructed camp. The camp will be located adjacent to the construction site to the east of Burizana and will have all the necessary facilities to make the camp self-contained, including recreational facilities. The construction camp will consist of several pre-fabricated buildings and necessary infrastructure.

The construction activities will include:

- Site clearance, ground modelling and landscaping;
- Utilities and services connections to site;
- Foundation excavations and installation of concrete footings;
- Erection of building steel frames and cladding;
- Installation of equipment;
- Ancillary facilities erection;
- Services and utilities connections;
- Building fitting-out; and
- Commissioning (due for 2010).

The main direct ecological impact resulting from the construction phase of the project will be the loss of vegetation associated with the “clearance” at the two quarry areas, the cement plant and construction camp sites and the access road alignments. With soil and vegetation removed, the habitat for fauna (mammals, birds, reptiles, amphibians, invertebrates) will also be destroyed along with any fauna that cannot readily move away when site clearance takes place.

Translocating vegetation on a large scale is unlikely to be feasible. However, it is Titan’s usual practice to establish forest nurseries in association with its projects. Tree seedlings are used (i) to provide physical screening of quarries and cement plant sites and (ii) for subsequent site restoration. The establishment of one or more nurseries in relation to the two proposed project sites should assist with short-term mitigation and longer term on and off-site restoration of damaged habitat.

Vegetation loss at the quarry and cement plant sites cannot be avoided, but successful restoration, improvement and long term management of the surrounding areas for conservation and productive uses will provide significant compensation. Careful consideration needs to be given to the plant species that are to be raised in a nursery. For

habitat restoration, native species should be used in preference to exotic and/or commercial forestry species, though there may be a role for commercial species if there is local demand for wood-producing plantations. In particular, consideration should be given to the propagation of indigenous herbal species with medicinal and other practical uses. i.e. species that are favoured by neighbouring communities. Species of known biological conservation value should also be favoured i.e. rare or threatened plant species and those known to be important food plants for wildlife, e.g. butterflies.

To achieve this, a “habitat survey and management study” needs to be conducted in and around the two sites in order to:

- (i) assess in more detail the type, distribution and condition of the existing vegetation (and soil cover);
- (ii) assess better the presence and status of fauna, especially species of conservation significance, and
- (iii) develop habitat and species management proposals. This will require close consultation with local scientists and communities to ensure that their requirements are met and that they subsequently comply with any management practices.

It is proposed that seed and other propagation material (e.g. bulbs and cuttings) will be collected for the plant nursery in the area adjacent to the development. A competent horticulturalist (preferably with ecological training or interests) will be required to oversee the collecting of the material, its propagation at the nursery and its subsequent planting). The horticulturalist should also participate in and contribute to the quarry extraction plan with regard to the sequence of the quarries development. With a knowledge of the clearance sequence and time-table and subsequent quarrying schedule, any programmes for surveying fauna and vegetation can be tied into the site-stripping programme. In addition to the horticulturalist, an ecologist will need to be appointed (with some occasional international support if he/she is lacking in experience of ecological mitigation) to contribute to the habitat survey and management study, and to survey and translocate fauna, where this is deemed desirable.

For the quarry access roads, an Ecological Method Statement should be developed in conjunction with the designer/contractor to provide a mechanism to ensure that the necessary protection measures are put in place. Adjustments to the alignment and construction methods will be made to avoid sensitive areas wherever practical and to allow e.g. suitable stream/river crossings to be incorporated.

With regards to emissions to air, construction activities can generate dust that can cause a nuisance to local residents and cause a health risk to construction workers. As the nearest residential receptors are approximately 1 km from the main development site it is considered unlikely that there will be an impact on local people. The main risk is considered to be the exposure of workers on site. Dust control measures, together with the use of appropriate personal protective equipment and appropriate maintenance of vehicles will be used to mitigate this impact. The impact of emissions of vehicle exhaust gases on air quality is considered negligible.

Water in the vicinity of the construction site can become polluted as a result of releases of materials used during construction. Potentially polluting materials will be carefully stored in suitable containment in order to reduce the risk of pollution incidents from spills and leaks. In order to manage the domestic effluent produced at the site which will be an issue particularly during construction with the large numbers of workers present at the site, a sewage treatment plant will be constructed. The plant which is being designed at the time of writing will be designed to take into account the load placed upon it during the construction phase and will be permanent for use treatment of domestic effluent during the operational phase of the project. The final effluent will be released to an, as yet unspecified, location.

Due to the semi-natural rural character of the proposed site, the transitory visual impacts of construction works are expected to be moderately adverse due to the introduction of prominent structures and construction equipment. However, the topography of the area will provide a natural level of screening of the works and the layout of the site will be sensitively planned to use this to minimise negative visual impacts.

The effects of the traffic generated by the construction phase are likely to be moderately adverse when considered within the context of the relatively low volumes of traffic that passes through the local area daily.

Finally, noises levels are likely to be fairly high and any noise associated with construction activities is likely to have negligible impact. Measures to reduce construction noise levels will be included in the Environmental Management Plan and Monitoring Programme.

Overall, with the exception of the impacts on ecology within the boundary of the development area, the construction activities are transitory, and are considered likely to have a minor adverse impact on dust levels and a moderate adverse visual impact.

Effects During Operation

The potential effects of the proposed development during operation can be divided as follows:

- Impacts on air quality as a result of emissions from the cement production process and dust from the quarry activities and crushing and grinding processes. Also, international scale impacts as a result of the emissions of greenhouse gases from the production process.
- Impacts associated with noise, particularly the impact of noise on nearby human receptors.
- Impacts of the plant and quarries by changes to the landscape and visual impacts.
- Impacts on the local ecology by the loss of habitat taken by the development and impacts associated with the operations on the surrounding ecology.
- Impact on the surface water regime (hydrology) by changes to the natural drainage of the landscape within the development area and potential emissions of fine particles (suspended solids) into the water as a result of the industrial activities. Potential release of contaminated effluents into the surface water drainage. Also, impact on the underground water, called groundwater (hydrogeology) as a result of extraction of raw materials for use in the industrial process.
- Use of significant volumes of raw materials and the production of waste on an industrial scale.
- Impacts of transport.

Each of these potential issues is addressed in the following sections.

Effects on Local Air Quality

A detailed study of the potential atmospheric emissions from the proposed cement works was undertaken for the proposed development. This study addressed the emissions to air which may occur during the normal operation of the cement kiln, as well as the minor emissions of fine particulate matter from other process stacks. The aim of this study was to assess the effects of these emissions in terms of ground level pollutant concentrations at ground level. These changes in local air quality were then compared with the European Union (EU) air quality criteria as well as the international World Health Organisation (WHO) guidelines.

The emissions to the atmosphere were modelled using the latest version of the US Environmental Protection Agency (EPA) atmospheric dispersion model AERMOD. This is internationally recognised as an advanced dispersion model and is widely used in industrial

regulation. The model was used with four years of meteorological data from a nearby representative location. The AERMOD model takes account of the influence of major buildings and local terrain on the dispersion of atmospheric emissions. The latter feature of the model is of particular relevance given the location of the proposed plant on a plateau above the town of Burizana, not far from a ridge of higher ground forming part of the foothills of the mountainous region inland.

The assessment focussed on the locations of local residential areas (sensitive receptors) where individuals may be exposed for relevant time periods according to the air quality criteria. The wider surrounding area was also modelled in order to generate graphical results which demonstrate the maximum effects due to the plant. These maximum concentrations occur in the uninhabited areas on higher ground in the surrounding area.

It was concluded that at all sensitive receptors, the maximum changes in sulphur dioxide, carbon monoxide, particulate matter and annual average nitrogen dioxide concentrations due to plant operation are a small fraction of the relevant air quality criteria, and future air quality will remain well within these criteria. The principal emission from the cement kiln is oxides of nitrogen. This leads to increases in nitrogen dioxide concentrations (a secondary pollutant) of a few percent of the hourly EU limit value at most sensitive receptors. However, at Picrraga (Popaj) the plant may contribute up to 25% and at Kruja (Pengile) approximately 15% of the criterion. Given the likely very good existing background air quality in these largely rural locations, air quality will remain well within the hourly limit value.

The overall conclusion from the dispersion modelling study is that when the plant is in operation future air quality will be well within the EU limits and WHO guidelines specified for the protection of human health. These limits are set well below the levels at which there are any observable effects on human health or respiratory function in order to protect vulnerable individuals within the population. On that basis, it is concluded that there will be no adverse health effects in the local population due to the operation of the cement plant.

Screening level assessments of the potential impact from dust emissions from the quarry areas and the potential for pollution from traffic movements associated with the operational phase of the development were also undertaken. Both of these assessments indicated that there will be no significant effects on air quality either as a result of dust emissions from the quarries or due to vehicle emissions.

Emissions of Greenhouse Gases

An assessment of the potential emissions of greenhouse gases from the proposed installation has been undertaken. The assessment concentrated on the main greenhouse gas emission which will be released, which is carbon dioxide. No other significant sources of greenhouse gas are likely to be released as a result of the proposed operations. As with all

cement manufacturing processes, large volumes of carbon dioxide are released as a result of the chemical reactions taking place during manufacture of clinker. In addition, the burning of large volumes of solid fossil fuels to drive the process leads to the release of significant volumes of carbon dioxide. Finally, energy is used to drive auxiliary processes associated with cement manufacture. The energy is delivered as electricity and as in this case is often derived from outside sources rather than generated on site. Most of Albania's electricity is hydro-electric. Hydro-electric power generation does not involve the production of carbon dioxide. The greenhouse gas assessment has taken this into account. However, because of problems with electricity generation within the country of Albania, it is likely that in the short to medium term, most of the electricity will be imported from surrounding countries. In the surrounding countries it is likely that electricity generation is undertaken through combustion of fossil fuels, often through the combustion of coal.

The greenhouse gas assessment indicated that the proposed technology has been designed to minimise CO₂ emissions and is in line with the guidelines for the best available techniques for cement manufacture. Since the cement will be produced locally and used for infrastructure development within the country, this will reduce the greenhouse gases produced to transport cement into the country.

In order to ensure that once operational the cement production process is as energy efficient as possible, the operator will be required to conduct a detailed energy survey 2 years after the plant is fully operational. The aim of the assessment will be to ensure that the plant is operating as efficiently as possible and identify whether it is feasible to adopt measures such as of capture of waste heat for power generation or other uses in order to reduce the carbon footprint of the plant operations. This requirement has been written into the Operational Environmental and Social Monitoring Plan. Additionally, during operation Antea will review the market conditions to identify whether further energy saving technologies could be installed at the site, in particular with view to installing waste to energy plant in the future.

Other Operational Effects

Noise

At the time of undertaking this assessment measured ambient noise data were not available for the local area, and only limited information was available on noise levels from the processing plant, traffic and quarrying activities.

Traffic data has been used to estimate the likely ambient noise levels at noise sensitive receptors and noise source levels for a similar plant in Greece have been used as the basis for the impact assessment. Using this approach it can be estimated that noise levels generated from the cement production plant are unlikely to cause disturbance in any of the nearby communities during the evening or night. There may be some disturbance during the

daytime at the communities nearest to the quarrying activities. This disturbance would be greatest when the quarrying activities are closest to the communities, and before the depth of the quarry provides natural screening of noise to these communities.

Changes in traffic on the local road network when the plant is operational would not give rise to perceptible changes in noise. Properties near the new link roads may be affected by increases in noise from traffic using them.

Vibration is unlikely to be perceptible from any aspect of the project. The company has committed to implement appropriate noise management practices in all aspects of the design and operation of the cement plant, quarry and transport.

A key area of potential noise and vibration emissions is the blasting associated with the limestone quarry. Note there will be no blasting at the flysch quarry. In order to minimise impact of blasting at the limestone quarry, the operator will use internationally recognised techniques of *sequential* blasting in order to minimise the blast wave and therefore reduce any impact of the blasting. Also, blasting will be limited to the daytime.

Landscape and Visual

The landscape and visual impacts will be:

- (i) Change in land cover, use and character, including an increased intensity of activity
- (ii) Visual impact of night time lighting, including the movement of vehicles at night and the provision of above ground utilities
- (iii) Visual impact of the movement of works vehicles and commuter traffic to, from and within the site

Ecology

To reduce impacts on the local ecology as a result of increased human presence, disturbance and exploitation, an educational programme is recommended to inform employees and their families of legal requirements and responsibilities towards wildlife. This should be conducted in a participatory manner since many of the local population may already be well-informed on the renewable natural resources of the area and be a useful source of knowledge. The environmental educational programme could be conducted / facilitated by the on-site ecologist and/or horticulturalist.

Ground, Surface Water and Groundwater

The operation of the facility will incorporate measures to prevent releases to ground, surface water and groundwater. Present, indications are that these will be appropriate to the nature and scale of the installation and that significant impacts should not occur. It is the intention of Antea to extract groundwater from boreholes for use in the industrial activities. Information available indicates that the existing groundwater reserves exploitation rate for water supply and irrigation purposes exceeds by far water requirements for cement production.

Raw Material Use and Waste Management

The bulk of the raw materials used in the production process will be obtained locally from the limestone and flysch quarries. Available information indicates that the company have thoroughly investigated the nature of the raw material reserves and that there should be no issues associated with the use of in appropriate raw materials leading to significant emissions to air from the process. Further, on line testing in the production process will ensure that no unsuitable materials will enter the process. The process produces very little waste and that which is produced will be recycled back into the process.

Waste effluent produced from domestic activities will be treated using a package treatment plant which will be permanently situated at the site and will be operational before the peak of the construction activities. The treatment plant will be designed to take into account the load placed during the maximum number of persons on site. Design details of this plant were being discussed at the time of writing and will comply with the standard GB8978-1996. Review of the available information of the sewage treatment package indicates that the design is appropriate to the load which will potentially be placed upon it. As part of the management programme, the operator is required to submit the final design, location of discharge point and potential impacts, if any, of the discharge.

Transport

Currently access to the plant area is achieved through a road that goes through the village of Burizana. This is clearly a difficult connection especially for heavy vehicles both from the geometric and road safety point of view. A new cement plant connection will be constructed directly to the Shkoder – Fushe Kruja Highway bypassing the urban areas of Burizana and Mamuras. This new connection would directly serve the plant avoiding any interference with village traffic.

A second access to the area between the flysch and limestone quarry locations is provided through a road starting from the village of Mamuras along the northern bank of river Droje. A bridge will be used to connect the two river banks at that point.

It is anticipated that the traffic generated by the construction phase will not have significant impact on current volumes of traffic that use the main arterial highways and the main effect will be the impact on the traffic along the local routes. However, the level of disruption is not expected to be significant and it should be noted that most of heavy transportation connected with ground works will not leave the plant, as excavation material will be stored within the limits of the site area.

The raw materials of limestone and flysch will be transported to the cement plant on new roads between the two quarries and the plant. Limestone will be transported in 90 tonne trucks. There are expected to be approximately 40 limestone truck loads daily. As the road from the limestone quarry is remote from residential areas, it is not expected that there will be any public exposure to emissions from these vehicles. Flysch will be transported in 22.5 tonne trucks, entailing approximately 50 loads daily.

The production of 4,000 tons of products per day will necessitate 200 movements of 20 ton trucks. In order to supply the factory with raw materials it is estimated that 2,300 tons of freight will be entering the plant per day – the equivalent of approximately 120 truck movements per day.

In total, 320 truck trips per day will be needed to adequately serve the factory in the period of full production. This figure is multiplied by 1.3 to provide for future growth and coverage of production peaks. The resulting figure comes up to 420 truck trips per day or an hourly demand of 35 truck trips (for a 12 hour period). This figure translates to one truck movement every 2 minutes in each direction. In conclusion, the maximum traffic demand in and out of the factory is estimated to come up to 120 private cars and 40 heavy vehicles (buses and trucks) for the peak hour per direction. The safety issues to the local communities associated with the development of the roads has been assessed as part of a Transport Safety Study, the results of which are discussed in the 'Social and Economic Issues' section below.

The impacts of the plant operation on the port infrastructure would be the exclusive dedication of half of the Durres Eastern Pier to the plant needs. The remaining half will also be occupied - on a priority basis - for a quarter of the year. As a result the port will receive considerable income and its infrastructure will be upgraded and modernised.

Impacts During Decommissioning

No detailed assessment of environmental impacts associated with decommissioning can be made at present. The plant has an expected lifespan of over 50 years and so only general principles can be established at the present time.

In broad terms, the process of decommissioning is likely to give rise to impacts similar to those experienced in the construction phase. The methods and techniques selected are expected to be in accordance with national and international standards prevailing at the time of decommissioning. Decommissioning will require the:

- Removal of all surface equipment and units;
- Potential removal of hardstanding and surface cover;
- Abandonment of sub-surface utilities or filling and abandonment as appropriate;
- Reinstatement of the site and all project areas to pre-construction conditions. With regards to the rehabilitation of the quarries during operation, the works shall be conducted on an on-going basis in accordance with the accepted timetable set out in the planning proposals to the Albanian authorities.

For the cement plant, Antea will develop a site closure plan during the later stages of project design and maintain the plan throughout the life of the development. The plan should include arrangements for decommissioning the plant in a manner which avoids any pollution and return the site to an acceptable state. In addition any decommissioning plan should take into account the social and economic impacts and include mitigation measures where necessary.

The opportunities the site provides for long term biodiversity conservation purposes should be investigated as part of the site closure plan. There are no identified sites of ecological significance outside the main development areas that should be affected by decommissioning activities, though consideration will need to be given as to the long term use of the access roads to the two quarries. This will depend on their future use. It may be necessary to remove the roads and “re-instate” the ground and vegetation, but maintaining vehicle access or foot access only are also possibilities.

The site closure plan and preceding rehabilitation plans will need to be reviewed and updated in the light of experience with implementing the ecological mitigation and compensation measures – especially the “Habitat Restoration” proposals. These habitat restoration activities will need to be monitored, during the course of the project, so that lessons can be learned and applied prior to and at the time of final site closure.

Overall, decommissioning activities are transitory, and are likely to be similar in magnitude to construction impacts.

Social and Economic Issues

The key impacts of the proposed development relate to four main aspects and these are:

- Employment of construction workers and operation of the construction camp, in particular terms and conditions of foreign worker employment and living conditions;
- The livelihoods of people from Picrraga and Brett whose activities use some of the land to be used by the quarries and cement plan, some of these households are considered as vulnerable households;
- Employment opportunities with Antea and local suppliers to the company and subsequent benefit to the Kruja municipal budget, and
- Road and transport.

The employment of foreign construction camp workers will meet the requirements of the national law for wages, tax and insurance. Foreign workers will have 30 days holiday per year and an annual paid airfare. No details on living conditions and the design of the camp are available at this stage, but mitigation measures for the provision and review of this information and the monitoring of worker quality of life is identified by the ESIA. Worker health, other than minor first aid, will be undertaken through contracts with Tirana based and local services. Major emergencies will be dealt with in Tirana. The Kruja District Health Service with support from Tirana institute for Public Health will provide targeted awareness training for communities who may be more susceptible to different transmittable diseases. A local liaison forum will be established to develop good two-way communications, allowing the information and feedback between the camp and local stakeholders.

A number of households depend for their livelihood on activities that use part of the lands which are to be included in the quarry and cement plant site. Aromatic herb gathering and grazing activities are likely to be the most affected within the boundary of the proposed development. The ESIA identifies the potential scale of these impacts and recommends that a more detailed assessment of the land use by affected graziers and confirmation of the nutritional and financial impacts for grazing herds is undertaken by a livestock and pastures specialist. A full list of herb gatherers earning more than ALL100,000 in 2006 should be identified from aromatic herb sales records. This value takes account of any significant income effects (i.e. greater than 10% of income) as a result of the project, taking into account vulnerable and low income households. Project affected people identified a strong preference for livelihoods compensation to be provided in the form of employment by the new cement plant. The ESIA identifies vulnerable households whose activities and quality of life are expected to be impacted. In the light of the ESIA results and further assessment, Antea is developing a compensation plan. The plan and criteria for eligibility will be informed

by the ESIA base line information. In developing this plan all Project Affected People will be invited to register during a 3 month planning period and an assessment of each case will be undertaken. Project affected people have identified a strong preference for livelihoods compensation to be provided in the form of employment by the new cement plant. This will be taken into account in case assessments. A compensation framework document accompanies the ESIA and sets out the principles which will guide the final plan.

A major benefit of the project will be both the increase in finance available for the Kruja municipal budget and the increase in employment in the area. The current budget for Kruja municipality is circa ALL100 million, or €0.813 million. Local business tax is based on the area of land occupied. It is anticipated that new tax revenue from the cement works and quarries will generate an additional ALL60 million/year or €0.49 million /year to the municipal budget of Kruja.

A total of 400 new jobs are expected to be generated when the quarries and plant become operational. Of these, 43% (including 70 jobs for HGV drivers) are expected be subcontracted and 57% will be as direct employment. Of the 400 jobs, approximately 42% may match the needs of the local population. Approximately 60% of the work will require shift working. It is expected that women may account for 12% of the positions and approximately 95% of positions will be for Albanian nationals and at least initially 5% are expected to be filled by expatriates. It is expected that this will encourage further secondary or induced employment.

The new road which is to be constructed between the cement plant and the Tirana –Shkodra highway is expected to generate a number of impacts. A small amount of private land will be purchased and a compensation mechanism is discussed in the ESIA. It is expected that the road will improve local communications and improve commercial opportunities. This it is believed will be reflected in higher land values, particular for those with land by the road.

A risk assessment of the route has been undertaken and has identified inconvenience and health and safety issues to stakeholders. The study was undertaken by Atkins Highways and Transportation Team in Athens, Greece. It encompassed the proposed roads between the Titan Cement Plant Site and the National Highway Fushe Kruje – Lezhe (NH-PS Road) and between the Flysch Quarry and the Cement Plant Site (FQ-PS Road). The assessment was conducted according to the Methodology for Road Safety Assessment, November 2007, approved by ANTEA CEMENT S.A. Company and the EBRD-IFC. The assessment was conducted to UK Highway Agency and Department of Transport approved standards. The report identified high risk issues associated with preliminary design and therefore has been used to provide additional safety measures into the road design process. High risk issues and their associated mitigation measures can be summarised as follows:

- The use of cuttings into steep sided slopes will induce instability: Appropriate measures such as wire fencing will be incorporated into the design to ensure that no falling rocks or ground will cause accidents.
- The preliminary design did not indicate appropriate facilities for pedestrian walkways or crossings. These will be implemented into the design at the locations where potential problems may arise. Areas where such problems may arise have been identified as intersections, major access / egress locations such as the cemetery and the pilgrimage site and the bridge situated along the route of the road to the Flysch Quarry.
- Lighting not included in the preliminary design that could lead to accidents, particularly at intersections. Lighting is proposed particularly at intersections.
- Lack of planned access to cemetery and pilgrimage sites. The revised design will include improved access facilities to both sites and parking at the pilgrimage site.

In addition measures to manage cyclists and equestrians shall be incorporated. Risk of accident shall be reduced by implementation of education (road safety awareness) programmes and liaison with the local communities as well as driver training programmes and implementation of near-miss/accident reporting procedures. As part of the exercise proposed closed silo lorry lease agreements and contractual terms should be reviewed. The Commune is to consider need for any additional safety bylaws or regulations for local business activities near roads.

Impact Summary

In summary the main potential environmental effects resulting from the development are likely to be associated with the following:

- Loss of local habitat. Potentially, with appropriate management of the surrounding area, an improvement to the local ecological conditions could be made.
- Visual impact of the construction and operation of the cement plant and local quarries.
- Local noise impacts will dominate particularly during the construction phase. The noise impact of the plant during operation is likely to be negligible. Noise impacts of the quarries, particularly the limestone quarry blasting could be intermittently significant but unlikely to lead to nuisance. Increased transport may have an effect in some local areas along the route of the new roadways but is unlikely to be significant on the main highways.
- Emissions to air both in respect to local air emissions and international greenhouse gas emissions.

- Releases to ground, surface water and groundwater. The development will not have any routine discharges. However, emissions to ground, surface water and groundwater may occur in the absence of proper controls during all phases of the development (construction, operation and decommissioning).
- It is anticipated that the traffic generated by the construction phase will not have significant impact on current volumes of traffic that use the main arterial highways and the main effect will be the impact on the traffic along the local routes. However, the level of disruption is not expected to be significant and it should be noted that most of the heavy transportation connected with groundworks will not leave the plant, as excavation material will be stored within the limits of the site area.
- Socio-economic impacts on the local and regional area, both positive and negative.

A summary of these effects, the mitigation measures and the environmental monitoring plans are found in the tables below.

Summary of Construction Phase Impacts and Proposed Mitigation Measures

AIR			
Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Air quality - dust emissions during construction and ground works	Development of procedures for : <ul style="list-style-type: none"> - water spraying roads and dusty materials stockpiles - sheeting vehicles carrying dusty materials on leaving the site to prevent materials being blown from the vehicles - speed limits on unmade surfaces on site to limit dust 	Dust propagation will be limited to construction area and will not influence local community. However workers should be supplied with dust masks especially in dry days.	Minor adverse

GROUND AND WATER			
Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Importation of pollutants already present within the materials to be used for filling and site levelling operations	Ensure that pollutants are not present in materials imported onto the site by appropriate selection of source material and chemical analysis if required	Potential for importation of pollutants in the material will be minimised	Minor adverse
Accidental release of fuels, oils, chemicals, hazardous materials, etc, to the ground, especially in the construction lay-down area, during deliver to the site	Appropriate procedures and protocols to be established and monitored for materials delivery and handling	Potential for accidental release during delivery of materials to the site will be minimised	Minor adverse

GROUND AND WATER			
Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Accidental release of fuels, oils, chemicals, liquid waste, hazardous materials, etc, to the ground, especially in the construction lay-down area, during storage	All storage areas will have appropriate environmental security measures to prevent accidental release to ground	Potential for accidental release of materials during storage on the site will be minimised	Minor adverse
Accidental release of fuels, oils, chemicals, hazardous materials, etc, to the ground, especially in the construction lay-down area, during transport to the area of use	Appropriate procedures and protocols to be established and monitored for materials transport and handling whilst on the site	Potential for accidental release of materials during transport within and handling on the site will be minimised	Minor adverse
Accidental release of fuels, oils, chemicals, hazardous materials, etc, to the ground, during use, for example, re-fuelling, maintenance, etc.	Appropriate procedures and protocols to be established and monitored for materials handling and use. Where possible, re-fuelling and maintenance areas will include some form of secondary containment	Potential for accidental release of materials during use will be minimised	Minor adverse
Accidental release of liquid wastes during removal from site	Appropriate procedures and protocols to be established and monitored for waste materials removal	Potential for accidental release of waste during removal from the site will be minimised	Minor adverse
Accidental discharge of sanitary wastewater to ground and groundwater from the workers camp	Sanitary waste will not be discharged to the ground	None	Negligible/Nil
Contamination of local water ways from proposed effluent plant discharge	Ensure that the plant complies with local and international standards and guidelines. Final effluent should have no significant negative impact on the receiving water. The plant should be designed so as to be able to cope with	Potential for release of harmful of effluent if the facility is underspecified or not managed correctly.	Minor adverse

GROUND AND WATER			
Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
	the load of the full construction camp.		
Discharge of pollutants in water used for plant, equipment and vehicle washing to ground	Washing activities will take place on areas with appropriate containment and procedures and protocols will be established and monitored to ensure that the preventative measures are efficient	Potential for accidental release of pollutants to the ground during washing activities will be minimised	Minor adverse
Increase of sediment load in natural aquatic receptors resulted from direct runoff disposal	Minimisation of excavations face during construction Temporary drainage grooves and sedimentation ponds for surface runoff collection	None	Negligible
Natural aquatic receptors degradation due to direct disposal of domestic type wastewater	Construction of appropriate sewage system and wastewater treatment facility.	None	Negligible
Groundwater contamination from leakage of polluting substances	Usage of non-hazardous construction materials for human health and environmental protection. Storage of potential polluting materials in appropriate areas, including secondary containment. Any contaminated land occurred during construction will be directly removed and disposed off in hazardous waste landfill sites.	None	Negligible

MATERIALS USE AND WASTE MANAGEMENT			
Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Waste generation	Reuse of soil Introduction of waste storage and control procedures Segregation and recycling of waste	Waste for disposal will be disposed of through the municipality	Minor adverse

ECOLOGY			
Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Burizana Area – Cement Plant and Quarry Sites			
Loss of vegetation on site clearance	<ul style="list-style-type: none"> - Translocate soil and some vegetation to help restore neighbouring eroded areas - Habitat Restoration Programme including “Habitat Survey and Management Study” (especially of neighbouring areas, to be defined, and in close co-ordination with local ecologists and communities); Seed Gathering; Nursery Establishment - Propagation of threatened species (Albanian Red List) such as <i>Quercus ilex</i>, <i>Salvia officinalis</i> to be included. - Survey and Ecological Method Statement for Access Road Construction (Appoint Project Ecologist) 	Vegetation loss cannot be avoided but successful restoration, improvement and long term management of the surrounding areas for conservation and productive uses will provide significant compensation	Severe adverse (Flysch site) to moderate adverse (Limestone site) and Moderate to substantial beneficial (neighbouring restoration areas)
Further land take (habitat loss) for temporary Construction Camp	Build temporary construction camp on land that will in due course be required for quarrying	No additional impact since land take would occur anyway at quarry site	Negligible / Nil
Destruction of fauna and habitat for fauna (mammals, birds, reptiles, amphibians, invertebrates)	Further ecological/fauna survey at appropriate seasons and translocations monitored by the company specialist	Moving fauna to neighbouring sites may help short-term survival, but not medium-term if these sites are already occupied. In long-term populations may recover on restored sites	Minor adverse

ECOLOGY			
Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Increase in exploitative pressures on habitats neighbouring the sites	Conduct and implement “Habitat Survey and Management Study”, in close consultation with local communities	With co-operation of local community and project providing alternative source of income, habitats should be improved.	Moderate to substantial beneficial
On ecology of surrounding area by temporary foreign workforce as a result of removal of vegetation (for firewood, medicine) and the capture of wildlife	Education, monitoring and enforcement programme. Adequate waste management and sanitation facilities.	Implementation may be difficult and some impact can be expected	Minor to moderate adverse (depending on implementation)

LANDSCAPE & VISUAL			
Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Damage to the landscape character and visual amenity due to introduction of incongruous features and activities	Sensitive planning of site works and compound Advance structure planting Minimise lighting and night time workings	Some exposure to alteration of the landscape character and loss of visual amenity, predominantly due to off site activity	Minor to moderate adverse impact

NOISE AND VIBRATION (incorporating Transport)			
Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Noise from construction of new plant/quarry and link roads	Good site management; Appropriate choice of machinery; Methods of working; Hours of working;	Until further details are known, it is not possible to predict whether there may be noise increases at nearby residential properties.	N/A

NOISE AND VIBRATION (incorporating Transport)			
Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
	Efficient material handling;		
Noise from traffic relating to construction using existing roads through local residential areas	<p>Define access routes to the site with the smallest number of properties in proximity to it.</p> <p>Keep vehicle movements to a minimum.</p> <p>Once link roads are completed, all construction traffic to/from the site should only use the link roads.</p>	There may be noise increases at residential properties in proximity to the chosen access route, and then from the link roads once completed.	Minor adverse

SOCIAL			
Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Foreign worker health problems may impact on work and wage payment	Specification by CBMI of reasonable sickness benefits and sick leave with pay	Sickness over specified period will affect earnings. Early return to work may damage health.	Minor adverse
Worker - industrial emergency	Contracted quality curative treatment in Tirana for all emergencies.	Depends on nature of emergency	Minor adverse
Foreign worker living conditions and quality of life. Utility and service provision impacts on local villages.	CBMI to provide Titan with detailed specification of camp layout, facilities, and utility provision (and disposal) in accordance with identified international standards. Titan to monitor health and safety and terms and conditions of employment. To do this a Chinese speaker should be part of the team	Depends on individual worker susceptibility. If conditions are poor multitude of issues could arise in camp and spill into local communities.	Minor / Moderate adverse
Disturbance and conflict in camp	In- camp codes of conduct and enforcement of key behaviours and reasonable use of alcohol	None identified	Minor adverse
Disturbance and /or conflict with local population	Camp code of conduct upheld by workers and enforced by camp. Provision of employment and opportunities to local population to minimise hostility. Liaison committee to identify early issues and their resolution	Some residual impact expected but scale limited by worker free time, and local interaction with camp	Minor / Moderate adverse
Opportunities for local procurement	Titan /Antea to arrange initial contacts and encourage CMB to maximise local procurement	Unless Titan provide financial incentives or contractual requirements to CMBI this may be unlikely to happen	May vary from negligible to moderate beneficial depending on the effort and incentives

SOCIAL			
Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
	<p>Titan should provide a trained facilitator to examine business opportunities and issues from CMBI and local provider points of view.</p> <p>Antea should provide consultant to support business development initiatives and ensure projects are financially sustainable</p> <p>Provision of support by Titan and /or concessionary terms (not subsidies) by CBMI to assist new supply businesses.</p>	Poor community relations if community sees no commercial benefits from the camp	provided by all parties.
Potential for increased incidence of sexually transferable disease (STD) in local populations and amongst workers	<p>Preventative health awareness campaigns for STDs provided to foreign workers and targeted at key urban locations / groups.</p> <p>Provision of free condoms in pharmacies and toilets or similar common access facility.</p>	Difficult to identify cause or source of such disease as this is commonly hidden and poorly reported. However some disease may be spread and curative treatment may be required for the different diseases, in case of HIV this would be of a long term nature.	Moderate (possibly severe) adverse -

Summary of Operational Phase Impacts and Proposed Mitigation Measures

AIR QUALITY			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Release of combustion gas emissions from the kiln stack	Primary operational management control techniques.	Local air quality will be well within the EU limits and WHO guidelines specified for the protection of human health at all relevant locations. On that basis, it is concluded that there will be no adverse health effects in the local population due to the operation of the cement plant.	Not significant
Release of particulate emissions from the kiln, the clinker cooler, the coal mill and the cement mill.	Bag filters – dust abatement.	Local air quality will be virtually unaffected in Burizana and will remain well within the EU limits and WHO guidelines specified for the protection of human health.	Negligible
Release of dust emissions from the quarry operations.	Use of best practice management techniques during extraction and loading.	It is unlikely that there would be any discernable adverse effect due to dust deposition at any residential properties.	Negligible
Release of combustion emissions from transport associated with transport of materials to and from the site.	Use of new, efficient vehicles, driver training to minimise emissions (e.g. prevention of over revving, shut off engines when vehicles not in use), rationalisation of traffic management system to optimise transport efficiency.	Localised minor effects on air quality at properties very close to certain roads, but increments a very small fraction of air quality criteria.	Negligible

SURFACE WATER AND GROUNDWATER			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Increase of sediment content in surface waters due to fugitive dust dispersion.	<p><u>For cement plant:</u></p> <p>Stormwater management through ditches and/or gutters and settlement ponds.</p> <p><u>For quarries:</u></p> <p>Quarrying face will be kept minimal.</p> <p>Gradual rehabilitation (through landscaping and planting) of the locations where extraction works have been completed.</p> <p>Stormwater management through peripheral ditches and settlement pond.</p>	None	Negligible
Degradation of surface waters quality due to process water direct disposal or leakage of polluting materials.	<p><u>For cement plant:</u></p> <p>Process water circulation is closed circuit including settlement tank for treatment.</p> <p>Storage of fuels for cement production in enclosed storage area.</p> <p>Tidying the plant on regular basis with mechanical sweepers removing dust collected on the streets and gutters.</p> <p>Thorough washing of surfaces in case of polluting materials spillages and further processing of collected washings as special waste.</p> <p><u>For quarries:</u></p>	None	Negligible

SURFACE WATER AND GROUNDWATER			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
	Appropriate collection and transportation of potential polluting materials (e.g. spent oils, lubricants, etc.)		
Pollution of surface water due to release of harmful/untreated sewage.	<p>The sewage treatment system will be peak for peak demand during construction phase and therefore will cope with the demands during operational phase.</p> <p>No hazardous liquids will be released in to the sewage treatment system. The provision of a large balancing tank before final release will act as a storage unit in the event of accidental release into the sewage system.</p>	None	Negligible
Soil Erosion	<p><u>For cement plant:</u></p> <p>N/A</p> <p><u>For quarries:</u></p> <p>Gradual rehabilitation of locations where extraction works have been completed.</p>	Soil erosion will be limited on-site the quarries.	Minor adverse
Ground and Groundwater contamination.	<p><u>For cement plant and quarries:</u></p> <p>Secondary containment for potential polluting materials.</p> <p>Any contaminated land removal and disposal to appropriate hazardous waste sites.</p>	Potential contamination will be limited on-site.	Minor adverse

SURFACE WATER AND GROUNDWATER			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Groundwater depletion.	<p><u>For cement plant and quarries:</u></p> <p>Surface water abstraction to cover process water demand is not viewed as an option, as existing groundwater reserves are considered adequate.</p> <p>Controlled water abstraction either through boreholes located on-site or through boreholes located towards Burizana plains.</p>	Existing groundwater reserves exploitation rate for water supply and irrigation purposes, exceeds by far water requirements for cement production.	Negligible

LAND QUALITY			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Accidental release of fuels, oils, chemicals, hazardous materials, etc, to the ground during deliver to the site	Appropriate procedures and protocols to be established and monitored for materials delivery and handling	Potential for accidental release during delivery of materials to the site will be minimised	Minor adverse
Accidental release of fuels, oils, chemicals, liquid waste, hazardous materials, etc, to the ground during storage	All storage areas will have appropriate environmental security measures to prevent accidental release to ground	Potential for accidental release of materials during storage on the site will be minimised	Minor adverse
Accidental release of fuels, oils, chemicals, hazardous materials, etc, to the ground during transport to the area of use	Appropriate procedures and protocols to be established and monitored for materials transport and handling whilst on the site	Potential for accidental release of materials during transport within and handling on the site will be minimised	Minor adverse

LAND QUALITY			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Accidental release of fuels, oils, chemicals, hazardous materials, etc, to the ground, during use, for example, re-fuelling, maintenance, etc.	Appropriate procedures and protocols to be established and monitored for materials handling and use. Where possible, re-fuelling and maintenance areas will include some form of secondary containment	Potential for accidental release of materials during use will be minimised	Minor adverse
Accidental release of liquid wastes during removal from site	Appropriate procedures and protocols to be established and monitored for waste materials removal	Potential for accidental release of waste during removal from the site will be minimised	Minor adverse
Accidental discharge of sanitary wastewater and wastewater to ground	Sanitary wastewater will not be discharged to the ground Wastewater sumps and pits will be newly constructed. Pipework will be inspected periodically	None	Negligible/Nil
Discharge of pollutants in water used for plant, equipment and vehicle washing to ground	Washing activities will take place on areas with appropriate containment and procedures and protocols will be established and monitored to ensure that the preventative measures are efficient	Potential for accidental release of pollutants to the ground during washing activities will be minimised	Minor adverse

ENERGY AND GREENHOUSE GAS BALANCE			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Use of solid fuels and direct and indirect greenhouse gas emissions	Ensure that combustion and processing is as efficient as possible by appropriate maintenance activities.	Emissions of greenhouse gases	Moderate adverse

MATERIALS USE AND WASTE MANAGEMENT			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Storage of solid and liquid wastes	Inspection of all waste storage areas to ensure appropriate segregation and containment	Potential releases into the environment.	Minor adverse
Waste management	<p>Arrangement of all solid waste management licences and permits</p> <p>Establishment of waste management disposal/recycling techniques and appropriate choice of contractor</p> <p>Establishment of filter dust handling procedures and choice of the contractors</p> <p>Hazardous waste disposal techniques to be established</p> <p>Review of waste minimisation and recycling options for all wastes</p>	<p>Waste management will be covered by internal procedures and will be regulated through local state regulations.</p> <p>Increased quantity of waste will be disposed of off site.</p> <p>Increase in recycling/reuse of waste generated</p>	Minor adverse

ECOLOGY			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Burizana Area – Cement Plant and Quarry Sites			
Dust deposition on leaves leading to loss of vegetation productivity and health	<p>Belts of trees to provide local screening</p> <p>Reduce dust emissions at source</p>	Some dust emissions at the quarry sites, associated with blasting etc, are inevitable, but emissions and impacts can be kept to an acceptable level by use of latest technologies and best working practices	Minor Adverse

ECOLOGY			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Productivity and quality of vegetation for herbivores reduced	Asphalt quarry access roads	Some impact is probably inevitable.	Minor Adverse.
Disturbance of wildlife by noise	Reduce at source	There should be some habituation to lower reduced noise levels by some wildlife, but more sensitive species may avoid the project areas	Minor Adverse
Disturbance of wildlife by human presence and activities	Environmental educational programme On-site ecologist	Full compliance is unlikely and some illegal hunting and gathering can be expected. There should be some habituation to human presence by some wildlife, but more sensitive species may avoid the project areas	Minor to Moderate Adverse
Wildlife "Road-Kills" along access roads	Ecological Survey Ecological Method Statement Road Warning Signs Driver Briefings	With compliance, road-kills should be reduced but some are still inevitable	Minor Adverse

LANDSCAPE AND VISUAL			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Damage to the landscape character and visual amenity due to introduction of incongruous features and activities	Cut off light sources and minimise night time workings Sensitive colouration of plant and vehicles Minimise the window between working and restoration phase of quarry	Some exposure to alteration of the landscape character and loss of visual amenity, predominantly due to off site activity	Minor to moderate adverse impact

LANDSCAPE AND VISUAL			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
	operations		

TRAFFIC AND TRANSPORT			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Increased heavy vehicles traffic both locally and nationally	<p>Maximise the use of the rail network for bulk deliveries and abnormal loads.</p> <p>Restricting delivery hours to reduce noise nuisance; avoid heavy truck movements in the night hours</p> <p>Considering whether deliveries should be scheduled to avoid peak times to reduce congestion;</p> <p>Heavy construction traffic will be subject to a traffic management plan, as necessary.</p>	The traffic has the potential to contribute to congestion and lead to complaints due to noise/vibration nuisance on a local basis. However, the transport study indicates that there will not be a significant impact.	Minor Adverse

NOISE AND VIBRATION			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Noise from cement plant	None recommended unless the plant and various installations differ significantly from similar established plants used as a reference.	None expected	Nil
Noise from quarrying activities	<p>Good site management;</p> <p>Appropriate choice of machinery;</p> <p>Methods of working;</p> <p>Hours of working;</p> <p>Efficient material handling;</p> <p>Construction of noise barrier or baffle</p>	There may be noise increases at residential properties in proximity to the quarry site boundary.	Minor Adverse

NOISE AND VIBRATION			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
	mound;		
Noise from increases in traffic on the local and wider road networks	None recommended on existing roads due to no predicted perceptible increases in noise levels due to the extra traffic.	None expected on existing roads. Noise level increase possible for residential properties in proximity to the new link roads.	Nil
Noise from traffic on new link roads	A possible need for noise barriers on the new link roads depending upon their proximity to residential properties and the number of properties likely to be negatively affected.	There may be noise increases at residential properties in proximity to the link roads alignments.	Minor Adverse

SOCIAL			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Increased Employment (positive change)	<p>Measures to maximise local employment and improve local skill base recommended.</p> <ul style="list-style-type: none"> Local recruitment of young people currently being trained outside the area Enhanced apprenticeship / training for some local people whose skills could be improved Positive selection and prioritisation of employment of PAP's Identification of targets of local people to be employed by skills level Publication of local employment 	This depends on skills of the young people and interest to return to home area, and on the opportunity offered by Titan and targets set.	Major beneficial

SOCIAL			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
	<p>targets in local newsletter.</p> <ul style="list-style-type: none"> Recruitment policy to extend in future to limited sponsorship BSc (or equivalent) for workers / local people children 		
Increased municipal tax and budget (positive change)	<p>Assistance to villages to formulate projects and strengthen advocacy if requested by Liaison committee.</p> <p>Money from improved budget can be used to realise these objectives. Antea cement may be prevailed on to offer skills training for improved planning and project formulation</p>	<p>Increased municipal budget for Kruja district</p> <p>Residual impact will depend on effectiveness of allocation process in favour of affected villages. A poor process would cause conflict / discontent</p>	Major beneficial
Electric and other infrastructure improvements (neutral or positive if realised)	None identified. This will be a “windfall” benefit (or benefit external to the project) if it occurs.	Potential impact on amenity through visual impact.	Neutral / Minor beneficial
<p>Loss or reduction of livelihoods for:</p> <p>Lime Producers (negligible / minor adverse)</p> <p>Herb Gatherers (medium adverse)</p> <p>Graziers (minor adverse)</p>	<p>Confirmation of potential impact on animal nutrition and impacts on production and budgetary implications’ by grassland specialist/livestock productionist following pasture (and livestock) inspection and assessment of stocking density and energy requirements.</p> <p>Confirmation of earnings from herbs to be obtained from wholesaler records, or by base line study.</p> <p>Prioritisation of employment or other</p>	<p>PAP’s have in the main identified a preference for employment rather than other forms of compensation.</p> <p>No household will loose their livelihood, and the income from employment (full or part time) of one or more household members, or alternative compensation, should be sufficient to compensate for expected reductions in the affected activities.</p>	Neutral / minor beneficial

SOCIAL			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
	<p>appropriate form of compensation for each affected household (identified in the confidential Appendix (See Appendix 2) and confirmed by the measures above).</p> <p>Antea to consider feasibility of job share schemes, and gender sensitive arrangements (e.g. for child care arrangements).</p> <p>Annual monitoring of change in activities and incomes related to herb gathering, lime burning and grazing herds as well as other dynamic changes in activities and incomes from employment by Antea cement to be monitored annually during construction and in the first years of operation. Reporting to investors and via CSR report and Liaison forum. Specific attention to be given to vulnerable households.</p>		
Extended and Improved Road and implications for local economy (minor/moderate beneficial)	<p>Regulations relating to roadside and commercial activities to be adhered to by business persons and enforced by Commune.</p> <p>Monitoring of health, road safety issues. Curative and preventive action to be taken if issues identified by monitoring.</p>	<p>Improved opportunities should be seen in increased opportunities and wealth of village. It may be difficult to apportion this only to the new road or cement works given the current increasingly dynamic economic environment.</p> <p>Residual impacts of noise and dust for local residents near the road and indirectly affected.</p>	Minor (/moderate) beneficial

SOCIAL			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Loss of land and property for 4 -9 households and compensation (minor beneficial / minor adverse)	An appropriate compensation plan should be developed and agreed. See separate compensation plan framework document.	No negative residual impact should be incurred by PAP's. The assessment should include <u>all</u> applicable entitlements Monitoring process to review and report.	Negligible / minor beneficial
Hazards associated with development of new roads from main intersection to the cement plant and from the flysch quarry to the cement plant.	<p>With regards to identified 'high' risks:</p> <ul style="list-style-type: none"> - Design measures to ensure landslips/falling rocks do not cause accidents - Inclusions of pedestrian walkways and crossings - Lighting, particularly at intersections. - Planned access and parking, specifically in relation to the cemetery and pilgrimage site. <p>In addition measures to manage cyclists and equestrians shall be incorporated.</p> <p>Risk of accident shall be reduced by implementation of education (road safety awareness) programmes and liaison with the local communities as well as driver training programmes and implementation of near-miss/accident reporting procedures.</p> <p>As part of the exercise proposed closed silo lorry lease agreements and</p>	Some residual impact is expected but should be limited by implementation of aforementioned mitigation measures.	Moderate adverse – possibly severe adverse if there is disregarded for safety issues by the road users.

SOCIAL			
Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
	contractual terms should be reviewed. Commune to consider need for any additional safety bi laws or regulations for local business activities near roads.		
Roadside residents health and quality of life	Risk assessment to cover these aspects and identify mitigation. Health records of dust related disease to be maintained by local health workers. Quality of life questionnaire to monitor noise and disturbance Further mitigation to be decided on basis of noted impacts via monitoring.	Depends on both cases a) effectiveness of monitoring undertaken b) corrective measures taken – depends on severity of case e.g. treatment may not solve the problem – extreme health issue may require re housing However numbers involved are expected to be no more than 20 households at most though consequences for individuals may be severe.	Minor/ moderate adverse
Cultural and heritage site: Boke e kuge (positive impact)	The pilgrim site Boke e Kuge will be more easily accessible by motorised transport. However the road should not pass next to the site, but allow for a connecting access road / drive.	Improved easier and faster access	Minor beneficial

Summary of Site Closure Impacts and Mitigation Measures

Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Emission prevention	Development of Site Closure Plan	Updated information on risks and requirements is available at site closure	Minor Beneficial
Dust emissions during ground works	Water spraying roads Sheeting vehicles carrying dusty materials Speed limits on unmade surfaces Dust emission monitoring in selected points	Dust propagation will be limited to demolition area and will not influence local community. However, workers should be supplied with dust masks especially in dry days	Minor adverse
Discharge of silty and contaminated storm water to surface water. Ground contamination by leakages from machines	Potentially polluting materials will be stored in dedicated storage areas Machines and equipment technical condition will be reviewed periodically Machines and equipment will be sited on hard surfaces All storm water will go via sedimentation ponds and oil separation Procedures for finding contaminated material during excavations will be established Covering and damping of excavated materials Appropriate storage of contaminated material if found	Ground contamination and storm water contamination will be limited on site by proper handling and storage of materials and equipment. Storm water will be treated in sedimentation ponds, the impacts on overall quality of discharge wastewater will be minor	Minor adverse

Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
Disturbance of bats or birds that may have colonised the cement plant structures	Survey, translocation, demolition at appropriate times of year	Some disruption of breeding still possible while adapting to new sites	Minor Adverse
Some loss of flora and fauna that are re-colonising quarry	Some loss of flora and fauna that are re-colonising quarry	Quarry Restoration Plan incorporating habitat creation and use of native species	Depending on proposed future use of quarry, habitat creation could lead to significant improvement for biodiversity over value when used as an active quarry
Damage to the landscape character and visual amenity due to introduction of incongruous features and activities	Restoration of the plant and quarry sites including a reforestation programme.	Return of the sites to existing to better than existing condition	Minor beneficial
Solid waste generation	Segregation and recycling of waste and proper storage in isolation from the ground	Solid waste will be managed by local waste contractors and disposed according to their permits and in compliance with local regulations.	Minor adverse
Noise and emissions generated by vehicles	Traffic management plan Use of rail traffic for bulk transportation for abnormal loads	Local traffic congestions problems avoided.	Moderate adverse
Noise from decommissioning of plant and quarry	Good site management; Good choice of machinery; Methods of working, including sequential blasting; Hours of working; Efficient material handling; Construction of noise barrier or baffle	Until further details are known, it is not possible to predict whether there may be noise increases at nearby residential properties.	N/A

Environmental Impact	Proposed Mitigation	Residual Impact	Residual Impact Rating
	mound; Maximising separation distances		
Emergency situations during construction works	Local fire and emergency squads available on-site Availability of Antea and contractors inspectors on site	Procedures for prevention of handling with emergency situations will be implemented. Proper training and equipment need to be delivered to the staff.	Minor adverse
Social impacts There will be job losses	An exit strategy should be devised to minimise losses and assist redeployment. It should include options for retraining / early retirement / assistance in job searches and positioning / identification of jobs within the group and possible relocation assistance.	Plans to re-deploy workers will be developed	Moderate adverse

Construction Phase Environmental and Social Monitoring Plan

Items	Measures	Responsibility	Schedule
Noise/vibration from construction traffic	Ensure construction traffic only uses pre-determined routes to access the sites until completion of the link roads. Once link roads are completed, all construction traffic to/from the site should only use the link roads.	Contractor	During construction phase
Dust	Constant visual vigilance of dust issues throughout the construction phase is necessary. All activities should be assessed for the potential for dust creation prior to their undertaking. Observation of the weather conditions is particularly important.	Contractor/ Antea	Throughout the construction phase but particularly when undertaking activities or handling materials which may lead to dust creation problems.
Communications	Compile and maintain register of environmental and social communications including complaints. These can be made through the existing grievance mechanism.	Antea	Suitable preventive and corrective action to be taken if required. Actions to be recorded in register.
Accidents and Incidents	Compile and maintain register of environmental accidents and incidents	Antea	Suitable preventive and corrective action to be taken if required. Actions to be recorded in register.
Waste	Visual inspection of waste storage, collection and disposal areas. Records to be maintained of inspections.	Antea	Monthly inspections. Suitable preventive and corrective action to be taken if required
Waste Effluent	Ensure that the proposed effluent treatment plant is of an appropriate specification to prevent significant impact to the receiving water way. When details of the effluent treatment plant are available the operator is required to submit full details of the water treatment plant (including its	Antea	As soon as the design of the effluent treatment plant is available and before it is commissioned for use during the construction phase of the rest of the development.

Items	Measures	Responsibility	Schedule
	management requirements) the expected loads, the quality of emissions, the emission point, the quality of the receiving water and the potential impact on that water.		
Storage areas	Visual inspection of all materials (including fuel) storage areas. Records to be maintained of inspections.	Antea	Monthly inspections. Suitable preventive and corrective action to be taken if required
Ecology Terrestrial	Belts of trees to provide local screening Environmental educational programme Access Road Wildlife Monitoring Quarry site monitoring Monitoring of Habitat Restoration Programs	Antea/Titan Specialist Drivers Specialist	Every 2 weeks Every 2 weeks Every 2 weeks and prior to clearance Monthly with annual reports
Ecology – Marine (Port)	Monitoring of vessels (waste disposal practices) Monitoring of shore-based solid and liquid waste disposal facilities	Antea/Titan	Routine review of documentation and spot checks Every 6 months and occasional spot checks
Socio-Economic: Camp planning	Provision of camp specification and plans against international “norms” Review of specification and identification of amendments Codes of conduct developed /agreed and provided for information to Liaison Forum	CBMI Titan to review with advice from Liaison forum CBMI	Prior to development of camp Prior to development of camp Prior to development of camp
Socio-Economic: Standard of Construction worker accommodation	Worker questionnaire and inspection	Titan	Quarterly

Items	Measures	Responsibility	Schedule
Socio-Economic: Standard of Construction worker catering	Worker questionnaire and inspection	Titan	Quarterly
Socio-Economic: Construction worker quality of life	Worker questionnaire, Site visit This and other questionnaires to be undertaken Chinese speaker trained and experienced in labour standards and issues.	Titan	Quarterly
Socio-Economic: Construction worker quality of life	Construction worker accommodation suggestion box	Titan /Antea and CBMI contractor	On-going
Socio-Economic: Resident quality of life	Liaison forum or committee to be formed. Members to include: community representatives, local authority and health representatives and Antea and CBMI camp representative(s). To monitor a list of potential issues /concerns (including road accidents, local transport availability, health aspects, potential conflict and others issues) on a regular basis, identify early preventative measures and emergency actions.	Antea and CBMI contractor and Mayor of Kruja and Chairman Thumana	Monthly
Socio-Economic: Health monitoring	Identify indicators and provide statistics of worker health	Camp Doctor	Monthly
Road Safety Measures	Implementation of physical measures proposed in Road Safety Study to minimise road safety issues. Implement awareness campaign of road safety issues. Resident comments to be included and considered in the final design/safety issues;	Antea	Design and construction of roads, before operation.

Items	Measures	Responsibility	Schedule
	Ensure driver contracts are contiguous with responsible driving. Implement road safety awareness/training to drivers prior to operation.		
Socio-Economic: New Road PAP's compensation process	<p>Verification that:</p> <p>Entitlement leaflet</p> <p>Process statement</p> <p>AVF valuation document</p> <p>Entitlement table</p> <p>Produced, with adequate detail and distributed to all stakeholders</p> <p>Grievance processes – number of complaints / issues identified and their status</p> <p>Monitoring of compensation transaction process to be undertaken by Commune. Report to be provided to Antea for annual reporting to investors and to local inhabitants</p>	<p>Chairman and lawyer of Thumana council.</p> <p>Chairman</p> <p>Reporting to Commune council & Forum</p> <p>Director of Services Department, and Lawyer Thumana Commune</p>	<p>At times specified for information production in Section 6 – 10 of this report.</p> <p>Monthly till end of construction.</p> <p>On dates agreed in compensation process.</p>

Operational Environmental and Social Monitoring Plan

Items	Measures	Responsibility	Schedule
Emissions to air from main stack	<p>Constant monitoring of the key parameters and spot sampling of secondary parameters.</p> <p>Monitoring equipment and methods shall be in accordance with:</p> <ul style="list-style-type: none"> ➤ National Albanian requirements ➤ The EU BAT Reference Document for Cement and Lime Manufacturing Industries. ➤ The guidelines set out in the IFC's EHS Guidelines for Cement and Lime Manufacturing. 	Antea	Throughout the operation of the plant from commissioning to closure of the plant.
	<p>The daily averaged air emissions from the main stack shall not exceed the following primary limits (mg/Nm³):</p> <ul style="list-style-type: none"> ➤ Particulate Matter: 30 ➤ SO₂: 400 ➤ NO_x: 600 <p>The operator shall also observe the limits for secondary parameters (HCl, hydrogen fluoride, dioxins-furans etc) as stated in the IFC's EHS Guidelines.</p>	Antea	Throughout the operation of the plant from commissioning to closure of the plant.

Items	Measures	Responsibility	Schedule
	<p>Consideration of the necessity for installation of abatement equipment significant emissions from the cement plant.</p> <p>The operator is required to present a report which considers the emissions from the installation against the benchmarks, the potential reduction of local air quality as a result of the emissions and the impact on sensitive receptors. The assessment should also take into consideration the proposed future operations of the plant, particularly the main fuel to be used.</p>	Antea	The report should be submitted to the IFC and EBRD within three years of start up of the cement plant.
Emissions from other parts of the installation	Dust Emissions from clinker cooling, cement grinding etc shall not exceed 50 mg/Nm ³	Antea	Throughout the operation of the plant from commissioning to closure of the plant.
Fugitive emissions to air	Constant vigilance and regular visual assessment of dust emissions.	Antea	Throughout the operation of the plant from commissioning to closure of the plant.
Operational Noise – Health & Safety	<p>Noise Monitoring programme. Noise levels in operational areas of the plant should be measured, and the risk of damage to hearing arising from high noise levels.</p> <p>Staff working in areas of high noise levels should undergo training and regular hearing checks.</p>	Antea	<p>High Noise Levels areas should be identified when expected noise levels are available, and verified once the plant is operational.</p> <p>Staff training and hearing checks should be ongoing.</p>
Protection of ground and groundwater	<p>Fuels, chemicals, liquid wastes and potentially hazardous materials will be kept in designated storage areas.</p> <p>Refuelling will be effected with a mobile bowser with suitable secondary containment and spill protection equipment.</p>	Antea	Secondary containment for all storage tanks and containers above 20-litres in total capacity (including loading areas) must be used. These must have impervious surfaces, free of voids; gaps, cracks and the material used must be compatible with the materials contained. The total bund capacity must be at least 110 % of the volume of the largest container or tank in the

Items	Measures	Responsibility	Schedule
	Plant maintenance and plant/vehicle washing will be carried out in dedicated areas with spill containment		<p>storage area;</p> <p>Proper maintenance of the secondary containment must be undertaken to keep debris, vegetation, leaked hazardous materials and storm water from accumulating;</p> <p>Roofs or covers should be constructed over transfer areas to minimize contact with surface water;</p> <p>All storage areas should be located in areas away from main construction activities and heavily trafficked routes;</p> <p>Areas must be kept dry and free of combustible materials; entrances, exits and aisles must be clear and unobstructed;</p> <p>Adequate lighting and ventilation must be provided;</p> <p>The areas must be secure from unauthorized access;</p> <p>All spills and leaks must be cleaned up promptly;</p> <p>Hazardous materials should be stored away from other storage areas.</p> <p>Suitable spill kits should be provided at all storage areas and at other suitable locations across the site. Workers should be trained in their use.</p> <p>All storage areas must be visually inspected at least monthly and the inspections recorded.</p>
Landscape and Visual	<p>Monitor soil erosion and establish a planting scheme, including advance planting with the aim to reduce erosion due to deforestation</p> <p>Monitor the establishment of on and off site planting with a permissible failure rate of with no</p>	Antea	To be agreed

Items	Measures	Responsibility	Schedule
	<p>more than 10% per year</p> <p>Manage access via the proposed access roads to reduce illegal stone mining</p> <p>Phase the quarry works and localised restoration to minimise the extent of exposed quarry face and window between extraction to restoration</p> <p>Monitor biodiversity enhancement through annual surveys</p>		
	Monitor the impacts of lighting through night time surveys	Antea	To be agreed
Waste	<p>For all waste streams (solid and liquid) data should be kept of:</p> <p>Waste quantities</p> <p>Physical form and containers used/packaging</p> <p>Disposal/treatment route</p> <p>Final disposal point</p> <p>Recycled/reused quantities</p> <p>All in house waste disposal/treatment facilities suitable monitoring/inspection in accordance with the relevant permit/license and legislation.</p> <p>Any breaches of legal requirements, including permits must be reported immediately.</p>	Antea	Monitoring data and a statement on compliance with this EMP shall be reported in the Annual Monitoring Report to Lenders.
Waste waters	Regular inspection of drainage and all waste storage tanks (including domestic) will be included in the wastewater monitoring plan.	Antea	<p>Frequency and methods will be determined before the beginning of the work of the plant.</p> <p>Monitoring data and a statement on compliance with this</p>

Items	Measures	Responsibility	Schedule
			EMP shall be reported in the Annual Monitoring Report to Lenders
Energy	<p>Regular internal energy inspections on the plant; testing and tuning of burners, boilers etc and so on will be undertaken annually by competent experts.</p> <p>Ensure that energy management is as efficient as possible.</p> <p>Undertake detailed study of the plant efficiency once the plant is operational to assess whether waste heat recovery for power generation or any other purpose is viable.</p>	Antea	<p>Monitoring data and statement on compliance with this EMP shall be reported in the Annual Monitoring Report to Lenders</p> <p>Recommended that this assessment be undertaken and submitted two years after the plant has become fully operational.</p>

Item/ Performance Criteria	Measures	Responsibility	Schedule
Determination of impacts on PAP's	<p>Monitor vulnerable household cash income over process of construction and operation</p> <p>Livestock production expert to identify key questions and monitor</p> <p>Monitor herd productivity and cash sales during construction and operation identifying any reasons other than the project affecting this.</p> <p>Grievance mechanism or early indicator system to be established via forum and village representative member.</p>	<p>Titan</p> <p>Titan to employ production specialist</p> <p>Specialist</p> <p>Liaison Forum</p>	<p>Bi annual</p> <p>Quarterly</p> <p>Base line questions and information collected at initial herd/pasture determination of impacts visit then Quarterly</p> <p>Quarterly report – more frequent if identified by representative</p>
Employment and other compensatory measures	<p>Monitor local employment and skill levels against established targets</p> <p>Employment of PAP's, any reasons for non-employment to be given and alternative solution reported. Forum to arbitrate if contacted by PAP.</p>	<p>Titan,</p> <p>Liaison Forum</p> <p>Titan to monitor and report to Liaison forum</p>	<p>Annual</p> <p>Monthly until all PAP's employed,</p>
Communication policies and stakeholder engagement	<p>Satisfaction and use questionnaire to all attending. Activities identified on communications to be completed and summarised by forum and questionnaire results to be reported in Titan CSR activities and appropriate Antea reports</p>	<p>Liaison Forum /Titan</p>	<p>To be agreed</p>
New Road	<p>Health of residents near road in relation to dust and associated diseases.</p> <p>No. of visits and no. cases diagnosed.</p> <p>By age group</p>	<p>Director, Health Centre, Thumana reporting to Liaison committee</p>	<p>Quarterly</p>

Item/ Performance Criteria	Measures	Responsibility	Schedule
	<p>Quality of life of road side residents (noise and disturbance)</p> <p>Questionnaire (developed by independent specialist)</p> <p>Asked and analysed and recommendations by independent organization paid by Titan.</p> <p>Monitor the number of near misses / incidents associated with transport to and from the site on both roads.</p> <p>Identify accident/potential accident hotspots</p> <p>Detail measures undertaken to make further improvements to road safety.</p>	<p>Titan / Commune Thumana to instigate.</p> <p>Reporting to Liaison Forum to consider action</p> <p>Antea H&S/EHS Co-ordinator</p>	Annually