Advisory Review of the Obajana Cement Manufacturing Complex in Nigeria

28 July 2004

055-160

ISBN 90-421-1380-4
Utrecht, Commissie voor de milieueffectrapportage

Advisory Review of the Obajana Cement Manufacturing Complex in Nigeria

Advice submitted to the FMO Nederlandse Financierings Maatschappij voor Ontwikkelingslanden NV (Finance for Development) , by a working group of the Commission for Environmental Impact Assessment in the Netherlands.

Technical Secretary — Chairman

Arend Kolhoff — Klaas Jan Beek

Utrecht, 28 July 2004

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The effects on biodiversity and on the use of biodiversity by the people (e.g. fuelwood, fruits, medicinal plants) have been considered in the different EIA reports but the cumulative impacts have not been considered. Due to the changes in land use a large habitat area will be lost completely. In an area adjacent to the site the quality of the biodiversity will be affected negatively. No reference was made to the occurrence of rare habitats or endemic species. The planned mitigation measures will help to avoid negative impacts such as fish migration. 24
In the EIA report it was stated that the following changes in land use will take place: 24
- 4.4 hectares is required for the cement factory and thermal power plant and an additional 0.5 hectares for compounds. The actual size of the site is estimated at approximately 100 hectares and the compound area 50 hectares. 24
- The size of the reservoir and dam is mentioned to be 130 hectares. Due to lack of contour maps this could not be verified but the total 24
reservoir including the infrastructure around the reservoir is estimated to be more than 150 hectares. 25
- The prospecting license is provided for 20 km2. A mining license is provided for 9 km2, which equals 900 hectares. Construction of an 8 km 25 meter wide road to the quarry results in another 20 hectares of land use change..... 25
In total at least 520 hectares of a habitat described as Guinea Savannah type of vegetation will be lost. The area that will be affected is at least two to four times this size. 25
The Commission is of the opinion that due to the considerable loss of biodiversity and consequently the use of biodiversity products opportunities for compensation should be elaborated. One could think of the following options: 25
- Establishing a forest reserve or a game reserve in the upstream catchment area(s) of the Adankolo and/or Mimi Rivers. 25
- Extension of an existing forest or game reserve located in Kogi State. 25
- Financial compensation; a national ecological fund exists so the Dangote Group could deposit an amount of money that will be spent for biodiversity conservation in the country.. 25
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1. INTRODUCTION

1.1 General

This advice has been prepared by the independent Netherlands Commission for Environmental Impact Assessment (hereafter called "the Commission")[1] at the request of FMO, the Netherlands Development Finance Company. It presents the review findings of (draft) Environmental Impact Assessment (EIA) reports for an integrated cement production complex in Nigeria.

1.2 Setting of the project

The Dangote Group of Nigeria have conceived and launched a project to construct an integrated cement production factory of 5 million tonnes per year capacity at Obajana in Kogi State, Nigeria. For a map of the area, please view Appendix 6 and 10. The principal rationale behind the project is substitution of imports of cement with Nigerian cement production. The Obajana Cement Company has been formed to manage this factory with the Associated Cement Company (ACC) of India being retained as consultants for the design, construction and commissioning of the factory. ACC will also be awarded a contract to manage, operate and maintain the factory after commissioning and full handover of the factory by the civil and equipment contractors. This management contract will include extensive training of Nigerian staff in the institutions and cement factories of ACC in India.

The Obajana cement factory will be supplied with marble, clay, laterite and marl raw materials from a dedicated quarry to be opened up at a distance of 8 km from the factory. The factory will comprise two cement production lines with the kilns being fired by natural gas through a new pipeline from Ajaokuta, 90km distant. The factory will consume 1.8 million tons of water per year requiring the establishment of a dam to ensure continuity of supply through the dry season. There will be no discharges. Power for the factory will be provided by a dedicated power station comprising three 45MW gas fired engines driving turbines.

This integrated project requires four separate environmental impact assessments for:

- The quarry
- The cement factory and power plant
- The construction of a dam
- The gas pipeline

The cement factory, power plant and the dam and reservoir are all located in the catchment area of the Adankolo River (local name Oinyin River). The quarry is located in another catchment area, known as the Mimi River.

[1] The Netherlands Commission for Environmental Impact Assessment is an independent advisory body, has a legal basis and was established in 1985. For more information see the website: www.eia.nl

Two communities are affected by these aforementioned project components; Obajana community, which is located close to the site of the cement factory and Oyo-Iwa community that is located close to the quarry.

The gas pipeline project affects the lands of the communities and farmers that coincide with the Right of Way for the pipeline over a distance of about 90 km.

1.3 Request for advice

By letter dated 11 June 2004 FMO requested the Commission to advise on the four EIA reports dealing with the execution of this project, see Appendix 1 for the request. This advice will be used by FMO for decision-making on financing of the Dangote group for the execution of the Obajana cement manufacturing project.

This advice has been prepared by an international working group of experts of the Commission from Belgium, Nigeria, The Netherlands and the United Kingdom. The group represents the Commission and comprises expertise in the following disciplines: mining, cement manufacturing, dam construction, pipeline engineering, safety, ecology, geography, sociology and public participation. For the composition of the working group, please view Appendix 2. The experts visited Nigeria from 20 June – 27 June 2004 to draft this advice. During this visit meetings with authorities took place, communities were consulted and the site was visited, please view Appendix 3 for the program.

1.4 Legislative and procedural setting

In accordance with relevant Nigerian law, a number of EIA reports are required to obtain the necessary permits and licenses to execute this project. An overview is provided in table 1.

Table1: Overview of the procedural and actual situation on June 26, 2004

Component	**Actual situation**	**EIA report**	**License / permit**	**Operational**
Mining	Site was cleared in July 2003	Planned to be available for review July 2004	Mining license provided by Federal Min. of Solid Minerals No approval yet by Federal Min. of Environment	January 2005
Cement factory & power supply plant	Site was cleared in June 2003. Construction started in April 2004	Draft EIA available Final EIA planned to be available in July 2004	Provisional approval by Federal Min. of Environment	Line 1 June 2005 Line 2 October 2005
Dam construction	Dam construction started May 2004	EIA report planned to be available for review July 2004	Not yet approved	December 2004

Gas pipeline	Right of way cleared June 2004 Preparations on the ground stopped by IFC on 21 June 2004	Draft EIA report available Final EIA report planned to be available for review July 2004	OPL license approved by Federal Department of Petroleum Resources Provisional approval by MoE based upon draft EIA report	June 2005

1.5 Justification of the approach

The aim of this review is to check whether the EIA reports contain sufficient information to guarantee the full integration of environmental and social considerations in decision-making. The EIA reports should be adequate and should not contain inconsistencies. If essential shortcomings are found, the importance of this lack of information for decision-making will be assessed and recommendations will be given for gathering supplementary information. An essential shortcoming is a shortcoming in the EIA report that, if not remedied, will hamper the decision making because it leaves a serious gap in information and/or it leaves major uncertainty and/or unacceptable risks untouched.

In consultation with FMO the Commission made use of the following international guidelines [2] and directives to review the EIA reports:

- World Bank guidelines for cement manufacturing and thermal power stations, open pit mining;
- Dutch standard for steel pipeline transportation systems NEN 3650;
- Experience of the Commission with comparable projects.

The Commission has studied the Nigerian EIA procedure and the relevant sectoral guidelines and concluded that they are comparable or less stringent than the above-mentioned guidelines. For that reason a separate review of the Nigerian guidelines has not been executed.

For the review the Commission made use of the available EIA reports and additional primary and secondary information. For an overview please view Appendix 4.

The five main components of the project subjected to EIA, were already under construction when the Commission executed the review. This gave the Commission the opportunity to verify on site if the different project components were executed in accordance with the description in the EIA report and/or the

[2] The most common rule to define a large dam is that of ICOLD (International Commission of Large Dams), founded in 1982 and advancing the art and science of dams. It has some 6,000 individual members and National Committees in 80 countries. ICOLD defines a large dam as one that is over 15 metres high, above their lowest foundation. The Obajana River dam has a design height of 14.5m. Consequently at the design stage it is not a large dam but during the work stages and after the overburden removal until the sound bed-rock that can be found locally at a larger depth, it is not excluded it would become a large dam. If it would be the case, the dam would have to fulfill the large dams requirements.

license. The findings of this verification have been included in the assessment.

1.6 Outline of this advice

In chapter two the most important conclusions and recommendations are listed. In chapter three of this advisory report, the assessment findings of the different EIA reports are presented and all conclusions and recommendations are given.

2. MAIN CONCLUSIONS AND RECOMMENDATIONS

The Commission has come to the conclusion, that crucial information in the EIA reports is missing. This information is considered to be essential for adequate management of the environmental and social aspects of this project and should therefore be supplemented.

The execution of the EIAs for the cement factory & power plant, quarry and the construction of the dam should have started earlier in the process. Construction work for these activities started without approval of the EIA reports by the Federal Ministry of Environment. Consequently, important decisions have already been made for instance on water use for the project, location of the factory, compounds and dam. However, there are still opportunities to mitigate the most important negative impacts.

Below in section 2.1, the Commission lists the main conclusions and essential shortcomings, identified in the EIA reports. In section 2.2 a number of recommendations are given which should be acted upon before decision-making takes place. The justification for these recommendations can be found in the corresponding paragraphs in Chapter 3.

2.1 Main conclusions

2.1.1 Quarry

The EIA report is incomplete, with significant gaps in the provision of information and therefore does not contain sufficient information for decision making. Shortcomings are:

- The site description and the mining stages are not accompanied by clear drawings, sketches or cross sections.
- The EIA report does not demonstrate that top soil heaps and tailings have been properly designed.
- The hydro-geological information is incomplete: information on groundwater depth, ground water flow direction, hydraulic conductivity and effective porosity is missing.
- The consequences of the (re)use or release of replenished groundwater on the river discharge have not been described.
- The design, related work and impacts of the diversion of the Mimi River and a few smaller streams crossing the site have not been addressed.
- Disposal of waste material has not been considered.
- The EIA report does not contain information on decommissioning.

2.1.2 Cement factory and power plant

The EIA report does not sufficiently demonstrate that the cement factory and power plant will fully comply with the World Bank guidelines. Additionally the following items have been omitted:

- The 8 km conveyor belt and overhead transmission lines, forming the links between the cement factory and the quarry have not been considered in the EIA reports.

- The kilns on the factory have the provision for being fired by gas or oil and the power station engines could be modified to be fired by diesel. In the event that insufficient gas is available, the kilns and turbines will need to be converted to liquid fuels. The option and related impacts of firing by oil/diesel have not been considered.
- Transport of cement and gypsum will involve 500 to 1000 truck movements per day. Related environmental and social impacts have not been considered.
- The trace metal contents of the raw materials have not been investigated.

2.1.3 Dam construction

The information in the EIA report is in general of good quality, but lacks:

- A visual inspection report of the dam basement after final excavation, results of in-situ water tests and Proctor tests to demonstrate the technical feasibility of the dam at this site.
- An integrated watershed management plan for the river Adankolo (Oinyin) to provide insight in the water availability and the opportunities for use.
- A map with a clear reservoir area delimitation.
- An assessment of hazards of leakage.

2.1.4 Gas pipeline

The EIA report is incomplete and does not meet international standards. Serious flaws can be summarised as:

- The most environmentally friendly routing of the pipeline has been elaborated in the EIA and approved by the Ministry of Environment. Observations on the ground showed that the cleared right of way did follow another shorter (cheaper) route not respecting safe distances to communities.
- A safety analysis has not been included for the Kabba-Lokoja junction.
- A quality plan or quality management system for the design and engineering of the pipeline has not been included. A reinstatement plan is missing and therefore it is not clear which mitigation measures will be applied during and after construction.
- Information on a secured supply by the Oban-Ajoakuta gas pipeline to the Ajoakuta-Obajana gas pipeline has not been addressed.
- Although individual compensation seemed to satisfy the affected people, community compensation was not considered in the EIA report.

2.1.5 General social and environmental issues

The EIA reports do not contain sufficient information on socio-economic impacts, compensation and biodiversity loss. For instance:

- Compensation of individual farmers meets Nigerian standards but the payments do not meet the actual loss and are inadequate to start new economic ventures. Compensation of the affected communities has not clearly been determined. Opportunities to compensate the loss of biodiversity e.g. by establishing a reserve have not been considered.
- The population growth in the adjacent communities (in particular Obajana) will be considerable, but the impacts have not been considered. A social/community management plan has not been made by the Dangote group. Urban planning is required to secure community services and avoid the occurrence of squatters. This needs to be done in collaboration with the Kogi State Government.

2.1.6 Social and environmental management

The Commission observed that the management of the Dangote Group had a positive attitude towards the importance of environmental and social issues. However, the following plans are not in place:

- Occupational health, safety and environmental management plan, including a waste management plan.
- Water management plan.
- Social management or comparable plan that aims to consult and support the communities affected by the project has not been included.
- Monitoring plans for the above mentioned issues.

2.2 Recommendations

2.2.1 Quarry

The Commission recommends supplementing the EIA report with:

- Plan views and cross sections of the site for the initial stage, after 5, 10 and 15 years. In the plan views are indicated: the working levels, the access trails and gradients, the overburden and topsoil heaps, the crusher and the drainage system. The final stage includes the landscaped proposal. On the cross sections the ground water level should be indicated.
- Information on top soil heaps and tailings: bulk estimation at different stages and related balance), location, slope calculation. At any work stage a drainage system at the upper part of the tailings and on the slope of the tailing has to be designed properly in order to avoid erosion.
- Appraisal of the hydro-geological situation, which requires additional fieldwork. The use of groundwater should be determined.
- Design of the Mimi River diversion and streams crossing the site.
- Integration of the outcome of the ground water appraisal and the additional study on the diversion of the river and streams into the Mimi watershed management plan. This should be part of project water management plan (see 3.7).
- Integration of information on the waste material disposal into a larger waste management plan. This plan should include the waste generated at the plant, the compound and Obajana village. Information should be provided on the preferred waste treatment, recycling or disposal. The identification of a landfill site and the proper design of the landfill is a main issue (see also 3.7).
- A comparison of storing of the explosives at the plant site versus the proposed storing close to the quarry.
- A decommissioning plan.

2.2.2 Cement factory and power plant

The Commission recommends supplementing the EIA report with:

- A description of impacts and necessary mitigation measures of firing the kilns of the factory by oil and the power station engines by diesel.
- Details of the conveyor belt and power transmission lines between the factory and quarry including related impacts.

- Implications of up to 1000 heavy vehicle movements per day on the road network around the factory, including mitigation measures.
- Information on the trace element contents, in particular lead and chromium, to reassure that these metals will not be released into the environment in the gaseous and particulate emissions from the cement factory.
- An iso-fallout chart for the plume from the main factory exhaust stacks showing the concentrations of particulate emissions that can be expected at ground level based on prevailing wind directions in the dry and wet seasons. This chart should also show any communities which lie within the fallout zone of these plumes.
- Details of the ACC operation and maintenance contract, as well as details of the planned training, in order to demonstrate that the Obajana cement factory will be adequately operated and maintained.

2.2.3 Dam construction

The Commission recommends to provide additional information on:

- The results of a visual inspection report and in situ water after rock and soil removal and before dike construction.
- A reservoir contour map, an assessment of the reservoir slope stability and the leakage through the geological structures.
- The integration of the dam in a larger water management plan, including the water balance of its watershed, the watershed of the Adankolo River and the (future) water requirements at the plant, the villages and the compound.

2.2.4 Gas pipeline

The Commission recommends supplementing the EIA report with:

- The clear description of the actual pipeline, with figures showing the pipeline route in the geographical context on clear and large-scale maps. Potential financial consequences of the realignment should be indicated.
- A proximity survey, giving the distances of the (EIA) pipeline route to houses, schools and special premises. Classification of the environments the pipeline crosses through should be included (the pipeline is designed for a class III environment).
- The applicable minimum distances, derived from international standards and/or Nigerian policy.
- The Operations and Maintenance aspects of the pipeline project.
- A safety analysis of the pipeline, especially at critical points such as the Kabba–Lokoja junction.
- The safe operating parameters of the Oban-Ajaokuta pipeline, the remaining life expectancy of this pipeline the capability to service the demand of the cement factory and, if required, the Ajaokuta Steel Company should milling operations be resumed, should be demonstrated by further analysis and be verified through independent review.
- A reinstatement plan with a specific section on (civil engineering) measures to mitigate the negative environmental impacts.
- Information on compensation for communities that are affected most by the presence of the pipeline. This type of compensation, determined on basis of a community plan or programme and in close co-operation with the main stakeholders (government as well as non-government), could

create important support for the pipeline during construction and the lifetime of the pipeline.

2.2.5 Environmental and social management

The Commission recommends:

- the Dangote group to draft health, safety and environmental management policies. These policies should form the basis for the required health, safety and environmental plans, including water and waste management plans as well as a monitoring plan. A social management plan should be developed in co-operation with the affected communities. Suggestions for the contents of these plans are given in section 3.6 and 3.7.
- To consider options for compensation of biodiversity loss, because at least 520 hectares, but probably 2 to 4 times this size of habitat will be lost. Section 3.6 lists some opportunities.

3. ASSESSMENT OF THE EIAS

3.1 Introduction

The assessment findings of the EIA reports for the various main components are described in the different sections of this chapter 3.2 – 3.5. Impacts affecting communities and biodiversity in the vicinity of Obajana are caused by the following project components: cement factory & power plant, dam construction and quarry. This is why they are dealt with in a separate section (3.6). In the last section (3.7) the environmental and social management aspects of the entire complex are elaborated.

3.2 Quarry

3.2.1 Description of the project

The major raw material for cement production is marble. The Obajana cement factory will get its marble requirements for the next twenty years from Oyo – Iwa community approximately 8 km from the factory site. A prospecting license of 20 km2 has been acquired from the Federal Government although 9 km2 will be exploited in the first 20 years (the Oyo-Iwa community was informed about the use of 9 km2 only). The mine area is located on the southern side of the Mimi River, 2 km from the Oyo village on the other side of the river. Marble will be blasted and crushed at the quarry and will be transported to the factory by an 8 km conveyor belt.

3.2.2 Assessment of the EIA

The EIA provides an adequate description of the surface water and soil characteristics. Some cartographical documents in the EIA report would have improved the site description. A geological map and at least three geological cross sections, including the marble body and its identified boundaries, micaschist at the north-east and migmatite at the south-west should be available. Within the marble body metrical micaschist or sand inclusions are

found, however due to their low quantity and their rather random location they do not affect the cement process (see maps, appendix 7 & 8)

The geological survey proves the available quantity of marble that will be the resource material for the cement production to be sufficient for the next 20 years. The body has a surface of 0.7 km X 1.6 km and 0.3 km X 0.5 km or 1.3 km2 and a volume roughly estimated at 55 million m3. Other major marble bodies in the close vicinity of the present sites up to 9 km have been identified; the confirmation of the corresponding reserves is underway. The geological map of the site is available and there is sufficient data to establish convincing geological cross sections.

The description of the works: the equipment list has been supplied, the different mining working stages have been described. After removing the topsoil (1.5m) and the lateritic overburden, the marble body will be mined in three levels of 15m each, until a maximum depth of 45m. For the last level ground water abstraction is required. Two main stages are planned, the first is at the south-east of the Mimi River, the second is at the north-west including the marble below the river itself.

The site description and the mining stages have to be completed with drawings and schemes including cross sections. Clear drawings or sketches have to be added to the EIA for the following four situations: the initial stage, after 5 years, after 10 years and 15 years. Each plan view will be accompanied with at least two cross sections. In the plan views are indicated: the working levels, the access trails and gradients, the overburden and topsoil heaps, the crusher and the drainage system. The final stage includes the landscaped proposal. On the cross sections the ground water level should be indicated.

Top soil heaps and tailings have to be properly designed, with bulk estimation at different stages (each 5 years) and related balance (what is disposed, what is used to fill the pits), location of the tailings (it would be preferred to store the barren material above the pegmatite or above the micaschist), slope calculation, drainage system at the upper part and the slope of the tailing (there are numerous examples of poorly designed tailings having initiated dramatic erosion phenomena). At any work stage a drainage system at the upper part of the tailings and on the slope of the tailing has to be designed properly in order to avoid erosion. There is no need to fill shafts, they will not be existing. As the tailing will only be slightly acid (pH of the laterite), there is no need to line the tailing with a geomembrane. The topsoil heap has to be separated into tops soil (1.5m) and arable soil (the upper 0.3m).

Hydro geological description; at present the depth of the groundwater occurrence is not known, main hydrodynamic parameters have not been determined such as ground water flow direction, hydraulic conductivity and effective porosity. This information is of major importance to assess the working design and the potential impact of ground water on the work in the open mine. Additional fieldwork is required to gather this information.

Ground water; the use, reuse or release of the replenished groundwater has not been defined. Its consequences on the river discharge, though crucial during the dry season, has not been estimated and consequently no mitigation is foreseen.

The main river (Mimi River) running along the different marble bodies and a number of smaller streams crossing the site have to be diverted. The design, the related work and the impacts have not been addressed.

The explosives (ammonium nitrate) to blast the marbles are stored in a fenced shelter close to the quarry. If, from a safety point of view this is appropriate, one would prefer the shelter to be located for instance at the plant site where the security could be better guaranteed.

Disposal of waste material has not been considered.

Post mining work situation or decommissioning: no details of the after work situation are given. Just a number of general recommendations regarding mitigations are given. Here again a plan view with adequate cross sections is required. It includes the Mimi River situation, the after mining ponds and the refilled areas.

3.2.3 Conclusion of the review

The EIA report is incomplete and does not meet World Bank standards for open pit mining. The following main issues have not been considered: cross sections of the site over time, hydro-geological situation, erosion mitigation, diversion of the Mimi River and a decommissioning plan.

3.2.4 Recommendations

- The description of the site and the mining stages, including design of top soil heaps and tailings have to be completed with drawings and schemes including cross sections.
- Drainage system at the top of the tailings, waste and material disposals (even if temporary) have to be designed.
- Appraisal of the ground water at the quarry site should be carried out and therefore additional field investigations have to be done. The use of the ground water should be determined.
- The diversion design of the main river and of the streams crossing the site have to be defined. A plan view and the related earth works are required.
- The outcome of the ground water appraisal and the additional study on the diversion of the river and streams should be integrated in a watershed management plan for the Mimi River.
- Storing of the explosives at the plant site should be considered and compared with the proposed storing close to the quarry.
- Waste material disposal has to be integrated into an overall waste management plan.
- A decommissioning plan should be made.

3.3 Cement factory & power plant

3.3.1 Description of the project

State of the art new cement manufacturing equipment from FL Smidth of Denmark is being installed with cement packing equipment from Haver and Boecker of Germany. The gas turbine power station will be supplied by Gen-

eral Electric from the USA. Civil construction is being carried out by Julius Berger, Nigeria, steel erection by Petron, and fabrication by Arab Contracting of Egypt. Dangote Group are managing the construction with ACC acting as consultants.

3.3.2 Assessment of the EIA

The EIA report does not adequately demonstrate that the cement factory and power plant will fully comply with the World Bank guidelines as detailed in Appendix 5. In addition the following items are not adequately considered in the EIA report. These concern the interface of the factory with the associated elements of the project and the local environment, infrastructure and communities in particular.

Cement Factory and Power Plant

The quarry and cement factory will be linked by an 8km belt conveyor which will be mounted on gantries some 5m above the ground. In turn, the quarry will be supplied by power from the cement factory power station also requiring 8 km overhead transmission lines. These links between the factory and the quarry have not been considered in the EIA report.

The capacity of the gas supply pipeline is questioned in section 3.5, which leads to further questions regarding the draft EIA for the factory. The kilns on the factory have the provision for being fired by gas or oil and the power station engines could be modified to be fired by diesel. However, the EIA does not take into consideration the additional impacts (e.g. additional truck movements) which would be involved in the event of firing with liquid fuels becoming necessary.

Process water will not be discharged from the cement factory or power station to local water sources, however extensive provision has been made for the controlling and channelling of storm and runoff water within the boundaries of the factory. Outside the factory the handling of this runoff water has not been defined. A settlement tank needs to be established with a fat-trap to collect any oil residues contained in the runoff water. This settlement tank needs to be cleaned out and the fat trap renewed during each dry season. The same arrangements must be made to handle the runoff water from the housing compound provided for the factory employees.

When in full production, 15,000 tonnes per day of cement will be despatched from the factory by road. An average of 750 tonnes of gypsum will need to be trucked into the factory from Yobe and/or Gombe States. This will involve between 500 and 1000 truck movements per day on the local road network around the factory. This impact has not been adequately considered nor any realistic mitigation proposed.

Elevated levels of chromium (Cr) are present in soils, and lead (Pb) in the river Mimi running off the marble deposit which will be the principal raw material of the cement factory. This is likely to arise from the solution of these metals from the marble due to the acidity of the water rising while running over laterite. When this acid water subsequently runs onto the marble the metals are dissolved. The trace metal contents of the raw materials therefore needs to be investigated to reassure that these metals will not be released into the environment in the gaseous and particulate emissions from the cement fac-

tory. This matter has been raised with FL Smidth who have conducted the laboratory analysis of the Obajana raw materials. They report that "the levels (of Pb, As, V, Zr, Zn, F, Cr and Sr) are extremely low to warrant further investigation", but there is no information to reassure this statement.

The diligent approach of the Dangote Group and their consultants (ACC) is demonstrated by the steps, which have been taken to provide adequate foundations for the factory. The excavations for line 1 had to be deepened at significant expense to provide stable foundations prompting the company to retain the services of Geotec of London, UK to investigate the requirements for line 2. This has resulted in the decision to pile the foundations for line 2. The principal equipment supplier, FL Smidth of Denmark have confirmed that they are fully satisfied with the foundations that have been provided for the factory.

Ability to operate and maintain the equipment

The World Bank requires that "the capacity to maintain operational and maintenance standards for the equipment be demonstrated. If necessary provision must be made within the project for training to ensure that this is the case".

Dangote Group intends to award an operation and maintenance contract to Associated Cement Companies (ACC) of India for the Obajana Cement factory. ACC successfully operate more than 10 cement factories in India and have fulfilled such an operation and maintenance contract for the Yanbu cement factory in Saudi Arabia for more than 25 years. ACC are certainly capable to operate and maintain the Obajana Cement factory.

ACC will also provide extensive training for Nigerian employees of the Obajana Cement Company at their three training institutes in India and also on site, at their cement factories in India.

The IFC have requested that Dangote provide them with details of the planned training. Details of the ACC operation and maintenance contract, together with details of the planned training should be included as an appendix to the EIA to demonstrate that the Obajana cement factory will be adequately operated and maintained.

3.3.3 Conclusion of the review

The cement factory and associated power plant will fully comply with World Bank guidelines with respect to environmental impacts, although the EIA report does not demonstrate this clearly.

In the EIA a number of issues, concerning the interface of this factory with the associated elements of the project and the local environment and communities will need to be addressed.

In section 3.5 of this advice the long-term security of the gas supply is questioned. In the event that insufficient gas is available, the kilns and turbines will need to be converted to liquid fuels. This option will need to be elaborated in the EIA to consider the impacts and necessary mitigation measures.

Dangote Group and Obajana Cement can adequately demonstrate their capacity to operate and manage the cement factory and power plant through their operation and management contract with ACC of India.

3.3.4 Recommendations

- The options of firing the kilns of the factory by oil and the power station engines by diesel should be elaborated as well as the impacts and necessary mitigating measures.
- The conveyor belt and power transmission lines between the factory and quarry need to be included in the EIA-report.
- A settlement tank with fat trap needs to be installed in the runoff water channel between the factory and the discharge to the river and also between the housing compound and the river.
- Implications of up to 1000 heavy vehicle movements per day on the road network surrounding the factory needs to be fully assessed and mitigated.
- The trace element contents in the gaseous and particulate emissions from the cement factory, in particularly lead and chromium, need to be investigated to reassure that these metals will not be released into the environment.
- The EIA report should include an iso-fallout chart for the plume from the main factory exhaust stacks showing the concentrations of particulate emissions that can be expected at ground level based on prevailing wind directions in the dry and wet seasons. This chart should also show any communities that lie within the fallout zone of these plumes.

3.4 Dam construction

3.4.1 Description of the project

The dam is raised close to the cement plant (at a distance of a few hundred meters). At the time of the visit by the Commission, this earth fill dam or homogenous dam was under construction. It has been built to retain the water of the Adankolo River and is meant to supply water to the cement plant. During the dry season (three to four months) the Adankolo River dries up. The catchment areas upstream the dam site amounts to 70 km2. The storage capacity is 4.2 million m3. The annual water consumption by the cement plant is 1.8 million m3. The reservoir area is 1.3 km2. The surface of the dam at the base is 76m, at the crest 5m. Its height is 12.9m, length 360m and total volume 69000 m3. On the left bank there is a broad crested spillway, sized for a millennium flood. There is a penstock with a discharge capacity of 180 l/s.

3.4.2 Assessment of the EIA report

The dam which is under construction is of a much used type and properly designed. The design of the rip-rap, the filter between the rip-rap, the earth body, the embankment toe drain and the dam slopes are adequate.

The dam is founded on the micaschist–gneissic bed rock. Soil and weathered rock has been removed. To reach the sound bed-rock, the rock has been blasted. Previous investigations have been carried out which involved georesistivity investigations.

The borrow area is located close to the dam and upstream, the earth used for the dam dike has been tested. While raising the dike, the earth density and water content is monitored[3]. If this proves to be inadequate, the layer (30cm thickness) is removed and mixed with other earth or alternatively the water content is adapted by adding or drying.

The main shortcoming is the lack of a visual inspection report on foundation level of the dam. This observation was required for the decision not to grout the basement. It was also not possible to establish if in-situ water tests (Lugeon tests) had been performed. Similarly, results of Proctor tests, required for the dam earth compaction could not be shown.

An integrated watershed management plan for the river Adankolo watershed is missing. This plan can provide insight in the availability of water and the opportunities for use. It should take into consideration the water consumption of the plant, the compound, the villages and settlements located nearby, and their potential population and related water consumption increase on the one hand and on the other hand the dam capacity and groundwater. It should also include the wastewater treatment and the releases. The plan should consider the watershed upstream as well as downstream of the dam.
The boundary of the watershed downstream of the dam should be justified. A map with a clear reservoir area delimitation is not included but should become available.

The hazards of leakage through the different geological structures and of mass sliding in the reservoir are small. However, in conformity to common practice for dams this has to be assessed.

The mitigation of negative impacts is well defined. An alternative water supply for the Obajana community has been proposed. Therefore a georesistivity investigation has been performed, followed by the sinking of water boreholes. One of them has been used for the water supply of the compound. This mitigation measure is positive but should be part of a large environmental management plan including more specifically a water management plan.

3.4.3 Conclusions of the review

The information in the EIA report is generally of good quality. The following aspects have been described sufficiently: justification of the site of the dam, work description, hydrology, drainage, morphology of the reservoir area, the environmental impacts (river discharge during the filling up stage and when operated, sedimentation of the reservoir, local water supply downstream, water borne diseases vectors) and the mitigation measures. The monitoring during the construction of the dam is of good quality. One significant shortcoming is the fact that the following information could not be provided: a visual inspection report of the dam basement after final excavation, results of in-situ water tests and Proctor test. This type of information provides insight in the technical feasibility of the dam at this site.

[3] During site visit a density and water content measurement was performed. It was observed that if follows ASTM standards.

3.4.4 Recommendations

- The following additional information has to become available: a reservoir contour map, an assessment of the reservoir slope stability and the leakage through the geological structures.
- An integrated watershed management plan for the Adankolo River watershed should be made.

3.5 Gas pipeline[4]

3.5.1 Description of the project

The Dangote Group has reached an Agreement with the Nigerian Gas Company (NGC, a 100% government owned company) to design and construct a 18" gas pipeline between Ajaokuta and Obajana. Upon completion, the gas-pipeline will reportedly be transferred to NGC, who will operate and maintain this pipeline. Full ownership of the pipeline will eventually revert to NGC.

3.5.2 Assessment of the EIA report

Routing

In the EIA report, two alternative routes have been investigated:
- Route A; consists of two sections Ajoakuta – Egayin and Egayin – Obajana. The first section follows the main road and the second goes straight through the bush.
- Route B; consists of three sections Ajoakuta – Egayin (this section is the same as in route A), Egayin – Kabba and Kabba/Lokoja Junction and Kabba/Lokoja Junction– Obajana.

Route A, by far the shortest route, is considered not acceptable because of technical and environmental difficulties on the second section Egayin – Obajana. This has been justified adequately in the EIA report. Route B is considered a route but deviations were made in the first and third section to avoid communities. In the first section a route south of the main road Ajoakuta – Egayin is followed. In the second section a route parallel but at a distance of 4-5 km along the highway Egayin – Kabba/Lokoja Junction is followed. In the third section the route deviates slightly to the north of the Kabba/Lokoja Junction – Obajana road to avoid a few communities. Route B has been assessed as the most environmentally friendly route. A provisional license has been provided by the Federal Ministry of Environment, and is based upon the draft EIA report with the condition to elaborate a detailed route in the final EIA.

In June 2004, the IFC has pointed out a major inconsistency between the pipeline route as specified in the EIA (route B) and the route the consultants of the proponent were planning to follow. As a consequence they already started preparations on the ground. Groundwork such as clearing of the

[4] The content of this section deviates from the earlier sections because the pipeline-area of impact differs completely from the area of impact of the other project components.

Right of Way (RoW), was stopped (21 June 2004). The major discrepancies are:

→ Route along the Ajoakuta – Egayin Dual carriageway;

The EIA assumes a route several hundred meters up to 2000 m south of the dual carriageway, whereas the proponents design assumes a route along the middle of the dual carriageway, between the two lanes of the highway, a major traffic artery in the region. The proponent's route also passes through several communities along the highway, the largest being Egayin.

The proponent's route between the two lanes of the dual carriage way is not acceptable.

→ Route along Kabba/Lokoja Junction – Obajana highway;

The EIA assumes a straight route between Kabala and Obajana, which veers off the highway after 4-5 kilometers. The proponent's route assumes a parallel course along the entire highway, thereby disturbing several communities and at least in one location the removal of residential buildings would be necessary. This does not conform to the EIA.

The proponent's route as pointed out disturbs local communities, in one location passing a community containing a Secondary Science School within a distance of 25 meters (near the starting point). At another point (3 kilometres off Kabba/Lokoja Junction along the highway to Obajana), passing within 5 metres of a community. No justification has been given for these routing decisions.

→ Kabba/Lokoja Junction;

At Kabba/Lokoja Junction the gas pipeline follows an existing RoW where two pipelines are present already: an oil pipeline and a products pipeline. The RoW approaches Kabba/Lokoja Junction, a small community seemingly developing into a village from the south, and crosses the highway to Obajana, which roughly has an east-west orientation.

Apart from the Oban – Ajaokuta gas pipeline (OCP) it has been reported that another pipeline, described as the Sahara gas pipeline, will also make use of the RoW. Encroachment of the RoW can be observed. Several houses have been built within 25 meters of the proposed gas pipeline, directly near the road. This road is expected to carry a significant proportion of the traffic generated by the cement factory (estimated to be 500-1000 trucks per day). The situation is relatively complex. There is no evidence of the existence of a safety analysis for this location where additional mitigation measures may very well have to be considered.

Quality

The Dangote Group has no prior experience in the pipeline industry and it has engaged Zishan Engineers (Pvt) Ltd as its consultants. Dangote is reportedly responsible for overall project management, procurement and contracting. As designated owner, NGC is involved in design and construction of the pipeline to a certain degree and has taken part in the selection of contractors and suppliers.

- There is no evidence of a Quality Plan or Quality Management System for the design and engineering and transfer to NGC. Such a plan or system has not been developed yet.
- The contractor has submitted a quality plan, which is currently being analysed. This plan was not available at the site.
- Documentation (surveys, studies, detailed engineering) was not available at the site. The detailed Engineering was not yet completed.

A reinstatement plan is missing and consequently it is not clear which measures will be applied to avoid or mitigate negative environmental impacts during and after construction. It is also not clear how this will be monitored.

Gas supply via the OCP gas pipeline to the project

At the starting point of the pipeline near Ajaokuta, the pipeline will connect to the existing Oban-Ajaokuta 20" pipeline (OCP). This pipeline was put into operation in 1984, as a dedicated pipeline for the Ajaokuta Steel Company (ASC), a very large steel mill. Virtually since the commissioning of the pipeline the ASC steel mill has not been operational, the complex has been taking off only a small amount of gas. Initiatives to resume steel milling operations have been reported, but it has not been possible to verify the status of these initiatives during this mission. The metering station within the ACS complex is manned, and seems at first sight to be well maintained and operational. In the Front End Engineering Design (FEED) document the pipeline is described as "being out of service for a long time". Also the FEED assumes that since the Ajaokuta Steel plant is not operational and there are no other major consumers, the Oban-Ajaokuta Pipeline will become a dedicated pipeline for the Obajana Cement plant. This has to be verified.

No documentary evidence has been made available which demonstrates:
- The safe operating parameters of the Oban-Ajaokuta pipeline;
- The remaining life expectancy of this pipeline;
- The capability in time of the Oban-Ajaokuta pipeline to service the demand of the cement factory and the Ajaokuta Steel Company should milling operations be resumed.

Therefore the basic design assumptions concerning the Oban-Ajaokuta pipeline, on which the Front End Engineering Design of the Ajaokuta-Obajana pipeline have been based, have not demonstrably been verified.

Socio-economic impacts, public participation and compensation

The EIA report provides a detailed description and analysis of the land use and socio-economic impacts of the proposed pipeline. A combined team of EIA consultants, Local Government staff (Ajaokuta, Adavi en Lokoja LGs) and field officers of the Kogi State Ministry of Environment and Physical Development carried out a valuation of the impact on land use, in particular the value of arable crops that would be affected by the construction of the pipeline. Trees that have to disappear on the route were not considered in this valuation. Most of the trees are owned by the community and do have a considerable value for the population because of the fact that they provide all kind of products such as fruits, herbs and timber. The traditional rulers and communities of Ajaokuta and Adavi Local Government Councils also appointed a legal firm of valuers from a neighbouring state to do an independent valuation on their behalf; the value of trees was included. The two results were harmo-

nised and formed the basis for acceptance of valuation and compensation. Such a valuation did not take place for the Lokoja local Government communities. It must be noted that the involvement of an independent valuer was the initiative of the Ebira group and not a statutory requirement. As noted above, economic trees to be removed were not assessed, neither the loss to hunters or migrating cattle herdsmen (Fulani).

Preparations for the payment of compensation to the individual farmers, men as well as women, in cash were ongoing during the time of the review by the Commission. The chief provides land to individuals and based on this allocation the user of the land receives an amount of money, based upon the agreed valuation of the loss of crops and trees as well as rates stipulated by relevant federal laws.

In addition the following should be noted:

- During the review, the affected people stated and accepted that there would be changes in the route of the pipeline in all the places where the present proposed route passes in front of and/or through residential buildings. This is especially so in Adogo, the headquarters of Ajaokuta Local Government Council and similar places along the Ajaokuta – Eganyin dual carriageway as well as the two small settlements before Obajana. A detailed consultation process that includes an assessment of village land use needs in the next 30 years should be made and appropriate compensation and other mitigation measures should be agreed.
- The economic trees along the route that will disappear (outside existing farmlands) should be enumerated and valued for compensation payment to the community.
- The current payment to farmers for actual crops on existing farms does not consider compensation for the loss of the land. The political economy of the rural peasant communities depends on the joint use of the land so compensation should extend beyond the current user. The compensation system is based on the Land Use Act of 1978 but an industrial enterprise should go beyond this.
- Since the preparations for clearing the RoW were stopped and it was agreed to follow the route in the EIA report, people should be compensated for the already cleared land.

3.5.3 Conclusion of the review

The EIA report is incomplete and does not meet international standards. The EIA does not adequately demonstrate the degree of control over environmental impacts and risks which is required for a project of this magnitude. The consultation and public participation process during the execution of the EIA study is of good quality. The process of individual compensation as agreed seems to satisfy all people affected. Community compensation has not been not considered at all in the EIA report.

The routing of the gas pipeline approved by the Federal Ministry of Environment has not been followed by the proponent. After identification of this inconsistency by a team of IFC, the proponent has stopped construction, and has agreed to follow the route as specified in the EIA. The proponent has also agreed to incorporate adequate safety distances between the pipeline route and communities. The proponent has agreed to review the design of the pipeline at Kabba/Lokoja Junction, taking into account foreseeable developments

at this location and to undertake a detailed safety analysis possibly leading to additional mitigation measures or re-routing of the pipeline.

It should be mentioned that this decision may have consequences for the budget of the pipeline. The proponent's route is the optimal route from the standpoint of cost and ease of construction. Therefore, the (necessary) realignment of the route can have financial consequences. The geology of the terrain may request blasting to achieve the proposed 1.2 meters depth of the pipeline due to rock formations below the top-soil and rock outcrops.

A secured supply of by the Oban–Ajoakuta gas pipeline to the Ajoakuta-Obajana gas pipeline could not be demonstrated in the EIA report or in other available documents.

3.5.4 Recommendations

- The description of the actual pipeline route should be clear, figures should show the pipeline route in the geographical context on clear and large scale maps.
- A proximity survey, giving the distances of the (EIA) pipeline route to houses, schools, special premises, should be presented. Classification of the environments the pipeline crosses through should be included.
- The fact that the pipeline has been designed for a class III environment should be mentioned.
- The applicable minimum distances, derived from international standards and/or Nigerian policy should be presented.
- The Operations and Maintenance aspects of the pipeline project should be described.
- A safety analysis of the pipeline, especially at critical point such as the Kabba/Lokoja Junction should be included.
- The safe operating parameters of the Oban-Ajaokuta pipeline, the remaining life expectancy of this pipeline and the capability in time of the Oban-Ajaokuta pipeline to service the demand of the cement factory and, if required, the Ajaokuta Steel Company should milling operations be resumed, should be demonstrated by further analysis and be verified through independent review. Dangote has verbally agreed to undertake a study into this issue. No Terms of Reference for this study were under development and could be demonstrated as yet.
- A reinstatement (restoration) plan should be made with a specific section on (civil engineering) measures to mitigate the negative environmental impacts.
- Compensation of the communities that are and will be affected by the pipeline should be considered. This type of compensation executed on the basis of a community plan or programme and in close co-operation with the main stakeholders (government as well as non-government) might create important support for the pipeline during construction and the lifetime of the pipeline.

3.6 Social impacts, public consultation, compensation and social management

3.6.1 General

This section focuses on the communities of Obajana (3.6.3) and Oyo-Iwa (3.6.4) which are located in the vicinity of the plant and quarry site respectively and which are affected by the impacts of the different project components. The impacts can be considered as cumulative impacts caused by the quarry, cement factory & power plant and dam construction.

Compensation in a national context

Both communities have been compensated. Relevant Nigerian legislation is briefly described to understand the practice of compensation in Nigeria. The compensation rates paid in this project conform to relevant Nigeria Federal laws particularly the Land Use Act (1978) and the Mining Act (1979 and reviewed in 1999). These laws vest ownership of all land and minerals in Nigeria in the Federal Government. This makes the people just tenants with user rights only. For development projects, occupiers of land to be acquired are, at the start of a project, entitled to compensation for agricultural crops and economic trees found on the land at the time. Rates were fixed for each tree and crop. The relevant laws empower the Ministries of Agriculture as well as Environment and Physical Development in each state to enumerate the crops and trees and apply the rates. The actual rates do not match market prices and do not take inflation into account. In virtually all cases, and Obajana and Oyo-Iwa communities are just another example, the compensation paid at such rates is insufficient for the farmers to successfully re-establish the farm elsewhere or invest in other business opportunities. As in other projects, although the law has been followed by the proponents of the Obajana Cement PLC, there is discontent among the affected farmers as well as communities who operate the land as common, rather than individual, land and do not get any compensation at all. Payment over and above the federal rates as well as implementing compensation projects, which solve many of the community problems, may put the Company in good stead with the Communities.

3.6.2 Description of the communities

The community adjacent to the Obajana Cement company site is Obajana, a village with a population of less than 500 which has increased to 1500 inhabitants since work started on the site, is located along the road at about 1 km from the main entrance of the factory site. The land where the cement factory and the power plant are located belonged to the community of Obajana.
The Oyo-Iwa community owned the quarry site and the site where the Company's housing estate is located as well as the location where the reservoir will occur. During the execution of the EIA study 120 people were living in the small hamlet located about 2 km from the site of the quarry. According to the traditional leader, up to a few thousand people live on the community grounds of Oyo-Iwa. Most of these people live in small hamlets scattered through the area.

3.6.3 Obajana community

Socio-economic impacts

The original proponents of the project (the Kogi State Government) presented the project as a development project with the expectation of jobs, educational, health and transport facilities, water supply, higher standard of living etc. This results in extremely high expectations from the local communities.

Tremendous change in the socio-economic life of Obajana and its surrounding area is expected as a result of the construction and operation of the cement factory. This requires detailed analysis with some projected figures where possible to facilitate contingency planning by the Company and government. For example:

- demographic impact of influx of non indigenous and returning indigenous on the local population. Will the Obajana identity survive?
- impact of influx of outsiders on local infrastructure – water supply, housing, education, jobs, postal and communication facilities, transport;
- impact of new town on local culture – life styles, income, liberalised sexual behaviour and negative consequences, perception of importance of immediate cash over diligence, movement away from farming to other occupations, land tenure, emergence of crime, youth militancy;
- ability of local people to survive – do they have the economic power to compete for the businesses that the company will spawn? Do they have the education and training to be considered for employment? Do they have the capacity to resist land speculation that can make them tenants in their traditional society? Will they have to resort to youth militancy and resource control struggles to get a fair share and to maintain control over their own life?

Consultation and compensation

The EIA team consulted widely within and outside the State. A major gap in the consultation process is the fact that the Kogi State Environmental Protection Agency and the political heads of the State's Ministry of Environment and Physical Development as well as the Ministry of Solid Minerals were not consulted by the EIA team during the process. They were only invited to the public hearing. The Commissioner for the Ministry of Environment and Physical Development protested this neglect at the hearing and it is hoped that this would be rectified.

While good relations between the Dangote Group and the Authorities have been observed, the communication gap between Federal and State Authorities and between Dangote Group and the Kogi State Government is of major concern and remains a point of attention for both parties, considering the wide range of large and small issues connected with the project. Payment for crops found on the project site and for some timber, which was not properly evaluated because the trees had been felled and packed before any attempt was made to count them, cannot be considered as compensation for this community.

Urban planning

The population of Obajana village has doubled in the last year because of the expectations of people to find paid work. There is already shortage of drinking water. A construction company working on the site has provided three tanks that are irregularly filled with water for domestic use. Other industries already showed interest in starting business in Obajana. Within a number of years Obajana most likely will change into a small town.

The traditional leader has expressed the need for spatial planning of the rapidly growing village of Obajana. The State Government has also indicated this need and is anxious to play its part in the process. The Commission would like to underline the importance of urban planning and the provision of community services, the sooner the better. The Commissioner for the ministry of environment is responsible for spatial planning. He can appoint Obajana as an urban area and that is the start of the urban planning process. The Dangote group cannot be held responsible for urban planning but can actively support this process.

3.6.4 Oyo-Iwa community

Socio-economic impacts

The direct impacts of the different activities on the community are well described. The most important impact is the complete loss of land. A minimum of 500 hectares of agricultural land has been lost already and this might increase to more than 1000 hectares when the quarry is in full operation. The agricultural land covering the quarry is considered to be more fertile than most of the land the community owns. The Mimi River is the most important source for water supply and the community already observed an increase in the silt load; which causes some concern. The impacts of the diversion of the Mimi River should be considered. During the rainy season, the villages can be isolated for weeks due to flooding of the Mimi River and the absence of a bridge. The clearing of the watershed has already caused more flooding than usual this year. Due to the construction of a road between the plant site and the quarry (8 km) this community has better access to the main road, although the last part of the road over a distance of 2 km, including the crossing of the Mimi River, has not been improved.

Consultation and compensation

The community was informed about the quarry but not about the construction of the dam on their grounds. The individual crop compensation was paid in the same way as in the other communities where people were affected. The traditional landowners received nothing. Representatives of the Dangote Group promised compensation measures for the community such as a simple bridge to cross the Mimi River, but they have not been substantiated yet. There is evidence of resentment in the community and this needs to be addressed.

There is a strong need to rectify the lacunas in the consultation process in order to create a peaceful relationship between the Company and the Oyo – Iwa community. When the Commission visited the community, a number of issues were raised that can help to improve compensation and other mitigation measures, namely:

- Evaluation and payment of farmland and farm crops lost should involve the whole community instead of existing farm owners.
- Enumeration of economic trees was carried out after clearing and only timber was paid for. Other uses should be paid for as well.
- The company should improve its compensation to the community for the land it acquired to build a housing estate. The amount should be negotiated with the community representatives.
- Compensation measures such as the extension of the road to the mine by just the few remaining kilometres to Oyo village, provision of employment for the youths, health and educational facilities should be reflected in the EIA report.
- Ensuring that royalty is paid to the community to enable them to embark on community development in order to complement the efforts of the company and the government.

3.6.5 Conclusion of the review

The community of Obajana was well consulted about the project whilst the community of Oyo-Iwa is only partially informed about the planned project components. Impacts for the community of Obajana are significant due to uncontrolled population and spatial growth and lack of community services. The main impact for the Oyo-Iwa community is the considerable loss of community land. Individual compensation for crops was paid in accordance with the law. Community compensation measures are promised but have not yet been provided.

3.6.6 Recommendation

To address the issues of community compensation, a social management/community development plan should be developed. Suggestions for such a plan are provided in section 3.7.

3.6.7 Biodiversity and compensation

The effects on biodiversity and on the use of biodiversity by the people (e.g. fuelwood, fruits, medicinal plants) have been considered in the different EIA reports but the cumulative impacts have not been considered. Due to the changes in land use a large habitat area will be lost completely. In an area adjacent to the site the quality of the biodiversity will be affected negatively. No reference was made to the occurrence of rare habitats or endemic species. The planned mitigation measures will help to avoid negative impacts such as fish migration.

In the EIA report it was stated that the following changes in land use will take place:

- 4.4 hectares is required for the cement factory and thermal power plant and an additional 0.5 hectares for compounds. The actual size of the site is estimated at approximately 100 hectares and the compound area 50 hectares.

- The size of the reservoir and dam is mentioned to be 130 hectares. Due to lack of contour maps this could not be verified but the total

reservoir including the infrastructure around the reservoir is estimated to be more than 150 hectares.

- The prospecting license is provided for 20 km2. A mining license is provided for 9 km2, which equals 900 hectares. Construction of an 8 km 25 meter wide road to the quarry results in another 20 hectares of land use change.

In total at least 520 hectares of a habitat described as Guinea Savannah type of vegetation will be lost. The area that will be affected is at least two to four times this size.

The Commission is of the opinion that due to the considerable loss of biodiversity and consequently the use of biodiversity products opportunities for compensation should be elaborated. One could think of the following options:

- Establishing a forest reserve or a game reserve in the upstream catchment area(s) of the Adankolo and/or Mimi Rivers.

- Extension of an existing forest or game reserve located in Kogi State.

- Financial compensation; a national ecological fund exists so the Dangote Group could deposit an amount of money that will be spent for biodiversity conservation in the country.

- Establishment of grazing land to compensate the nomadic Fulanis, whose grazing land is affected by the factory location and quarry.

3.7 Social and Environmental management

3.7.1 Assessment of the present situation

Environmental and waste management, including occupational health and safety is entirely lacking in the Obajana Cement Company. Consequently, monitoring plans are not available. Policies and plans on Health, Safety and Environment (HSE) do not exist. Some aspects of an HSE plan were mentioned in the EIA reports but do not meet international standards. Environmental licensing and permitting is being handled by the Dangote Group's Environmental Affairs Manager (one person for the entire Dangote Group). Safety of the construction of the Obajana cement factory is provided by safety managers for the sub-contractors Petron and Julius Berger. This situation is unsatisfactory and contravenes with international standards.

A good social management/community development plan should form the basis for a structured process to inform, consult, co-operate and support the people and the communities of Obajana and Oyo-Iwa that are affected by the project. Such a plan is not included in the different EIA reports. A social management / community development plan and a communication and urban development plan that has been prepared in close co-operation with the local affected communities and State Government could raise the support for the project and could even contribute to sustain peace in the communities. In particular, sustaining peace has been mentioned as a major issue by the local representatives of the fast growing community of Obajana.

3.7.2 Conclusion of the review

The Obajana Cement Company does not have in place an occupational health, safety and environmental management plan, a waste management plan, or a social management or comparable plan that aims to consult and support the communities affected by the project. Monitoring plans are not available.

3.7.3 Recommendations

- The Obajana Cement Company will need to establish a strong division to undertake and manage occupational health, safety, social and environmental management responsibilities on site as well as off site.

- The Obajana Cement Company needs to:
    - Draft occupational health, safety and environmental management policies.
    - Develop occupational health, safety and environmental management plans, including a water management, waste management and monitoring plan.
    - Seek certification under ISO 9001, 14001 and 18001 for their quality, environmental and safety management systems. The frequency of monitoring, reporting and remedial action procedures need to be set out in the safety and environmental policies and management plans.

- Water management plans should be drafted including two watersheds (Adankolo and Mimi Rivers), taking into consideration on the one hand the water consumption of the plant, the compound, the nearby located villages and settlements, their potential population and related water consumption increase and on the other hand the dam capacity, groundwater capacity and water abstraction at the quarry. It should also include the wastewater treatment and the releases.
    - More detailed information at different stages, for instance 2005, 2010 and 2020. One would approximate the requirements as being:
        - Plant consumption;
        - Compound, drinkable water for instance on the basis of 150 l/d per person;
        - Villages, settlements for instance on the basis of 30 l/d per person in 2005 and 100 l/d per person in 2020;
        - Gardening, irrigation;
        - Water that has been or can be released in the rivers (Adankolo and Mimi Rivers).
    - The water potentialities:
        - The dam during the dry season, during the rainy season including the watershed balance;
        - The river as well;
        - The groundwater at or close to the site, in that case not only the optimal groundwater locations have to be determined but also the groundwater balance (rainfall less runoff, less evapo-transpiration and less replenishment). Protection areas around the water supply wells are fixed.

  - The water abstraction discharges at the quarry, it includes a groundwater balance but also the watershed balance of the Adankolo River.
  - The water quality assessment of the different water bodies.
  - The wastewater generation, the proposed wastewater treatment.
  - The storm and runoff discharge at the compound and at the plant.
  - The balance between requirements and potentialities can then be established taking into account the related impacts and their mitigation. Most of the required data, except for the Mimi River and quarry groundwater, are available and can be easily integrated. As already mentioned in the review of the quarry EIA report, additional field investigation has to be performed, including field observations (potential springs at the limits of the marble body with the surrounding formations (pegmatite and micaschist) and the Mimi River). Consequently, it is recommended to propose a water management plan, integrating the existing data subsequently completed with the results of a field investigation and observations at the quarry site.

- Waste management plan: waste will be generated at different stages and locations of the plant, the quarry, the compound and the villages. Not exhaustively, one could identify:
  - At the plant:
    - spent oils, lubricants and greases
    - spent radioactive sources
    - used refractories
    - damaged polypropylene sacks
    - collected suspended material, trapped fat
    - spent parts
  - From the transport:
    - tires, spent parts
  - From the compound and villages
    - municipal waste
    - sludges from the waste water treatment plant
    - demolition waste
    - clinical waste
    - tires, spent parts
  - From the quarry
    - tailing
  - For each waste stream should be given: the quantity forecast, the type of waste (inert, biodegradable, hazardous, metallic). It is then determined how it will be treated or disposed, i.e. the spent radioactive sources will be returned to the company that delivered them, some waste can be incinerated at the rotary kiln, some can be recycled, disposed to fill pits, other waste will have to be landfilled. Consequently, a landfill site has to be identified and properly designed.

- A social management/community development plan should be drafted in co-operation with and agreed upon by the Obajana Cement Company management, Local and State Government authorities and representatives of the affected communities. The following should be considered:

  - A needs assessment of the communities should form the basis for drafting such a plan.
  - Opportunities for the use of unskilled as well as skilled labour from the adjacent communities should be studied. A goal could be to maximise the number of labourers from the local communities so as to decrease the chances for social tension and conflicts. The company could develop a training programme. The large number of people from ACC India, working on the construction of the different project components was mentioned by a large number of people as not acceptable in the long term.
  - Opportunities for community compensation should be considered in this plan. This should become common practice for companies that cause significant effects on the environment and local population and that are willing to meet international standards for social compliance.
  - A communication plan to streamline contacts between stakeholders should be developed. A procedure for handling of complaints from individuals and communities should be included.
  - The role the communities can play in the monitoring of environmental and social impacts as well as mitigation measures should be part of the plan.
  - NGOs originating from the area as well as NGOs from outside the area can play an important role in the drafting, execution and monitoring of this plan.

- These policies and plans should then be supplemented to the EIA to provide details of the potential impact mitigation plans of the company.