



APPRAISAL OF THE ENVIRONMENTAL IMPACT ASSESSMENT FOR THE EXPANSION OF GHANA'S T3 THERMAL PLANT: IMPLICATIONS FOR TOURISM DEVELOPMENT

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ABSTRACT

The purpose of this paper was to appraise the Environmental Impact Assessment (EIA) undertaken to expand Ghana's T3 Thermal Power Plant, located at Aboadze in the Western Region and also examine implications of the expansion of the thermal plant on tourism development in the study area. Content analysis of the EIA document was supplemented with an interview of ten key informants in two communities near the plant, selected using purposive sampling for the study. In addition some tools of assessment: vulnerability, land-use and suitability, cost benefit, multi criteria and sustainability analyses, were used to appraise some aspects of the EIA prepared. The study revealed that although Ghana has a good legal and administrative framework for EIA preparation, public participation in the EIA process was limited. Also, sustainability of the project was not considered as alternatives to fossil fuels to be used, were not proposed. The EIA for the project expansion was comprehensive enough as it covered among others; noise pollution, the nature of the coastal environment as well as the aesthetic and tourism appeals of the study area. A positive implication of the project's expansion is the continuous addition of 132MW of electric power to help eliminate *dumsor*, which affects tourism and hospitality facilities in the country.

Keywords: Electric power project, content analysis, ecological impacts, noise pollution, *dumsor*, fossil fuels.

INTRODUCTION

Before implementing any project, an evaluation of its likely adverse impacts on the physical and socio-cultural environment, is provided in a document known as Environmental Impact Assessment (EIA). An EIA could also be seen as "a systematic process for considering possible impacts prior to a decision being taken on whether or not a proposal should be given approval to proceed." (Jay, et al., 2007: 287). According to the authors, EIA has thus become an internationally accepted and established tool for environmental management. The need for the preparation of EIA as a national requirement before implementation of proposed projects has been well documented (Asiedu, 1997; Jay et al, 2007; Wood, 2003). Due to their negative impacts on the environment, projects that are concerned with the production of energy (such as hydro, thermal, atomic, nuclear etc.) are among those that strictly require the preparation of an EIA before their implementation (Cooper, Randle & Sokhi, 2003; Michalik 2008; Teodoru, Wüest & Werli, 2006). This is necessary because some of these plants have caused serious accidents resulting in fatalities and long term incapacitation of people living in such environments. An appraisal of the EIA of one of such energy projects, which is the expansion of a thermal plant in Ghana, to ensure its efficiency in helping to eliminate *dumsor*, which is irregular and unpredictable electric power outages, is the main thrust of this paper.

The Takoradi Thermal Power Project expansion EIA document (TTPP EIA, 2009), covered the tourism potentials of the study area. It states that during migration periods, birds are relatively abundant along most of the coast, utilizing the beaches, lagoons and estuaries as feeding areas and the coastal zone as a



route between individual lagoons (p.70). It also noted that numerous bird species were present generally within the TTPP site, township and immediately surrounding area. These included pied crows, vultures, raptors (buzzards/hawks), weaver birds, various finches, egrets and wagtails, and at least another three unidentified bird species. In the local area, the Hwin River estuary, located just west of Takoradi is a major stopover point that is utilized by migrating waterfowl. In the vicinity of the project area, shorebirds (mostly terns) utilize the Aboadze/Aboesi area extensively during migration. These reasons necessitated the present study to assess the implications of the expansion of the Takoradi Thermal plant project on tourism development in the ecosystem of the study area.

The Energy Project

In 2009, the Volta River Authority (VRA), responsible for electricity production in Ghana, decided to undertake a project to expand the existing Takoradi Thermal Power Plant (TTPP), by adding 132 Megawatts (MW) of electric power produced by the thermal plant. The project was referred to as T3. This thermal plant, located on the south west coast of Ghana at Aboadze, north-east of Sekondi Takoradi, the capital of the Western Region of Ghana, is one of the main electricity generation plants in the country. The existing T1 plant consists of a 330 MW light crude oil (LCO) fired, combined thermal generating plant, built to supplement electricity power produced by the Akosombo and Kpong Dams and other independent power plants in the country. As demanded by the Environmental Protection Agency (EPA), an EIA report was prepared, for identification of potential impacts of the project on the physical and socio-cultural environment (Glasson, Therivel & Chadwick, 1999). The initial EIA was prepared earlier in 1995, in support of an application for funding from donor agencies, including the World Bank, through the International Development Association (IDA). T1 began generating 330 MW of power, in December 1997.

The plant is situated between five settlements of varying sizes, with the nearest Aboadze, located about 1½ km to the east of the plant. The VRA Township for the plant is sited approximately 800m north west of the site boundary. The surrounding area is relatively low lying, particularly the area to the west and north of the site. The Anankwari and Atombaka Rivers and associated valleys flow to the west and east of TTPP, respectively. In 1999, the Thermal Plant referred to as T2 was expanded increasing the plant's output from 330 to 660 MW. A Supplementary Environmental Impact Statement (referred to as 1999 SEIS) was submitted to the EPA in March 1999 and approved in April 1999, to be completed in three phases. Construction of the T2 project then commenced and was completed before the idea to expand the project to T3 was conceived. An Environmental Management Plan (EMP) was prepared as an Addendum Environmental Report in 2001, to address certain specific environmental and social issues related to the third phase of the T2 project. The addendum was a financial requirement to ensure compliance of certain requirements by the funders of the T2 Project: the Government of Ghana through the Ministry of Energy, with support from the International Finance Corporation (IFC) and the Overseas Private Investment Corporation (OPIC). What was the basis for all these environmental documentations?

Purpose of the Study

The main purpose of this study was to appraise the EIA prepared for the expansion of the TTPP project while the specific objectives were to examine the perceptions of the people in the local communities about the thermal plant's expansion project, analyse and explain the attributes of some assessment tools used for appraising the EIA of the TTPP. The study also outlines implications of expansion of the thermal project on tourism development in the area, focusing on the importance of protecting the habitats of migratory and other birds in the wetlands as well as the beaches in the study area. The paper is presented in five sections: It begins with the introduction, which includes the literature review; covering EIA legislation and practice in Africa and Ghana, followed by the research methodology. Then the discussion,



followed by the findings, implications for tourism development, recommendations and conclusions are drawn.

State of EIA Legislation and Practice in Africa

Before the UN Conference on Environment and Development (UNCED) had requested governments of member nations to make the conduct of EIAs mandatory in respect of activities and projects (United Nations, 1992), developed nations and most developing ones especially in Africa such as Ghana, had already started conducting EIAs (Appiah-Opoku, 2001; Kruger & Chapman, 2006; Mwalyosie & Hughes, 1998). Ghana's incorporation of EIAs before the implementation of development projects was the result of lessons learnt from other nations that had implemented foreign direct investment projects without consideration of their environmental impacts, which have often resulted in serious environmental consequences (Betey & Godfred, 2013).

Some of these negative environmental impacts resulting from absence of implementation of EIAs include pollution of water bodies, water shortages, and improper sewage and refuse disposal, health hazards and outbreak of diseases. Due to its importance in ensuring sound environmental management as well as sustainability of projects, Bekhechi and Mercier (2002), had noted that some countries in Africa such as South Africa, Zambia, Senegal, Cote d'Ivoire and Togo had introduced EIA provisions in their environmental legislations in the last quarter of the twentieth century. Since then, almost all African countries, which have the hope of reaping some of the potential benefits from EIA, had been strengthening their legislative frameworks for the incorporation of the conduct of EIAs in their development projects. However, these systems are mostly based on the practices and experiences of developed countries (Betey & Godfred, 2013). African countries need to implement EIAs taking into consideration their peculiar circumstances, especially in relation to the exploitation of environmental resources such as minerals, which are mostly undertaken by multinational companies from the developed countries, as well as unplanned indigenous surface miners. Initially, most government agencies responsible for ensuring the compliance of EIAs played merely advisory roles. These agencies have lately been empowered to enforce EIA legislation in these countries.

EIA Legislation and Practice in Ghana

In Ghana the EPA is responsible for ensuring the preparation of EIA all over the country, but the EPA is not represented in the districts, except in a few areas of stronger mining concentration such as Tarkwa and Obuasi. In 1988, Ghana initiated a National Environmental Action Plan (NEAP), aimed at giving priority to environmental issues on the development agenda. This was then followed in 1994 with the enactment of the Environmental Protection Agency (EPA) Act 490. The EPA was later on empowered by Environmental Assessment Regulations of 1999; Legislative Instrument (LI) 1652 to enforce the preparation of EIA before undertaking any project (GNGC, 2012). Therefore, before undertaking the expansion of the T3 project, an EIA had to be prepared and submitted to the EPA by African Environmental Research Consulting Group Ghana Limited (AERCG), a group of Environmental Consultants for the proponents: The Government of Ghana, through the VRA. The project was to be constructed by HPI Technologies of Texas, USA and funded with credit support from Society Generalé of Canada, with the Export Development of Canada (EDC) providing credit insurance for the construction of 132 MW combined cycle Thermal Power Plant, to be completed by the end of December, 2011. The project was estimated to cost over US\$185 million (www.modernghana.com, 2013) and was to be completed in 2012, however, it was commissioned later, in April, 2003.

RESEARCH METHODOLOGY

Qualitative research methods were used for this study. These involved the use of content analysis of the 311 page EIA document for expansion of the T3 Thermal Plant (TTPE EIA, 2009) and personal in-depth



interviews of ten residents in communities close to the thermal plant on the environmental consequences of the expansion of the thermal plant. The EIA document for the expansion project was carefully appraised so as to analyse the merits and demerits of some of its aspects. The document was very comprehensive and covered all aspects of the environment that could experience negative impacts from the project. The document covered among others, the legal and administrative framework for EIA in the country, location, site characteristics, all aspects of the physical, biological and socio-cultural environment, and analyses of alternatives. Other important aspects of the environment covered by the EIA document included residual effects, proposed contingency plans, mitigation measures, environmental management and monitoring plans.

The qualitative technique employed made it possible to appraise consultations made before preparing the EIA as well as some negative physical impacts and social considerations of the project noted by the people in communities near the site of the project. According to Lein (1993), qualitative research techniques can be used for environmental impact analysis and prediction. A non-directional interview schedule prepared in the form of open-ended questions was used to interview ten members in the two communities of Aboadze and Inchaban with populations of 9,471 and 9,860 respectively (GSS, 2010), located near the project site. The respondents involved were aged 25 to 65 years and were selected using purposive sampling techniques. Those interviewed included a chief of one of the towns, who is the custodian of the land on which the project was sited, the two Assembly members of the towns, two women leaders and five other people from the two settlements.

The areas covered by the interviews included acquisition of the land for the project, compensation paid, noise pollution and awareness of negative ecological impacts of the expansion project on tourism development in the area. Questions were asked about the tourism potential of this area, which is near the estuary of the River Pra at Shama and the colorful Nye-yi Pra festival celebrated in November, annually. The study area is known to have a light vegetative cover leading to the rocky and sandy beach flanked by coconut trees that could attraction ecotourists seeking sun, sea and sand recreation (TTPP EIA, 2009:34).

RESULTS AND DISCUSSION

The respondents were asked to state whether they were aware of the importance of the thermal power plant in their immediate environment. Almost all those interviewed (9 out of 10) indicated that they were aware of the importance of the thermal plant in their vicinity, but most of them (7 out of 10) were neither aware of the proposed expansion nor the need for the expansion of the project. When questioned about the expansion of the project, one of the respondents answered, "I don't know why they want to undertake the expansion of the plant". It was therefore revealed that consultation before the preparation of the EIA was not taken seriously as even the chief, the custodian of the land on which the project was sited, remarked that although he was informed about the project's expansion; no inputs were requested from him. Some of the women living near the project complained of being deprived of their energy source. When one of the women leaders from Aboadze was asked about her views on siting of the project near the town, she said:

"The siting of the project here has deprived women in this town the land for cultivation of crops and an important area where we gathered the firewood needed daily for the preparation of meals for our families."

On the issue of whether sufficient and satisfactory compensation was paid by the government to the community before acquisition of the land on which the thermal project is sited, the chief, who is the custodian of the land, responded in the affirmative. However, one of the youth (aged 25 years) involved in the study remarked:

"It was the chief and elders of the town who sold the land for the project thereby benefitting from the sale, but not the whole residents living in communities around the project."



The respondents from Aboadze were however quick to praise the VRA for giving them an International School, a Community library, a newly constructed market, a community cold storage facility (for storing fish bought by the people) and a clinic that served the needs of the workers of the company as well as that of the community members.

Noise Pollution

According to the United States Aid for International Development (USAID, 2011), being exposed to high noise levels for long periods may result in hearing loss, creation of stress, reduction in productivity, interference with communication, leading to accidents and injuries by making it difficult to hear warning signals. To estimate noise emissions during construction and operation of any facility, operational monitoring may be necessary. As excessive noise is associated with most generating plants and must, therefore, be covered by EIAs (Bond, 2000), the respondents were asked questions regarding noise produced at the plant in its operation. Regarding whether the noise level by the plant was a problem, the responses of the people were varied.

While respondents at Inchaban did not think that noise levels emitted by the plant was a major problem, residents at the western boundary of the plant were of the opinion that noise levels were slightly higher there. One young lady interviewed at Aboadze claimed:

“I don’t think noise levels around the plant during the day are too high, it is only at times during the night that noise levels become unbearable”.

When the noise levels around the plant were monitored and recorded in the EIA in various areas around the thermal plant, using the EPA’s acceptable noise limits from January to March 2009, the data on Table 1 were produced.

Table 1: Noise monitoring at T1 boundaries [dB(A)] Jan – March 2009

Area	EPA Limit [dB(A)]	Noise Levels [dB(A)]			Remarks
		Jan 2009	Feb 2009	March 2009	
Eastern Fence	70	53.0-5.0	52.0-4.0	54-55	Compliant with allowable limit
Northern Fence	70	64.3-66.0	64-66	60-62	Compliant with allowable limit
Southern Fence	70	58.2-62.8	57.1-60.5	59-61	Compliant with allowable limit
Western Fence	70	69.0-70.	69.5-73.3	68-72	2-3 dB(A) above compliance limit due to TICO GTs
Aboadze Village (day)	55	50-54	50-54	51-53	Compliant with allowable limit
VRA Township (day)	55	53-55	53-55	54-55	Compliant with allowable limit
Aboadze Village (night)	48	43-47	43-47	44-47	Compliant with allowable limit
VRA Township (night)	48	46-48	46-48	45-47	Compliant with allowable limit

Source: Takoradi Thermal Plant Project expansion EIA Report, (2009)

NOTES

[dB(A)]: A-weighted decibels, is an expression of the relative loudness of sounds in air as perceived by the human ear.

- a) Eastern fence corresponds to the fence east of the crude oil storage tanks
- b) Northern fence refers to the fence dividing T1 from T3 and land adjacent to the raw water tank
- c) Southern fence is next to the T1 cooling tower



d) *Western fence is west of the T2 gas turbines*

As indicated on Table 1, noise levels around the project were within acceptable limits, with the exception of the western fence, where noise levels exceeded the acceptable limits of 70 dB(A) that may pose significant threat to the workers (Runion, 1988). Although the site preparation stage, involving the preparation of the area for construction required the use of plant and equipment which could have the potential to produce excessive noise levels at Aboadze, it was reported to be only temporary and would cease with the completion of the expansion of the project. As noise levels around the thermal plant were not excessively high, the EIA did not recommend the installation of sound dampening devices to be built into either the machinery or the buildings.

Negative Ecological Impacts

Among many other important issues of concern covered in the EIA, the assessment covered a study of the potential negative ecological impacts that may result from expansion of the T3 thermal project. These included clearance of vegetation and habitat loss, disturbance of wildlife and habitat contamination. While this represented a cumulative loss of vegetation cover and consequently loss of the habitat for animals, the area affected was relatively small and a few of the animals had already been disturbed and isolated from the surrounding wetlands due to the spoil disposal from T1/T2. Almost all those interviewed were of the opinion that clearance of the land for implementing the project has resulted in deprivation of wild animals and some migration birds from their habitats which was a wetland. The area has numerous lagoons with variety of fish, shrimps, crabs, mollusks and *polychaete* species, which have the potential for tourism development and, therefore, needs protection.

Tools used for Appraising the EIA

To be able to assess or appraise the usefulness or otherwise of the EIA of the TTPP, a content analysis of the document was undertaken. Content analysis is a research technique used to obtain “data by observing and analyzing the content or message” of documents (Zikmund, 2003:248). This technique was used because it is a multi-purpose method that is useful for assessing negative environmental impacts identified by the EIA of a project. In assessing environmental impacts, the assessor may seek to determine the extent to which the predicted impacts are acceptable and make value judgments. Part of the evaluation stage includes identifying ways of minimizing environmental impacts. Glasson *et al* (1999), proposed the following assessment techniques of EIA, which were used for this study. They are vulnerability, land-use and suitability, cost benefit, multi criteria and sustainability analyses, which are explained in the following section.

Vulnerability Assessment

According to van Straaten (1996), vulnerability analysis of a project is a planned activity onto the vulnerability of the original system. Vulnerability in this context could refer to the combination of sensitivity and an evaluation of the weakness of the system under study. Vulnerability is also linked to specific sub-activity impacts such as desiccation, eutrophication and pollution (van Straaten, 1996). Basically, vulnerability analysis works with maps, linking a continual or discrete vulnerability value to a cartographic object. In this way, different alternatives for example, groundwater extraction units can be evaluated by calculating a weighted total figure. In the case of the TTPP, alternatives for pollution from the burning of fossil fuels as well as its effects on the micro climate of the area, was not discussed in the EIA. This was unfortunate as fumes from the burning of these fossil fuels could have long-term impacts on the people and the environment in general. Regarding the use of fossil fuels, whilst the level of environmental impact depends on the particular type of fuel used and the extent to which abatement technologies are being employed, the greater the efficiency of the power plant, the lower the environmental impact for each unit of electricity produced, assuming that the increase in efficiency leads



to an absolute decrease of fossil fuel input. Efficiency ratios of alternative fuels that the plant could use were also not discussed.

Land-use Suitability Analysis (LSA)

Land-use suitability analysis aims at identifying the most appropriate spatial pattern for future land use and other alternatives such as tourism development according to specific requirements, preferences, or predictors of some other activities (Hopkins, 1977; Collins, Steiner & Rushman., 2001). According to Moreno and Seigel (1988), application of LSA for environmental impact assessment is made possible by the use of Geographical Information Systems (GIS). A careful appraisal of the EIA report for the TTPP revealed that a comprehensive land-use and suitability analysis was undertaken, indicating all projected environmental impacts. In addition, a comprehensive soil assessment for the land on which the plant is situated was undertaken for the report. It was based on a 60m transects of which four sample points were located at 10 m intervals on the plot on which the plant is sited. Table 2 shows the soil sample analysis undertaken at and around the Thermal Plant. The major soils of the area are forest and coastal savanna ochrosols, developed in forest and savanna environment under an annual rainfall of between 900 mm and 1650 mm. The organic matter content of such soils was low, with pH generally less than 5.5. Within each habitat type, soil samples were taken from the depth of 0-15 cm and 15-50 cm at each of the sampling points.

Table 2: Soil Sample Analysis at T3

Microbial parameter	A-Composite (0-15 cm)	A-Composite (15-50 cm)	B-Composite (0-15 cm)	B-Composite (15-50 cm)
Total coliform (g-2)	14,620	154,000	154,000	150,000
Fecal coliform (g-2)	< 1	110	< 1	< 1
Total heterotrophic	680	560	720	800
Bacteria (g-1)	--	--	--	--
<i>Pseudomonas</i> spp. (g-1)	9	24	18	154
<i>Clostridium</i> spp. (g-1)	960	520	800	400
<i>Desulphovibrio</i> spp. (g-1)	< 1	< 1	< 1	< 1
Hydrocarbon oxidizers (g-1)	126	27	18	115
Hydrocarbon degraders (g-1)	80	44	90	110
Moulds (g-1)	640	440	480	70
Yeasts (g-1)	50	14	8	4

Source: Takoradi Thermal Plant Project expansion EIA Report (2009).

The results on Table 2 show high counts of total coliform bacteria in the different samples, which are normal flora of soil, whose presence may not necessarily indicate contamination. Faecal coliform bacteria count which is an indication of possible contamination of the soil with faecal matter ranged from < 1 to 110 cfu/100g, with the composite sample (15-50 cm) recording the highest count. The total heterotrophic bacteria count was high in the samples, which ranged from 560 to 800 cfu/100g. These included the various coliform bacteria, the *Clostridia*, the *Pseudomonas*, and the hydrocarbon bacteria. The levels of sulphate-reducing bacteria in the different soil samples from the sampling areas were found to be very low. The soil analysis presented indicates satisfactory levels for the project. The only issue of concern was exclusion of the local people from the LSA. Innes (1995) advocates public participation in undertaking LSA for the preparation of all EIAs. However, public participation in the conduct of the LSA for TTPP was not mentioned. Moreover, land use changes that may lead to biodiversity loss that will affect farming activities and tourism development in the area, ground water pollution, oil spills in this



coastal and marine environment as a result of the expansion of the thermal project, were neither envisaged nor planned for, in the preparation of the EIA.

Multi Criteria Analysis (MCA)

Multi-criteria analysis (MCA) is a procedure in which several criteria are needed to be evaluated to meet a specific objective especially for EIA. The starting point of MCA technique is the generation of discrete set of alternatives, formulation of the set of criteria and evaluation of the impact of each alternative on every criterion. The estimated impacts of alternatives on every criterion, called criterion scores, are organized into an evaluation matrix (Gantsetseg & Basting, 2009). According to Janseen (2001) MCA is a popular tool in the preparation of EIA in the Netherlands. MCA also provides a systematic and transparent approach for assessing EIAs, increasing objectivity and generating results that can be reproduced and verified (Bonte, Janssen, Mooren, Smidt & Burg, 1998). The application of MCA employs methodologies such as weighted summation and limited interest in sensitivity analyses as a decision making tool in EIA preparation and assessment (Janseen, 2001). Therefore, its importance in the preparation of EIA cannot be over emphasized. It is useful for explaining the impacts of a project on the physical and socio-cultural environment and how these impacts could be mitigated, especially if tourism development is decided upon in that environment. In spite of its usefulness in the preparation of EIAs, MCA was never mentioned in the preparation of the EIA report for the TTPP.

Cost Benefit Analysis (CBA)

According to Pearce, Markandya and Barbier (1989), CBA aims to translate all impacts into monetary values. The aim is to help decision-makers by "translating" environmental and social costs into a single unit of measure -- money -- that they already might have used to make decisions. In theory this allows all impacts to be put on the same footing. Westman (1985) also describes CBA as a "variety of economic tools that assign values to project components and perceived benefits, and are used to determine relative costs and benefits of developments or projects" (pp. 532). The EIA report was silent about what time period costs and benefits should be compared, as well as the negative impact of the use of LCO or diesel for the operation of the thermal plant on the micro-climate of the area over the next ten, twenty, thirty or forty years. This aspect of the EIA could be discussed under 'replacement cost approach' (Pearce *et al*, 1989), which is used to explain the amount it would cost to replace an asset at current prices. Moreover the report did not mention an aspect of contingent valuation, for example the people's perception of noise levels that they can bear or whether they must be compensated for bearing with the level of noise from the operation of the thermal plant including its expansion.

Sustainability Analysis

Sustainability issues about the EIA for the TTPP project were discussed from two angles: sustainability of project funding and sustainability of raw materials for the plant. Regarding the first issue of sustainability of project funding, the expansion of the TTPP was expected to last for two and a half years: i.e. from 1st June 2009 to 28th December, 2011. However, the project was handed over to the Minister responsible for Power and Energy in Ghana only at the beginning of April, 2013 and was yet to commence operation to augment electricity power generation in a country that was then experiencing electricity power rationing. The delay in the completion of the project was not anticipated in the preparation of the EIA report.

Regarding the second issue, i.e. sustainability of the raw materials for operation of the thermal plant, it was not captured by the report. The plant was built to operate mainly on fossil fuels (i.e. LCO, diesel and natural gas). Natural gas was considered appropriate because it was cheaper and 'cleaner' than LCO and diesel, but was unavailable in the country in larger quantities at the time of developing the TTPP. The plant had therefore operated on LCO until the WAGP started supplying gas to the TTPP. Unavailability



of gas from the WAGP has negatively affected the plant and consequently electricity production in Ghana.

Based on the interviews conducted and content analysis of aspects of the document undertaken using the tools of assessment, the following findings were arrived at:

- i. Perceptions of the local people interviewed indicated that public participation in the preparation of the EIA for the TTPP was limited, with no awareness creation for the people.
- ii. Furthermore, the study revealed that the traditional leaders in the area did not consider the interest of their people in sharing benefits accruing from projects located in their environment.
- iii. In preparing the EMP, MCA should have been used to enhance decision making. As Ghana is a net importer of LCO (in spite of the discovery of crude oil in commercial quantities in the country in 2010), alternative energy sources such as the use of biomass, wastes, geothermal or even development of nuclear energy, for electricity generation, should be considered in the preparation of an EMP to ensure sustainability of the supply of raw materials for the thermal plant.
- iv. Although the EIA report recommended the monitoring of important variables such as the quality of the air around the plant, sea water temperatures and the quality of sludge/oil waste. Although these activities had commenced, it was also revealed that regulations for regular reporting by developers and monitoring by the EPA have not been implemented.
- v. The project expansion could enhance electric power production by adding 132 Megawatts (MW) of electric power needed by tourism and hospitality facilities in the country.
- vi. It was revealed that the expansion project could negatively affect tourism development in the area by destroying the habitats of animals such as the various migratory birds including pied crows, vultures (which are endangered species), raptors (buzzards/hawks), weaver birds, various finches and other migratory birds in the wetlands that could attract ecotourists to the study area.

Recommendations

From the findings, the following recommendations are made:

- i. There is also the need for a proper EMP to be prepared for the TTPP, which should stress the use of cheaper energy sources, such as natural gas in its operation, as this could now be produced from the newly discovered Jubilee Oil and Gas field in Ghana, to ensure sustainability of the thermal plant.
- ii. Moreover, in considering the importance and usefulness of MCA in EIA preparation, they should have been used in preparing the EMP to make clear which criteria to be used to indicate mitigation measures for negative environmental impacts identified.
- iii. In addition, in spite of the usefulness of the EIA document, most of the technicalities should have been reduced to make its reading and understanding less difficult for the lay man.
- iv. Also, a complete study must be undertaken on the impacts of the expansion project on the tourism development in the area, including the rehabilitation of displaced migratory birds in the swampy areas and the beaches of Aboadze.
- v. The Shama District Assembly needs to collaborate with the Regional office of the Ghana Tourism Authority to ensure the development of tourism in the area as it has some notable potential tourist attractions such as the numerous birds in the area and the pristine beach.
- vi. Finally, as the EIA document contains a lot of abbreviations; it should have included a glossary of abbreviations used in the text for easy referencing.

Implications of the Project Expansion

Like all other projects occurring in the environment, the expansion of this thermal project in Ghana has both negative and positive implications for tourism development not only in the study area but the country in general. The positive implications of the expansion of the thermal project include:



- i. The ability of the expanded thermal project to continuously add 132 Megawatts (MW) of power to the supply of electricity needed by tourism and hospitality facilities in the area and other parts of the country to cater for tourists visiting the area and the country, by reducing the *dumsor* problem.
- ii. In addition, tourists could also be encouraged to visit the thermal plant as a tourist attraction to appreciate its contribution to the supply of electric power for the country's industrialisation.

The negative implications of the project on tourism development in the area were two-fold.

- i. The first is that destruction of the habitat of animals and migratory birds in the study area should be prevented as this might inhibit ecotourism development in the area. Failure to do this may prevent potential tourists who might have liked to visit the area to watch animals including migratory and other birds, such as the vulture, which is endangered, from doing so.
- ii. Secondly, destruction of the source of fuel-wood for women in the area due to the project means that households in the area should have to switch to the use of gas for their household energy needs, at a cost that may not be easy for some of the poor local people.

Limitations of the Study

As with all research works, some methodological limitations were associated with this work. The first limitation was that the use of purposive sampling technique for selecting respondents for the interviews, limited the responses from a wide range of other people in settlements near the project, whose views could have enriched the study. Secondly, arising from the first limitation is the inability to make generalizations concerning the total population with the use of purposive sampling (Singh, 2006). Though most of the people interviewed were important stakeholders in the project, whose views are well considered in the societies which they represented, exclusion of the views of officials of the Environmental Protection Agency (EPA) and Ghana Tourism Authority (GTA) from the study was a serious shortcoming as their inclusion could have improved the quality of the work. Finally, the selected aspects of the report that were used for the content analysis as well as the tools used, limited the components of the report that were assessed. This seemed to be unfair as other aspects of the report were equally important and could have been covered in the appraisal process. Moreover, the EIA document used for the study is over seven years old so certain aspects would have changed over the years.

CONCLUSION

The EIA report for the expansion of the TTPP project was comprehensive enough and generally useful as the 311 page document is full of maps, pictures, tables, graphs, diagrams and appendices to illustrate the major write ups made to tackle all aspects of the plant's environment that could be negatively affected. However, appraisal of the report reveals that aside the mention of a scoping report for the earlier T1 project, no scoping notice was advertised for the expansion of the T3 project (TTPP EIA, 2009:142). This makes the lack of public participation in the preparation of the EIA for the thermal project a serious matter of concern, which must not be repeated, as it may have serious consequences with the local communities as far as sustainability of the project is concerned. Although noise levels around the project did not exceed 70 decibels and so were described as not excessively high, the workers were affected by some noise pollution. The EIA should, therefore, have recommended the provision of sound dampening devices for the buildings and the training of workers in their use, as well as making it mandatory for them to participate in mandatory annual hearing examinations (Epstein & Selber, 2002).

In addition, the EIA report did not mention alternatives to fossil fuels to be used for running the thermal plant. Alternative fuel sources such as geothermal or even nuclear should have been suggested for sustainability of the project. It should also have covered mitigation of factors hindering tourism development in the area due to the destruction of the habitats of migratory birds and animals (some of which are endangered) that could attract ecotourists to the study area. Finally, the TTPP's EIA report



should have indicated measures for the mitigation of land use changes that may occur as a result of the expansion of the thermal project. This was necessary to ensure sustainability of the project, which could also have ensured that Ghana had sufficient electric power for domestic and industrial use as well as to meet her international bilateral obligation of eliminating *dumsor* and supplying electric power to neighbouring countries of the Republics of Togo and Benin, both lying to the east of the country. Overall, considering the wider coverage of the EIA for the expansion of the TTPP, its usefulness cannot be questioned, despite its technical nature. The EIA report could be described as extremely useful. What is left however is the rigorous implementation of its recommendations for identified negative impacts indicated in the EIA, to be mitigated, so as to ensure sustainability of the thermal plant for improved power production and tourism development in the study area.

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