



Impacts on Environmental Components of the Proposed Liquefied Petroleum Gas Bottling and Distribution Plant at Dacope Khulna in Bangladesh

R. Bagchi¹, M. A. Miah^{2*}, S. M. T. Islam³ and S. C. Shil⁴

¹Department of Disaster Risk Management

Patuakhali Science and Technology University, Dumki, Patuakhali-8602

²Department of Environmental Science and Engineering

Jatiya Kabi Kazi Nazrul Islam University, Trishal, Mymensingh-2224

³Institute of Disaster Management, Khulna University of Engineering and Technology, Khulna-9203

⁴Department of Environmental Science

Patuakhali Science and Technology University, Dumki, Patuakhali-8602

*Corresponding author: alim@jkkniu.edu.bd

Abstract

Impact identification is the first step in an Environmental Impact Assessment (EIA) process, contributing to prediction, evaluation and mitigation of significant environmental impacts. It connects the project characteristics to baseline environmental information with the aim of ensuring that all significant impacts are taken into consideration. The study location was at Dacope Upazila of Khulna District in Bangladesh. A Liquefied Petroleum Gas (LPG) bottling and distribution plant is going to set up by Energypac Power Generation Limited. The objective of the study was to identify the impacts on the major environmental components of the study area. The field observation, interviews of project proponent and community people, public consultation, laboratory analysis were the main activities of the study along with others. This study has done an appropriate analysis of baseline condition of the major environmental components of the study area, identified the impacts of the project on major environmental components and developed an environmental management plan for the LPG bottling and distribution plant.

Key words: Assessment, Environment, Impact, Management, Mitigation measures

Introduction

The world is advancing in terms of development. The concept of Sustainable Development is frequently used in every important program and projects. Along with it, the environment and environmental pollution are the talk of the time also. Scientists, engineers, developers, civil society have their concern to do this development in a decent way that negative impact from those development activities should be minimized. Combining the most recent scientific information, it is estimated that the identification of potential environmental impacts of development activities are very much important with the need of the day. Bangladesh is a country of transitional economy, having on an average 6% economic growth in the last decade (World Bank, 2013). Since early nineties there has been an increasing trend of foreign direct investment (BOI-GoB 2012), which comes with the investment in industrial and infrastructure sector. Each and every sector of human need is increasing at a high rate. In Bangladesh, 92% people are familiar with biomass as cooking fuel among the 70% people who are leaving in bucolic areas (Tamim, 2013). About 6% of the entire inhabitants use NG for cooking purpose (Elahi, 2013). For the fact, LPG as an alternative source of fuel is going to be popular day by day. The project will beneficial to meeting up the potential demand of LPG, supplying best quality LPG with reasonable prices,

decreases pressure on natural gas uses, creating employment opportunity for the local people and country's economic development. In Bangladesh perspectives of industrial activities, it is compulsory to follow the proper guideline of Environmental Impact Assessment (EIA) process, which was developed by DoE (DoE, 1997). Impact identification is the first step after project screening and scoping in an EIA process, contributing to identification, evaluation and mitigation of significant environmental impacts. It connects project characteristics to baseline environment information with the aim of ensuring that all significant impacts, positive and negative are taking into consideration in the EIA process (Oikonomou and Guitonas, 2011). Various studies (e.g. Momtaz, 2002, Morgan, 2012, Gilpin, 1995, Retief, 2010) recommend that impact identification is very important and vital part of EIA Process. Project identification involves a description of the physical and socio-economic characteristics of the proposed development, while there is a need to focus on all details that may cause significant impact on environment (Glasson *et al.*, 2005). Setting the baseline environmental condition refers to defining the existing environment in its ecological, economic, social, cultural aspects, with the aim of focusing on all factors that may be affected by the proposed action (Gilpin, 1995).

Methods of impact identification include checklist, matrices, quantitative methods, networks and overlay maps - GIS - (Glasson *et al.*, 2005), while objective, time, resource and data availability, previous experience and nature of the proposed project are the major factors to choose the most appropriate method (Nobel, 2010). Impact evaluation is related to the assessment of impacts related significance, while mitigation is defined as all measures taken in order to avoid, reduce and remedy all significant adverse impacts (Glasson *et al.*, 2005). Public participation is considered to be an important factor in order to improve the quality of environmental decision making (Canter, 1996). Environment Management Plan (EMP) is a site specific plan developed to ensure that all necessary measures are identified and implemented in order to protect the environment and comply with environmental legislation. The EMP is the document that provides a description of the methods and procedures for mitigating and monitoring impacts (DEAT, 2004). Therefore, this particular study aims to provide an analysis of the existing baseline condition and review the current practices of environmental impact identification which is extensively used to identify the impact on environmental component. At the end, the paper provides an environmental management plan that will help to mitigate the negative impacts and implement the LPG

bottling and distribution plant with environmental friendly manner as a sustainable development.

Materials and Methods

Description of the study area

The study area was at Chunkuri Village of Bajua Union under Dacope Upazila of Khulna District in Bangladesh. Area of Dacope Upazila is 991.58 km², located in between 22°24' and 22°40' north latitudes and in between 89°24' and 89°35' east longitudes. The area constitute of total 1, 43, 131 populations (BBS, 2013). A LPG bottling and distribution plant is going to set up there by Energypac Power Generation Limited (EPGL). The location of the proposed project site confined geographically, between 22° 35' 26.89" N and 89° 31' 17.30" E, 22° 35' 45.56" N and 89° 31' 26.11" E, 22° 35' 46.28" N and 89° 31' 20.82" E, 22° 35' 20.18" N and 89° 31' 40.68" E (GPS survey, model no: Magellan Explorist 510). According to project proponent information, the site has already occupied 7.80 (around 31,200 m²) acre of land. The project site is easily accessible by water course as it is situated nearby to Rupsha-Passur River. The project site is about 11 km from nearest Sundarbans boundary. So the project is outside of the Ecologically Critical Area (ECA) (ECA, 1995).

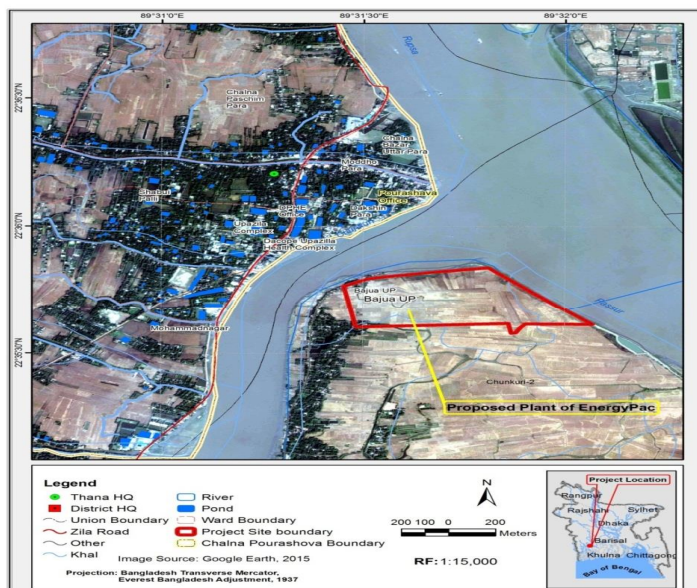


Fig. 1. Map of the project site of the study area

Methodology

Baseline condition of major environmental component (land cover, air quality, water quality, noise level) has been analyzed. Global Position System (GPS) survey method (model no: Magellan Explorist 510) have been used to identify the project location. Four ambient air

pollutants concentrations of Suspended Particulate Matter (SPM), Oxides of Nitrogen (NO_x), Oxides of Sulphur (SO_x), and Carbon Monoxide (CO) has been monitored to assess the present air quality. Monitoring was conducted in the month of January and March, 2016. Method of analysis (analysis by DoE, Khulna) of

four air pollutants concentrations were SPM (Gravimetric method), NO_x (Jacob and Hochheiser method), SO_x (West-Geake method) and CO (CO meter). Seven parameters of water have been tested to judge the water quality. Location of water sampling was Passur River; nearby the project site. Water parameters were tested in the laboratory of Green Development Consulting (GDCON), Khulna and Department of Environment (DoE), Khulna. Water sample was collected in the month of January and March, 2016. Tested water parameters were pH (digital pH meter, model: pH scan WP 1,2), Electrical Conductivity (EC) and Total Dissolved Solids (TDS) (digital EC and TDS meter, model: HM digital), Chloride (Argentometric method), Dissolve Oxygen (DO) (digital DO meter, model: D. 46974), Biological Oxygen Demand (BOD, 5 days after collection) (incubation in the dark condition at 20⁰C for 5 days), and Salinity (Brix Refractometer, model: Rhbo-90). Digital sound level meter AR814 (smart sensor) have been used to measure the noise level at the project site within variation of time and distances. Noise level data were collected in the month of January and March, 2016. An environmental management plan has been developed for the LPG bottling and distribution plant that may help to take appropriate mitigation measures to minimize the negative impacts on environment.

Data collection

Field observation, interviews of project proponent and community people, laboratory analysis and public consultations were the main methods of primary data collection for the study. Collected data has been analyzed through scientific procedures; descriptive

checklist and matrix method (both simple and weighted) to identify the potential impacts of the project on environmental components of the study area. Secondary data was collected through feasibility and Environmental Impact Assessment (EIA) report of various industries of same categories and from different report, research articles, books, journal papers and many more related to it.

Results and Discussion

Physical environment

The study area is mostly surrounded by agricultural land 65% of the total area. Another dominating land use of the study area is rural settlement with homestead vegetation 10% and forest area 6%. Also the road and embankment is 4%, industrial area is 3% and water bodies are 12%.

Air quality

Air quality at the project site is typical of a rural environment. Ambient concentrations of air pollutants are apparently very low to particularly non-existent. SPM increases sporadically in some areas when winds pick up dust over unpaved roads and exposed surface. Source of emissions, however, vehicle playing along the project site and village road called -Wobdhaø traler movement along the Chunkuri River nearby the project site. Recent two surveys (January and March, 2016) of the existing air quality of the project area and respective concentrations well below the standards applicable to rural areas as specified in the Environment Conservation Rules, 1997. Existing state of ambient air quality in the project area are presented in the following Figure 2.

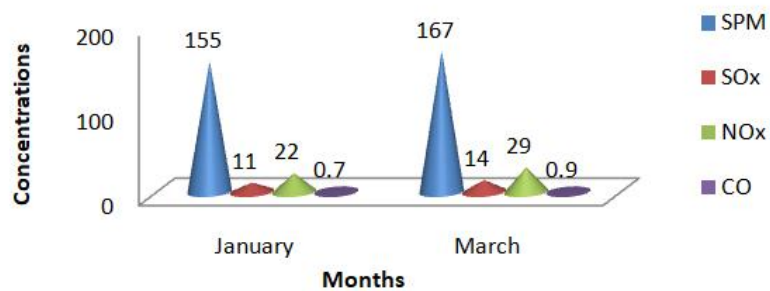


Fig. 2. Ambient air quality in the project area (January and March, 2016)

According to Figure 2, in January SPM concentration were (155 g/m³) and in March (167 g/m³). Concentration of SO_x were (11 g/m³) in January and (14 g/m³) in March. Concentration of NO_x were (22 g/m³) in January and (29 g/m³) in March. CO concentration were (0.7PPM/vv) in January and (0.9PPM/vv) in March. All the parameters were within the standard limit (ECR, 1997) for Bangladesh.

Water quality

The project site is beside Mongla-Khulna at Chunkuri and nearby to Passur River. It is an active tidal channel of Rupsa-Passur system and adjacent to project boundary. The samples were collected from surface water body of Passur River. Existing surface water quality (January and March, 2016) have drawn from the point of the project area along Passur River.

Water quality data of surface water samples of Passur River are presented in the following Figure 3 and 4 which results from the testing of water quality parameter

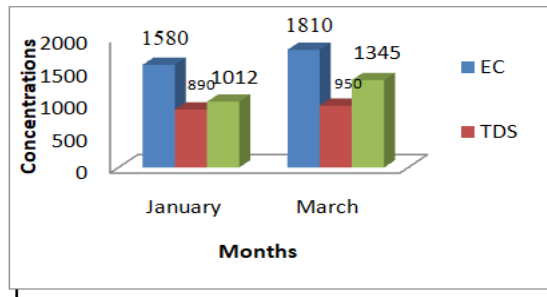


Fig. 3. Water quality data of Passur River (January and March, 2016)

by GDCON and DoE, Khulna in the month of January and March, 2016.

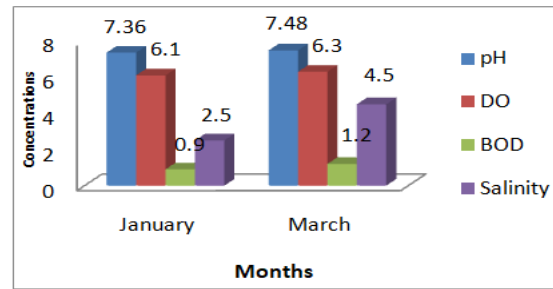


Fig. 4. Water quality data of Passur River (January and March, 2016)

According to Figure 3, in January pH concentration of Passur River were 7.36, DO (6.1mg/l), BOD (0.9 mg/l) and Salinity were 2.5 mg/l. In March pH concentration of Passur River were 7.48, DO (6.3 mg/l), BOD(1.2 mg/l) and Salinity were 4.5 mg/l. According to Figure 4, in January EC concentration of Passur River were (1580 S/cm), TDS (890 mg/l) and Chloride were (1012 mg/l). In March EC concentration were (1810 S/cm), TDS (950 mg/l) and Chloride were (1345 mg/l).

The above result shows DO concentrations of Passur River were acceptable and BOD exceeds the potable quality limit (ECR, 1997) for Bangladesh. The pH concentration was increasing with the increasing of EC. The pH concentration was better during the sampling period. The EC and chloride were going down to previous month (January) due to up steam water flow and tidal influence and open connection with the Bay of Bengal. Chloride concentration gradually increased towards the sea and exceed the surface water standard (ECR, 1997) for Bangladesh. Higher values of EC in dry season may be possible due to decrease of fresh water flow and high evaporation rate.

During dry season the water is not useable for agriculture, domestic and industrial purpose. But it is

suitable for shrimp cultivation due to high salinity. The result confirm that TDS concentration of Passur River of project site were comparatively lower than the recommended level (ECR, 1997) TDS for Bangladesh.

Noise quality

Existing noise level of the project area was measured over periods of three hours at day time (9 am to 6 pm) and one hour at night time (7 pm to 10 pm). Noise levels dB(A) in the project area on January and March, 2016 are presented in the following Figure 5 and 6.

According to Figure 5, in January at day time ambient noise level of the project site SW corner were 46 dB(A), NW corner 53.4 dB(A), SE corner 50.2 dB(A) and NE corner were 45 dB(A). At night noise level of the project site SW corner were 43 dB(A), NW corner 42 dB(A), SW corner 40 dB(A) and NE corner were 40 dB(A). According to Figure 6, in March at day time ambient noise level of the project site SW corner were 47 dB(A), NW corner 57.3 dB(A), SE corner 52.1 dB(A) and NE corner were 46 dB(A). At night noise level of the project site SW corner were 44 dB(A), NW corner 44 dB(A), SW corner 42 dB(A) and NE corner were 40 dB(A).

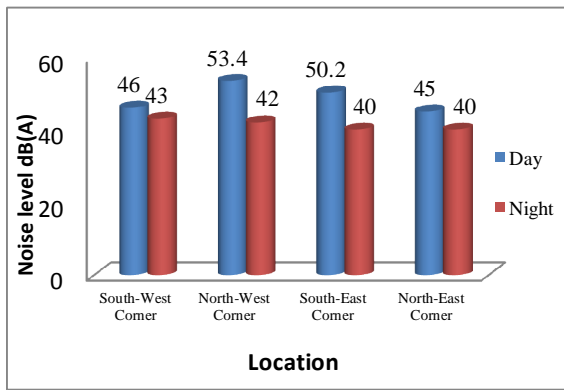


Fig. 5. Ambient noise level in the project site (January, 2016)

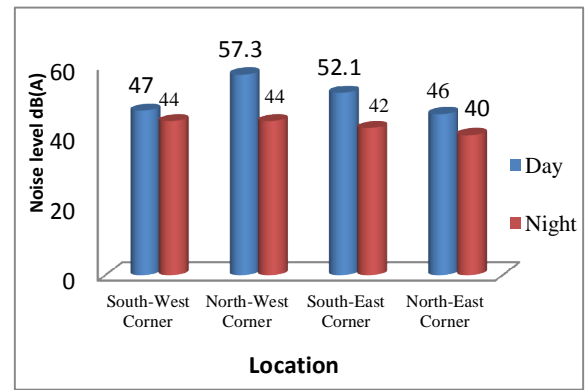


Fig. 6. Ambient noise level in the project site (March, 2016)

The above result shows that noise level data varies place to place along with the time and distance. Four points have taken for the noise level data measurements at the project site. In January the average noise level of the plant site were measured 48.65dB (A) at day time and 41.25 dB(A) at night. In March the average noise level of the project site were measured 50.6 dB(A) at day time and 42.5 dB(A) at night. From analysis, at day time the average level of noise at project site were 49.62 dB(A) whereas 41.87 dB(A) at night (approximately). Data indicates that the existing noise levels in study area were within the standard range (ECR, 1997) of Bangladesh for rural and semi mixed zone.

Potential Environmental Impacts

Use of simple matrix

This study identifies and predicts the probable impacts on different environmental parameters due to

construction (Table 2) and operation (Table 3) phases of the proposed plant through uses of simple matrix. This simple matrix mainly shows the permanent and temporary impacts on environmental parameters.

Use of checklist

In this study, a checklist method has been used to identify the potential environmental impact. This checklist presents the impacts of LPG plant construction and operation phase actions affecting the environmental resources. It shows the magnitude or importance of the impact as well as indication on prediction methods and indicators. The checklist are presented in the following table 4 and it has been prepared through after studying the existing baseline environment, field survey, scientific analysis, information of project proponent, public consultation and community interviews.

Table 2. Environmental impact identification matrix-construction phase

Parameter	Physical Environment					Biological Environment			Human Environment				
	Topography	Hydrology	Water Quality	Air Quality	Noise	Vegetation	Fauna	Aquatic Environment	Displacement	Employment	Service	Health	Culture
Liquid effluent			P					T				T	
Gaseous effluent				T		T						T	
Solid waste												T	
Hazardous waste													
Transport			T	T	T			T				T	
Operational noise					P							T	
Immigration			T							T	T		T
Employment										P	T		T

Here, P – Permanent and T – Temporary

Table 3. Environmental impact identification matrix-operation phase

Parameter	Physical Environment					Biological Environment			Human Environment				
	Topography	Hydrology	Water Quality	Air Quality	Noise	Vegetation	Fauna	Aquatic Environment	Displacement	Employment	Service	Health	Culture
Procession of land													
Site development	P			T		P				T		T	
Water requirement			T										
Civil and structural work			T	T	T			T		T		T	
Mechanical and electrical work				T	T					T			
Transport			T	T	T			T					
Immigration									T				
Employment										T	T		T

Here, P – Permanent and T – Temporary

Table 4. Checklist of potential environmental impacts

Project Phase	Actions Affecting Environmental Resources	Impact				Types		Comments
		None	Minor	Medium	Major	Adverse	Beneficial	
Construction Phase	Land value depreciation	x					x	Land value change: positive impact
	Loss of and displacement from homestead land			x		x		Deterioration of homestead vegetation
	Loss of and displacement from agricultural land			x		x		Primary economic activity to secondary economic activity
	Damage to nearby operation	x						No impact anticipated as no major installation
	Disruption to drainage pattern	x				x		Take care of local drainage pattern
	Encroachment into precious ecology	x						No major impact
	Runoff erosion		x					Take care of drainage pattern
	Water quality				x	x		Changes in water quality
	Air quality			x		x		No major impact
	Worker accident		x			x		Take care by good house keeping
	Sanitation diseases hazard		x			x		Concentration of laborers cause unhygienic
	Noise/Vibration hazard			x		x		Piling/equipment installation may cause noise
	Traffic congestion			x		x		Movement of vessels
Employment					x		x	Good employment opportunity

Operation Phase	Encroachment into precious ecology	x					No major impact
	Depreciation of environmental aesthetics		x				Community prefer employment generation activities
	Erosion/ Silt runoff	x					Having boundary wall : no impact
	Water quality				x	x	Water pollution
	Pollution from liquid discharge		x				Need to take prevention measures
	Pollution from solid waste		x			x	No significant solid waste: no significant impact
	Air quality/ pollution from gaseous effluent		x				No major impact
	Occupational health hazard			x		x	Reduce by good management practice
	Odor hazard		x				No obnoxious odor, no major impact
	Traffic congestion		x				No significant impact
	Noise hazard		x				Moderate impact
	Employment			x			x

Use of weighted matrix

This study used a weighted matrix to identify the potential environmental impact. It takes site selection-impact identification elements of four major factors and they are as follows: social and land use factor, environmental aspects, construction and operation phase factor. Definition of each Weighting Factors (WF) has been used in this study are: 1 = not very important, 2 = somewhat important, 3 = important, 4 = very important and 5 = essential. Definition of each Criteria Ranking

Score (CRS) has been used in this study is 0 = no impact; 1, -1 = fair, not so good; 2, -2 = desirable, bad; 3, -3 = most acceptable, unacceptable (least desirable). For the matrix analysis the first or primary Site (site in the Chunkuri Mauja) is showed as -Site 1ø and the alternative site is showed as -Site 2ø (site at Chila-Telekhali in Mongla). Table 5, 6, 7, 8 presents the weighted matrix of social and land use factor, environmental aspects, construction and operation phase factor respectively.

Table 5. Social and land use factors-weighted matrix

Criteria	WF	Sites			
		1	x WF	2	x WF
Size of site	4	2	8	1	4
Site topography	2	2	4	2	4
Water access	5	3	15	2	10
Road access	5	-1	-5	1	5
Zoning/ Land use	2	2	4	2	4
Visibility/ Safety of driveways	3	2	6	-1	-3
Roadway capacity, safety needs	4	2	8	2	6
Existing site development	3	2	6	1	3
Proximity to Population to be Served	2	3	6	2	4
Proximity to future expansion of community	2	1	2	2	4
Site drainage	2	1	2	1	2
Resettlement	4	-1	-4	2	8
Level of support of local public	4	-1	-4	2	8
Scope of employment	4	3	12	3	12
Proximity to natural hazards	4	1	4	-1	-4
Flooding	5	2	10	-3	-15
Cyclone	4	2	8	1	4
Aesthetic value	1	2	2	2	2
Year-round accessibility	3	3	9	2	6
Total			93		64

The above result of table 5 shows that, total score at 'site 1' is 93 and 'site 2' is 64.

Table 6. Environmental aspects-weighted matrix

Criteria	WF	Sites			
		1	x WF	2	x WF
Water pollution	5	-1	-5	-2	-10
Air pollution	5	-1	-5	-1	-5
Noise	3	-1	-3	-1	-3
Loss of tree	3	0	0	0	0
Flora in the project area	2	-1	-2	-2	-4
Flora outside the project area	2	0	0	-1	-2
Fauna	2	-1	-2	-1	-2
Odor	1	-1	-1	-1	-1
Biodiversity loss	5	-1	-5	-1	-5
Vulnerability to ecosystem	4	-1	-4	-2	-8
Cultural heritage	4	0	0	0	0
Total			-27		-40

The above result of table 6 shows that, total score at 'site 1' is (-27) and 'site 2' is (-40).

Table 7. Construction phase factors-weighted matrix

Criteria	WF	Sites			
		1	x WF	2	x WF
Possession of land	3	1	3	1	3
Site development	4	1	4	1	4
Loss of and displacement from homestead Land	3	-1	-3	-1	-3
Loss of and displacement from agricultural land	3	-1	-3	-1	-3
Civil and structural work	3	1	3	1	3
Mechanical and electrical work	3	1	3	1	3
Drainage pattern	2	-1	-2	-2	-4
Runoff erosion	2	1	2	-1	-2
Water quality	4	-1	-4	-2	-8
Air quality	3	-1	-3	-1	-3
Transport	3	2	6	1	3
Worker accident	3	1	3	1	3
Sanitation diseases hazard	2	1	2	1	2
Noise/Vibration hazard	3	-1	-3	-1	-3
Traffic congestion	2	0	0	-1	-2
Employment	4	3	12	3	12
Total			20		5

The above result of table 7 shows that, total score at 'site 1' is 20 and in 'site 2' is 5.

Table 8. Operation phase factors-weighted factors

Criteria	WF	Sites			
		1	x WF	2	x WF
Liquid effluent	4	1	4	1	4
Gaseous effluent	2	1	2	1	2
Pollution from solid waste	2	1	2	1	2
Hazardous waste	2	0	0	0	0
Air quality	3	-1	-3	-1	-3
Water quality	4	-1	-4	-2	-8
Runoff erosion	2	1	2	1	2
Occupational health hazard	2	1	2	1	2
Traffic congestion	2	1	2	-1	-2
Noise hazard	3	1	3	1	3
Employment	4	2	8	2	8
Total			18		10

The above result of table 8 shows that, total score at 'site 1' is 18 and in 'site 2' is 10. Table 9 here presents the total score of weighted matrix.

Table 9. Total score-weighted matrix

Totals	Site 1	Site 2
Total (A): Social and land use factor	93	64
Total (B): Environmental aspects	-27	-40
Total (C): Construction phase factor	20	5
Total (D): Operation phase factor	18	10
Grand total	104	39
Ranking through impact identification (1 st Good option and 2 nd bad option)	1st	2nd

As more positive value indicates more good sign and the more negative value indicates more bad sign for the site. Through weighted matrix grand total score at site 1 is 104 and site 2 is 39. Result of weighted matrix shows that implementation of the project at site 1 (site in the Chunkuri Mauja) has less environmental impact than the site 2 (site at Chila-Telekhali in Mongla. It is about 8.5 km from Sundarbans boundary; it is in ecologically critical area). So, ranking through impact identification site 1 is the good option and site 2 is the bad option for the implementation of the project.

Impact on air quality

During construction activities, minor increase of Suspended Particulate Matter (SPM) in the local air within the close proximity of the construction yard within the project area may be noticed due to sourcing of fugitive particulate matter from different construction activities and vehicle movements on project site earthen roads. Emission of NOx will be temporary and of short duration and will be felt close to project construction site only and will persist so long the construction goes on.

During operation, effect of SOx is negligible as sulphur content in gas is negligible and the quantity of NOx will be less than the DoE standard (40 ppm).

Impact on water resources

Impacts on water bodies and water resources during construction and post-construction stage may be noticed due to discharge of waste water into the Passur and Chunkuri River. The waste water may include wash off from construction machineries, plant processes water, and domestic waste water. During transportation of raw material and final product, discharge of Ship ballast water will cause the change of River water quality.

Impact on noise

The proposed plant will produce noise during operation of above construction equipment and plant operation process but outside the project boundary very limited noise may be felt. But procurement of machinery or construction equipment and ship movement during transportation of raw material and finished product will cause the noise level high in the project area.

Environmental management plan

An Environment Management Plan (EMP) is a site specific plan developed to ensure that all necessary measures are identified and implemented in order to protect the environment and comply with environmental legislation (Yong and Raymond, 2003). The main objectives of EMP of this study are: mitigation measures to reduce and eliminate negative impacts and enhancement measures to maximize positive impacts.

Pollution control measures

The project proponent should follow the provisions of the department of environment (DoE, 1997), the people republic of the government of Bangladesh. The environment should not be hampered by any activities and process of the plant activity. All hazardous and nonhazardous wastes of the plant should be collected in a pre-plan way should dispose in special landfill.

Air pollution management

Dust suppressor measures for fugitive dust emission. Provision of efficient filters at various heights of the emission stack to arrest particulate matters (BCAS, 2011). Speed regulations should be imposed for automobiles and the haulage and delivery vehicles should be confined to designated roadways inside the site (World Bank, 1999).

Water environment management

The construction equipment and transport vehicle washing should carry out in designated areas only. Suspended solids in run-off should be reduced by the provision of a good surface drainage system with suitably designed catch pits to retain sediments (TSHPP, 2006). Construction material storage areas need to be covered during wet season to avoid contamination of runoff. Adequate sanitary facilities for workers onsite should provide to prevent contamination of ground water.

Noise pollution mitigation

In construction phase procurement of machinery or construction equipment should generally be done in accordance with specifications conforming to source noise levels of 70 dB(A) (Farooque and Hasan, 1996). Need to maintain the standard level of sound during transportation vessels movement (World Bank, 1999). Noise generating activities should schedule for midday, or at times coinciding with periods of high background noise (CEGIS, 2013). In operation phase stationary equipment such as air compressors, generator etc. should operate as far away from sensitive receptors as practical quieter methods or equipment shall be used whenever possible (BCAS, 2011). Need to maintain the standard

level of sound during transportation vessels movement and plant operation process (CSIR, 1997).

Monitoring environmental quality

Water quantity metering devices should be installed on the main inlet pipes and discharge pipes to collect water consumption and discharge data. Ambient air quality should be monitored periodically at some selected locations. The parameters to be monitored include SPM, SO_x, NO_x and CO (CSIR, 1997). Noise monitoring should be carried out inside the units and outside the plant.

Conclusions

Combining the most recent scientific and demographic information, it is estimated that the identification of potential environmental impacts of development activities prior to its commencement are very much important with the need of the day. This study may help to assess the ground level realities of environmental impacts of industrial activities. This study has done a detailed analysis of baseline conditions of the major environmental components of the study area, identified the impacts of the project on major environmental components and developed an environmental management plan for the LPG bottling and distribution plant. The results of the study indicate possible impacts on environment. However, it is important to an analysis of future impacts of the project. The findings of the study were possible impact on the environment and negative impact may increase if appropriate mitigation measures were not taken. These findings may use to identify potential environmental impact and take industry-specific mitigation measures. Results from this study action may take care of all responsible authority to minimize the negative impacts of the project on environment and may contribute in sustainable development.

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