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### RESEARCH ARTICLE

#### ENVIRONMENTAL ASSESSMENT AND MANAGEMENT PLAN FOR SETTING UP OF AN INDUSTRY - A CASE STUDY.

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#### Abstract

The study covers an assessment of the status of environment i.e. Baseline Conditions in a core area of 10 km radius from the project site for environmental components and categorization of the Project. The study was organized to incorporate all relevant legal requirements and critical issues of the proposed project. Desk research was undertaken to gather relevant information from available sources followed by intensive site inspections to the proposed plant location for getting further relevant details of the proposed project and collection of primary and secondary baseline information for various components of environment. EIA was conducted considering baseline status and estimated pollution generation consequent to proposed project. An Environmental Management Plan has been prepared giving various measures to be adopted to mitigate the negative impacts so that the project would become environment friendly. Objective of this study broadly includes: A characterization of the project environment in respect of air, water, land, biotic, noise and socio-economic environment. Prediction of likely impacts of the various chemicals used in the manufacturing process on the various components of environment through review of the process design and all pollution control measures and final prepare environment management plan to mitigate the negative impacts.

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#### Introduction:-

Industrial development significantly contributes towards economic growth. However, industrial progress engenders a host of environmental issues of concern. Many of these issues could be obviated right at the factures; and environmental considerations and factors could be duly taken into account in totality, both while selecting a site and type of industry. SCHMETZ India Private Limited (SIPL) is the Indian arm of Schmetz, a German based Group engaged in the business of sewing machine needles for more than 150 years. The group is one the leading players in the sewing needles market.

SIPL has the main unit of manufacture of sewing machine needles in Gujarat and established one more unit by implementing the Greenfield Project in Bangalore at a total cost of Rs.3,751 Lakhs in two phases, as SIPL proposes to increase its net annual capacity from 126.5 million as on 31st Dec. 2003 to about 400 million needles. The

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proposed new unit at Bangalore is under 100% export orient unit (EOU) scheme of Ministry of commerce, Government of India for which approval has already been obtained.

SIPL does chrome plating and therefore falls under the red category of the Pollution Control Board. It has a fully equipped effluent treatment plant to process all effluents. Necessary consents have been obtained from the Karnataka Pollution Control Board and SIPL monitors the control measures stringently.

Indiscriminate setting of environmental features, such as air, water, land, flora, fauna, demography and health could be detrimental to the environment. In order to exercise desired controls and implement the environmental protection policy, the Government accordingly enacted laws and laid down standards promulgated through Gazette Notification(s). In this study, an attempt has been made to study the environmental impact assessment (EIA) caused by setting up of a sewing machine needle-manufacturing unit at an industrial area in Bangalore and an Environmental Management Plan (EMP) has been prepared. The whole study is summarized in this paper.

### Materials And Methods:-

Basically prior to the EIA Study of the project required legal policies and Administrative framework of Environmental Legislation were studied.

### Environmental Legislation:-

The Ministry of Environment and Forests (MoEF), Government of India, as the nodal agency, formulates environmental policies and ensures compliance of the same. A number of legislations enacted by the Government of India and a few legislations enacted by the Government of Karnataka have a bearing on the proposed industrial Project and a brief summary of the environmental Legislation is given in **Table 1** below:

**Table 1:-** Summary of Environmental Legislation

Act or Notification	Year	Objective	Responsible Agency
The Environment (Protection) Act. The Environment (Protection) Rules	1986	To protect and to improve the quality of the environment and to prevent, control and abate environmental pollution.	Central Government
The Air (Prevention and Control of Pollution) Act	1972 amended in 1981	To prevent, control and reduce air pollution including noise pollution as per the prescribed standards.	SPCB & CPCB
The Water (Prevention & Control of Pollution) Act  The Water (Prevention & Control of Pollution) Cess Act	1974  1977	To control water pollution and restoration of water quality as per the prescribed standards. To levy and collect Cess from industries based on water consumption.	SPCB & CPCB
The Explosives Act The Explosives Rules	1884 1983	To regulate the manufacture, possession, use, sale and transport (import and export) of explosives and to restrict handling and storage of explosives	Central Govt.
The EIA Notification	1994	To issue environmental clearance to development projects based on EIA report.	MOEF
The Abatement of Environmental Pollution Notification	1997	To protect, prevent and control environmental pollution and improve quality of Environment	MOEF & DOEF
Hazardous wastes (Management and Handling) Rules The manufacture, Storage and Import of Hazardous Chemicals Rules	1989  1989	To protect the environment, to prevent and control accumulation and disposal of hazardous chemicals to soil or aquatic sources/water bodies	SPCB & CPCB
The Chemical Accidents (Emergency Planning, Preparedness and Response)	1996	To protect, prevent and control disasters occurring due to chemical accidents	SPCB & CPCB

Rules			
The Noise Pollution (Regulation and Control) Rules	2000	To regulate and control noise level in and around the project area	SPCB & CPCB
The Public Insurance Liability Act	1991	To protect workers at emergency	SG

CPCB: Central Pollution Control Board ; SPCB: State Pollution Control Board; MOEF: Ministry of Environment and Forests; DOEF: Department of Environment and Forests; SG: State government

Certain accepted standards need to be adhered to while preparing Environmental Impact Assessment Report including project specific Environmental Management Plan (EMP).

#### **Administrative Framework For Environmental Clearance:-**

As per the provisions of the EIA Notification, 1997 & 2006, Environmental clearance is required for electroplating industrial projects.

#### **Clearance from SPCB (Air and Water pollution only):-**

The concerned authority should apply to the Secretary of the concerned State Pollution Control Board, in the prescribed proforma along with the required copies of Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) report, to obtain State level Environmental Clearance.

SPCB (State Pollution Control Board) organizes Public Hearing and the Consultant/Client have to answer questions with justification and questions on compensation, under the supervision of the Committee Members formed by the SPCB.

#### **Clearance from MOEF:-**

The proposal should be submitted in the prescribed proforma (provided in CII and MOEF (1999) publication) with required documents to obtain Pre-Environment Clearance and to obtain Approval of Terms of Reference (ToR) and the study needs to be conducted as per the approved ToR. Final Environment Clearance from MOEF, Govt. of India and State Pollution Control Board need to be obtained for composite Environmental Clearance for the implementation of the project.

#### **Eia Study Methodology:-**

The study was organized to incorporate all relevant critical issues of the proposed project including manufacturing process and related hazardous materials with its probable impacts. Desk research was undertaken to gather relevant information from available sources followed by site visits to the proposed plant location for getting further relevant details of the proposed project and collection of baseline data for various components of environment. EIA was conducted considering baseline status and estimated pollution generation consequent to proposed project. Environmental Monitoring of Air, Water, Noise and Soil was periodically carried out as per requirement. An Environmental Management Plan has been prepared giving various measures to be adopted to mitigate the negative impacts.

Keeping in view the nature and capacity of SIPL proposed Unit, various guidelines available and with the past experience, it was decided to cover a project shadow area of 10 kms radius from the center of the proposed plant site covered during the study area. Various components of environment covered under the study are given below:

#### **Air Environment:-**

Ambient air quality data within 10 km radius were collected for three months. Taking into account micro-meteorological conditions sampling sites were identified. Ambient air quality-monitoring stations were selected at the proposed SIPL plant location and its surrounding areas within the radius of 10kms. The parameters selected for ambient air quality status were Suspended Particulate Matter (SPM), Respirable Particulate Matter (RPM), SO<sub>2</sub>, NO<sub>x</sub>, CO and Non-methane HC (NMHC). All the parameters were monitored on 24-hour cycle. The meteorological parameters were also recorded by installing meteorological station at the proposed plant site to determine the prevailing meteorological conditions during the study period.

**Noise Environment:-**

Noise pollution may cause an adverse effect on human beings and associated environment including land, domestic animals, wild life and natural ecological systems. Hence, noise surveys were carried out at site and within the study area of the project.

**Water Environment:-**

Information on water resources (ground water) was collected. The critical parameters of prime importance were selected and analysed under physical and chemical (inorganic and organic) aspects.

**Land Environment:-**

Studies were undertaken to characterize and describe the land environment and various components in terms of land use and cropping patterns, physico-chemical properties of soils etc. Samples were collected and analysed. Plant species for the development of green belt were also studied taking attenuation factors into consideration.

**Biotic Environment:-**

The study was based on physical observation of the species in the project shadow area. The expert team visited the area and collected the data on flora and fauna, forestry and wildlife, aquatic life in the surrounding water bodies as well as the avian scenario because no such study was available for the area, on these components of zonal and location specific ecology.

**Socio-Economic Environment:-**

Compilation and collection of requisite type of data were undertaken, such as, demographic pattern, population density per sq.km and economic status, educational facilities, medical facilities, health status transport and communication, entertainment etc. such data were collected within a radius of 10 kms of proposed project site.

**Results And Discussion:-**

The Air quality, Water Quality and Noise level studied during the Study period are given below in **Tables 2, 3 and 4**.

**Table 2:-** Summary of Ambient Air Quality Status in the Study Area (As Monitored At Site During Post-Monsoon)

Pollutant	Location	Conc. ( $\mu\text{gm}/\text{m}^3$ )		
		Min	Max	Average
SPM	Security Room Terrace	209.4	386.5	243
	Near Harish Electricals	165.8	171.4	168.6
	Near Water Tank, Hosapalya village, Bidadi hobli	136.2	149.6	142.9
	Near Primary Health care Center, Gonipura Village	127.8	135.8	131.8
SO <sub>x</sub>	Security Room Terrace	8.3	12.8	11.97
	Near Harish Electricals	3.8	8.1	5.95
	Near Water Tank, Hosapalya village, Bidadi hobli	7.1	8.6	7.85
	Near Primary Health care Center, Gonipura Village	4.1	7.5	5.8
NO <sub>x</sub>	Security Room Terrace	5.1	28.4	10.92
	Near Harish Electricals	6.4	8.1	7.25
	Near Water Tank, Hosapalya village, Bidadi hobli	4.6	4.7	4.65
	Near Primary Health care Center, Gonipura Village	4.1	5.6	4.85

All parameters were observed to be within the Standard limits.

**Table 3:-** Summary of Ground Water Quality Monitoring Results of the Project Site

Parameters	Results	Drinking water standards
Atmosphere temp ( $^{\circ}\text{C}$ )	28.00	----
Water Temp ( $^{\circ}\text{C}$ )	1.0	5.0
Colour Hazen Units	0.00	5.0
Odour	Unobjectionable	Unobjectionable

Turbidity (NTU)	0.00	5.0
Total Solids	645	500
Suspended Solids	0.00	Nil
Total Dissolved Solids	645	500
Conductivity in micromhos/cm	71.4	----
P <sup>H</sup>	7.2	6.5 to 8.5
DO	5.8	6.0
BOD for 5 days	Nil	Nil
COD	4.5	Nil
Total hardness as CaCO <sub>3</sub>	348	300
Calcium Hardness as CaCO <sub>3</sub>	218	200
Magnesium Hardness as CaCO <sub>3</sub>	226	100
Sulphate as SO <sub>4</sub>	26.0	200
Chloride as Cl	186.0	250
Total Alkalinity as CaCO <sub>3</sub>	289.0	200
Nitrate as NO <sub>3</sub>	7.9	45.0
Fluoride as F	0.21	1.0
Iron as Fe	0.06	0.3
Lead as Pb	0.00	0.05
Phenolic compounds	0.00	0.001
Oil and grease	0.00	Nil
Ammonical nitrogen	0.00	---
Kjeldhal Nitrogen	0.00	----
Phosphate as PO <sub>4</sub>	0.00	----
Boron as B	0.00	1.0
Calcium as Ca	94.0	75.0
Manganese as Mn	0.0	0.0
Magnesium as Mg	21.8	30.0
Sodium as Na	5.08	200.0
Potassium as K	3.2	----
MPN total coliforms	0.0	0.0
MPN Faecal coliforms	0.0	0.0

Results were compared with WHO and BIS standards for drinking water (Ref. Annexure-IV for drinking water standards). All the parameters are found to be well within the maximum permissible limits.

#### Water Supply Scheme – Water Requirement of SIPL:-

The per-day requirement of water is estimated at 35 KL for industrial purpose, 10 KL for domestic use. The supply of water for the unit does not pose any problem – abundant supply is available from existing bore, which could be supplemented, if required, from other sources like state board or private source. The treated effluent water quality parameters will meet the MINAS standards laid down by CPCB. The treated effluent is recycled/ reused in the industry for the process purposes; thus, making the SIPL as the zero effluent discharge unit.

**Table 4:-** Summary of Ambient Noise Level Status in the Study Area

Time in Hours	Results dB (A)						
	July-August 2004			August-September 2004			
	Plant site	Bus stop, Kumbalagodu (Commercial Area)	Hosapalya, Bidadi Hobli (near School)	Plant site	Bus stop, Kumbalagodu (Commercial Area)	Hosapalya, Bidadi Hobli (near School)	Kengeri
6A.M-7A.M	49.94	50.88	49.62	51.27	51.22	51.05	46.15
7-8	49.79	51.33	50.35	50.8	51.89	50.98	47.66
8-9	53.69	54.03	58.10	50.4	60.98	52.92	48.68
9-10	59.05	59.88	58.63	58.08	58.89	59.62	52.3

10-11	57.99	58.65	59.30	60.05	58	60.12	53.72
11-12PM	57.53	59.01	59.67	57.98	58.60	60.03	55.11
12-1	58.53	58.35	58.2	57.03	63.86	59.08	60.7
1-2	58.46	61.45	59.25	58.7	57.97	59.20	61.74
2-3	59.74	60.30	60.49	59.05	57.73	59.76	61.51
3-4	59.59	60.72	57.96	58.92	58.2	60.11	60.31
4-5	61.42	60.44	57.59	58.65	57.65	57.41	60.6
5-6	60.45	60.35	59.56	58.44	57.77	53.8	59.76
6-7	62.05	62.18	56.6	53.32	58.50	54.92	60.28
7-8	59.09	60.78	57.4	58	60.23	56.26	61.21
8-9	60.08	60.31	58.39	57.47	53.57	56.58	59.79
9-10	56.85	56.95	51.70	56.15	59.47	54.85	59.25
10-11	60.28	59.34	51.23	50.54	49.82	51.73	58.44
11-12AM	59.42	59.22	51.12	50.55	49.57	51.74	57.1
12-1	50.48	50.85	51.29	50.75	51.62	50.85	49.88
1-2	49.40	48.78	51.86	51.15	54.1	51.0	51.84
2-3	50.58	50.88	51.56	50.57	51.39	51.46	51.55
3-4	54.28	54.50	52.29	51.45	51.31	51.2	50.06
4-5	57.65	58.40	51.02	50.1	51.89	50.75	51.09
5-6	57.68	58.00	52.65	50.7	51.22	50.95	52

Permissible maximum outdoor noise level for residential area, are 55 dB(A) and 45 dB(A) for day and night respectively. Noise level was within the permissible limits.

#### Propagation Modeling:-

The sound power radiated by a source spreads in the space as the pressure waves travel outwards. Hence, it decreases with distance and also gets affected by environmental conditions.

Prediction of anticipated noise levels is the most critical step in assessment of the impacts of any development on the noise environment. Two simple models for noise level predictions are point source and line source model.

Point source propagation can be defined as:-

$$P_2 = P_1 - 20 \log (r_2/r_1) - A_e \quad \text{Where,}$$

$P_1$  = Sound level at station 1

$P_2$  = Sound level at station 2

$r_1$  = Distance of station 1 from source

$r_2$  = Distance of station 2 from source

$A_e$  = Attenuation by environmental factors

If we take  $A_e = 0$ , then

$$P_1 - P_2 = 20 \log (r_2/r_1)$$

This means that for every doubling of distance the sound level decreases by 6 dB(A). This point source relationship is called the inverse square law and is applicable for single noise generating source.

Line source propagation occurs when there is a continuous stream of noise sources. Line source propagation prediction is as follows:

$$P_1 - P_2 = 10 \log (r_2/r_1)$$

The decrease in sound level for each doubling of distance from a line source is 3 dB(A). When noise levels from a busy highway are considered, it is appropriate to utilize the highway as an infinite line source and consider a 3 dB(A) doubling distance propagation rate.

**Impacts Due to the proposed Unit:-**

Simulation carried out for the proposed plant with the help of above model indicates that the impact of noise levels would be restricted within the plant limits and is of concern for work place environment rather than for the residents of the area.

Predicted noise levels in the vicinity of the plant boundary shall be of the order of 40-50 dB(A) as the National Ambient Noise Standard is of 70 dB(A) for the industrial zone. The noise levels in the nearby residential localities remain more or less same as without this project. However, due to increased vehicular activities during the operational phase of the proposed project, there may be some increase in the background noise levels. It may be further noted that these predicted noise levels do not account for any constructional hindrances in the way of these noise-generating sources. Also the attenuation of noise levels achieved by the green belt all around the plant boundary shall further contribute positively in minimizing the impact on existing noise levels.

**Noise Generating Sources at Plant:-**

Noise is generated from process section needle manufacturing plant, cooling towers, vehicular movement etc. Estimated noise level within the plant will be of the order of 75 dB(A). Apart from this, there will be substantial vehicular movement within the plant area. But this being intermittent and will affect the passer by for a very short duration. Hence, this will not have any harmful effect on receptors.

**Prediction of Impact of Noise on Community:-**

In general the process does not inherently produce or create noise other than usual industrial noise. Estimated value of noise reading at the plant is less than 75 dB (A). This will reduce to 40-70 dB (A) at plant boundary. There will be intermittent movements where the noise levels may increase to 75 dB (A) when vehicles move through the area. There will not be any increase in the noise level of these areas due to plant and all the noise levels are within the limits specified by Ministry of Environment and Forests.

**Environmental Impact Assessment:-**

Industrial projects generally cause impacts in two specific situations. These are Impacts during Construction and Impacts during operational phase of the industry. Since the impacts due to project location and project design are negligible, they have not been considered significant here.

**Impacts during Construction Phase:-**

Several types of negative impacts upon environment may happen during construction of the proposed industrial project, primarily due to negligent practices. Responsible supervision is needed to avoid/minimise and to mitigate such adversities. The contexts of such impacts include Impact on Land Resources, Soil Quality, Water Resources, Water Quality, Air Quality, Noise Level, Biological Environment, Sanitation and Waste disposal, Aesthetics, other impacts, if any. Each of these requires specific mitigation measures.

**Impact on Air Quality:-**

Dust emission is one of the major problems. Regular watering will arrest entrainment of dust during construction period in the construction site.

Moderate air quality impacts during the construction phase of the project can be anticipated due to the uses of construction machinery and fugitive dust generation in and around the proposed industrial project site due to vehicular movement, handling of materials and their disposal during construction and operational phases of the project. The mitigation measures include the following:

1. Trucks carrying earth, sand or stone should be covered with tarpaulin or canvas sheets to avoid spilling,
2. Fugitive dust should be controlled by sprinkling water, and
3. Regular maintenance of machinery and equipment should be carried out.
4. Designated storage area for construction material like gravel, blue metal, earth and sand should be demarcated to ensure safe and accident free utilisation of raw material.
5. Diligent supervision by the Industrial management / supervision authority should be carried out to ensure implementation of suggested measures and rectify lapses of the contractor.
6. A green belt would be developed around the Plant site.

**Impact on Water Environment:-**

The untreated effluent has negative impacts on the Water environment causing physic-chemical impact on water and health of the community nearby. But, the properly treated effluent has no negative impacts and is used for farming, green belt development, etc. Presently, zero effluent discharge practice is exiting at SIPL, Kandla, Gujarat and similar system is proposed for proposed project activity. The physicochemical characteristics of treated effluent at SIPL, Kandla unit are given in **Table 5**.

**Table 5:-** Effluent Characteristics of SIPL, Kandla unit - Final Discharge of Treated Effluent

Sl. No.	Characteristics	Concentration
1.	Temperature, °C	27
2.	Colour, Hazen	12
3.	pH	7.89
4.	Total Dissolved Solids, mg/l	1923
5.	Total Suspended Solids, mg/l	76
6.	B.O.D., mg/l	21
7.	C.O.D., mg/l	70
8.	Oil & Grease, mg/l	1.9
9.	Ammonical Nitrogen, mg/l	2.4
10.	Phenolic Compounds, mg/l	0.9
11.	Chloride, mg/l	475
12.	Sulphate, mg/l	95
13.	Total Chromium, mg/l	1.3
14.	Hexavalent Chromium, mg/l	NIL
15.	Nickel, mg/l	NIL
16.	Zinc, mg/l	NIL

BDL – Below Detectable Limit

**Impact from Sanitation and Waste Disposal:-**

Sewage and domestic solid waste generated at the construction workers quarters shall be properly disposed off. Improper management of these solid wastes may lead to health and hygiene related problems. The authority will ensure that adequate sanitation at the workers' colony is maintained.

The basic mitigation measures include:

1. The adequate lavatories at the construction shall be installed in the camp to cater to the requirements of the workers.
2. Septic Tanks will be built if required.
3. Proper collection system for domestic refuse from the campsite and its segregation and disposal shall be ensured.
4. Periodic health check-ups of construction workers will be undertaken.

**Impact on Aquatic Ecology:-**

The study area as such does not have any significant water body and there would be no effluent disposal from the proposed plant.

**Impact on Noise Level:-**

Temporary impacts in the immediate vicinity of the project may occur due to construction. The magnitude of impact will depend upon the specific types of equipment used and on the construction methods employed. One should note that the workers near construction equipment are likely to be exposed to an equivalent noise level of 80-95 dB (A) in an 8-hour shift. The generated noise may affect workers. The mitigation measures suggested are given below:

1. Care should be taken to reduce such impacts.
2. Workers near noisy work areas would require protection devices like earplugs.
3. Other ancillary mitigation measures are source-control and scheduling of construction activities.

Source-control means that all equipment will be maintained in good condition, properly designed engine enclosures and intake silencers will be employed. Scheduling of project activities means that all operations will be scheduled to



coincide with periods when people would be least affected. Construction activities will be strictly prohibited between 10 P.M and 6 A.M.

**Impact on Soil and Agriculture:-**

As to the post operational stage, there seems to be no impact on the soils at site, as the proposed land for plant is under the purview of Karnataka Industrial Area Development Board (KIADB).

**Biological Impact (Flora & Fauna and Wild Life):-**

No impacts to threatened or endangered plant and animal species are anticipated. No tree felling is involved in the project. The temporary impact may be in the visual appearance of the trees and shrubs as construction activity may lead to deposition of dust over the leaves and foliage of the surrounding area. This is limited to the construction period and gets washed away with the first monsoon showers. The study area as such does not have any Forest nearby. Therefore, no impacts were noticed on wild life.

**Impact on Socio-Cultural Environment & Economy:-**

The employment opportunities provided by the project will enhance the societal level of the local community.

**Impact on Aesthetics:-**

It may be a short-term impact during construction phase. The construction activity may lead to dumping or deposition of debris in and around the industry. The proper care during construction is required to mitigate this problem by properly and immediately disposing the debris.

**Impacts during Operation Phase:-**

The major concerned areas of the impact of the industrial Unit include land, water, air, noise, land use, flora and society. The industry is self facilitated for power supply and treatment of solid, liquid and gaseous waste generated from the unit. Green belt is already developed in and the surrounding areas of the Unit. Therefore, as per the study, there will be no negative impacts of the project during operation. Instead it will enhance the economic level of society and nation.

**Environment Management Cell:-**

A post project-monitoring plan is prepared to keep a watch on the effects of emission and effluent emanating from the plant on the neighboring environment. The monitoring activities defined in this plan are designed to provide confidence that the environmental protection and pollution control measures is being adequately and regularly provided. The plan covers monitoring of both air and water in and around SIPL. Monitoring activities are defined for location both within the complex and around it. Significant sources of emissions and effluents inside the plant boundaries are identified for monitoring. Locations of expected impacts outside the plant are also identified for monitoring.

**Conclusion:-**

During operational phase, effluent produced will be properly treated and this assignment is agreed and will be taken up by neighboring industry M/s Pai and Pai Chemicals Pvt. Ltd., and it will be in accordance with State Pollution Control Board Standards. The industrial and domestic debris including solid waste materials (hazardous and non-hazardous) will be disposed in accordance with statutory official regulations. The overall economic impact due to the project is favorable as adjoining areas of the plant, will be developed by providing utilities and employment opportunities the local community. This has increased the overall income of the region due to indirect business generated and also exchequers due to the project establishment and in turn, enhances the economy of the State and Nation. The industry obtained required permits and now in Operation Stage with implementation of the approved Environmental Management Plan (EMP) actions.

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