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ENVIRONMENTAL MANAGEMENT PLAN FOR CHEMICAL INDUSTRIES ESPECIALLY RESIN MANUFACTURING UNIT

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Abstract: In this paper, we presented a management plan for chemical industries especially for resin manufacturing units. Industrialization refers to a process of change in the technology used to produce goods and service. Industrialization is frequently considered as the replacement of farming and resource extraction by manufacturing and service activity. This transition takes different forms in different places at different times. Geographies of industrialization and economic development are important in understanding future growth patterns. In the similar fashion, the other side is environmental pollution. The pollution in air, soil, noise and water affect the living system and our biodiversity. The chemical industries like resin production, pharmaceutical industries, dye and chemical manufacturing, etc. are the major pollution generating industries and at high risk. The proper and effective environmental management plan can over the risk and different type of pollutions.

Keywords: Economic development; EMP; Pharmaceutical industries; Resin production.

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INTRODUCTION

Industrial development is associated with both positive and negative impacts on the environment (Adrian, 2000; Aghion et al., 2006). The negative impacts should not hinder industrial development but they should be properly mitigated. The strong Environmental Management Plan (EMP) should prepared for the proposed activity to minimize negative impacts and is formed on the basis of prevailing environmental conditions and likely impacts of proposed activity on various environmental parameters. EMP will also facilitate monitoring of environmental parameters (Environmental Management Plan (EMP), 2004). Preparation of Environmental Management Plan is required for the formulation, implementation and monitoring of environmental protection measures. EMP should include schemes for proper and scientific treatment and disposal mechanism for air, liquid and solid hazardous pollutants. Apart from this, green belt development, safety aspect of the workers, noise control, fire protection etc. should also include in it. Adequate budgetary provisions should be made by proponent. The management for execution of environmental management plans should be framed. The detailed capital and recurring (per annum) budget should be earmarked for pollution control/monitoring equipment; operation and maintenance of pollution control facilities. A strong EMP will manage almost the negative impacts of proposed activity.

Principle

Various purposes for the preparation of environmental management plan are as follows:

- To treat and dispose-off all the pollutants viz. Air, liquid, gaseous and solid waste so as to meet statutory requirements (Relevant Pollution Control Acts) with appropriate technology. It will help to reduce the adverse effect on human being as well as on environment due to the proposed activity.

- To support and implement work to achieve environmental standards and to improve the methods of environmental management. Implementation of proper management plan will maintain good health of the employees and surrounding environment.
- To promote green-belt development.
- To encourage good working conditions of employees so that the working potential of employee may increase.
- To minimize the risk associated and reduce fire and accident hazards.
- Budgeting and allocation of funds for environment management system.
- To adopt cleaner production technology and waste minimization program.

ENVIRONMENTAL MANAGEMENT PLAN

During Construction Phase

Air Environment

Construction phase will be for a short period and hence the impacts will also be temporary for a short period. During construction activities, mainly emission of dust and gases from movement of vehicles and construction activity is expected. However, following measures will be taken to reduce/contain such emissions:

- Internal roads are well developed in the existing unit area and paved internal roads will be taken up at the initial stage of the proposed expansion during civil construction work for easy movements of vehicles.
- Water will be sprinkled on loose top soil to prevent re-suspension of dust into ambient air due to movement of vehicles etc.
- Separate civil construction material storage yard will be constructed within the site and it will be covered.
- Possibility of raising green belt along with construction activity will also be explored.
- Transport vehicles and construction equipments / machineries will be properly maintained to reduce air emissions.
- Vehicles and equipments will be periodically checked for pollutant emissions against stipulated norms. All vehicles' Pollution under Control (PUC) Certificate shall be checked regularly.
- Idle running of vehicles will be minimized during material loading / unloading operations.
- Exhaust vent of D.G. set will be kept at proper height to ensure quick dispersal of gaseous emissions.
- All construction workers will be provided appropriate PPE's like dust mask, ear plug, helmet, safety belt etc. and made to wear them during working hours.

Water Environment: The water source should be defined. There shall not major housing facilities at site for construction workers and hence a major source of impact on water environment can be avoided. Proper and sufficient sanitary facilities shall be provided to construction workers to maintain all hygienic conditions at site. Furthermore, existing sanitary facilities shall be utilized. Storm water drains compatible with the local hydrological pattern of the area which shall be provided to carry-off, any run-off or storm water from the premises. Care shall be taken during construction work and will not create any obstruction/dips in the topography which can lead to accumulation of water within premises leading to undesirable consequences like health and hygiene problems etc.

Solid Waste: Main solid waste generation during construction phase should be discussed like rubble, brick bats, debris, steel scrap, wooden scrap, sand, gravel etc. However, these materials are inert in nature and will not result into leaching of any substance or constituent. These materials shall be properly sorted and shall be used within premises for filling of low lying areas. Wooden scrap, steel scrap shall be given to scrap dealers. On completion of civil work, all debris etc. shall be completely removed from site to avoid any incompatibility with future use.

Noise Environment: Following measures shall be proposed during construction period to mitigate adverse impacts:

- Construction machinery and vehicles shall undergo periodic maintenance to keep them in good working condition.
- All machineries to be used for construction purpose shall be of highest standard of reputed make and compliance of noise pollution control norms by these equipments will be emphasized by company.

- Acoustic enclosure shall be provided to all D.G. sets to control the noise during construction activity.
- Feasibility of putting up acoustic enclosure / temporary barrier around areas with high noise levels shall also be explored.
- All construction workers working in high noise areas will be provided appropriate PPEs like ear muffs and made to wear them during working hours.
- Possibility of raising green belt along with construction activity shall also be explored so as to serve as a noise barrier.

Land Environment: Following steps shall be proposed to take care of impact of construction activity on project land area:

- On the completion of civil works, all debris etc. shall be completely removed from site to avoid any incompatibility with future use.
- Other materials like paint, diesel etc. shall be properly stored and handled to prevent any spillage on land.
- All the wastes will be stored at a designated site within the premises to prevent scattered discharge on land.

Ecological Balance: The project proponent should allot 33% area for green belt development. The green belt development shall start during construction activity.

Socio-Economic: As there shall be no temporary housing colony for construction workers, neither socio-economic impact due to the same will envisaged. Overall socio-economic effect of construction phase shall positive due to direct and indirect employment opportunity for the local livings. Local people from nearby villages of the surroundings of the site shall be employed for construction work to the maximum extent possible.

During Operation Phase

Operation phase of any industry being longer in duration and because of its potential to create continuous impacts is quite important from the impact point of view. Comprehensive and effective EMP has to be prepared and implemented to safe-guard environmental concerns during operation phase of any unit.

Air Environment

The air pollutants in the plant may be classified broadly into particulate matter and gases like SOx, Nox etc. from process emissions. The measure to control the air pollution will ensure the ambient air quality standards as laid down by Central Pollution Control Board for industrial areas. The system proposed for air pollution control will provide acceptable environment condition in the working areas and abate air pollution in the surrounding area of the plant. The technological equipment and processes have been selected with the above objectives. Depending on quality of emission from different sources, suitable air pollution control system will be provided. The chimney height will be as per CPCB norms to ensure ground level concentration of different pollutants within permissible limit. Following measures are proposed to mitigate negative impact of operation phase of the project on the surrounding air environment:

a) Height of all the stacks shall be as per statutory requirement. All the stacks shall have stack monitoring facility (SMF) consisting of sampling port-hole, platform and access ladder.
b) For the control measures of the air pollutants during operation phase, adequate stack height with cyclone separator, water scrubber and alkali scrubber shall be provided to respective stacks.
c) Transport vehicles shall be properly maintained to reduce air emissions.
d) Vehicles will be periodically checked for pollutant emissions against stipulated norms.
e) Idle running of vehicles shall be minimized during material loading / unloading operations.
f) Proper maintenance air pollution control equipments.
g) Regular maintenance of machinery's in order to control emissions.
h) A good housekeeping and proper maintenance shall be practiced in the industry.

Recommended Precautions to be taken for Release of Formaldehyde Gas

- Do not inhale formaldehyde vapour.
- Protective clothing like hand gloves and special respirator with reaction type

canister must be worn during fumigation with aeration.

- Do not work alone in any fumigation work.
- Odour of the fumigant should not be relied upon as an indication of poisonous concentration of the fumigant.
- Gas detector strips or tubes are used before allowing workers entry into the fumigated premises.
- Smoking or eating at any time during fumigation should be strictly prohibited.
- The antidotes will be kept in handy location for speedy distribution to workers.
- Warning notices must be pasted at the fumigation site to prevent exposure of employees to the gas.

Control and Monitoring of Secondary Fugitive Emissions

Fugitive emissions from the proposed activity would be significant as there shall be air pollution due to activities like material handling, transfer points of materials and movement of vehicles. These operations generate large quantity of dust. Specific instances of fugitive dust generation may include dust blown by wind from the raw-materials stockpile, dust caused by vehicular traffic etc, good housekeeping, proper maintenance, wetting of dusty areas, use of enclosed storage wherever feasible etc. would considerably reduce fugitive dust (Environmental management Plan Report, 2010).

For effective prevention and control of fugitive emissions, the proponent has implemented following:

- Enclosures should be provided for all the loading and unloading operations, if possible.
- All transfer points shall fully enclose and airborne dust is controlled by sprinkling of water.
- Preventive measures shall be employed to minimize dust build up on road.
- Maintenance of air pollution control equipment shall do regularly.
- All the workers should be provided with the dust mask.
- Green belt should be developed around the plant to arrest the fugitive emissions.
- Regular training should be given to the personnel operating and maintaining fugitive emissions control systems.

Water Environment

It should be ensure that, water consumption should not exceed than committed requirement by installing water meter.

- Surplus water shall be stored in water tank for future use.
- Regular operation and maintenance of ETP should be done to achieve CPCB norms and used for on-land irrigation.
- Rainwater harvesting should be carried out to recharge ground water and store for future use.
- Maximum reuse and recycle of water shall be carried out and zero discharge shall be followed to reduced fresh water consumption.

Rain Water Harvesting Scheme

Rain water harvesting is a way to capture the rain water when it rains, store that water above ground or charge the underground and it will be useable later. Geologically, the study area should be defined. The fractured, jointed and weathered igneous rock can provide room for the construction of check dam or percolation tank.

Roof top area of any constructed structure, any surface or the paved areas can be treated as catchment as these areas receive the direct rainfall. Rooftops are the best among them because of the large coefficient of runoff generated from them and there are less chances of contamination of water.

Conveyance system basically includes rain gutters and down pipes which collects the rain water from catchment to the storage tank. These rain gutters are usually built during the time of construction. They need to be designed appropriately as to avoid the loss of water during the conveyance process. A tank of 4'x 4' x 4' (or bigger size suitable for the user) should be made around the recharge tube well. The upper 2 to 3 m of the well casing should be filtered and wrapped with micron or resin filter. The whole tank should be filled with uniform sized gravel up to the top level. The rain water stocks towards the bore hole are filtered through the gravel and pass

through the micron filter and poured automatically inside the tube well.

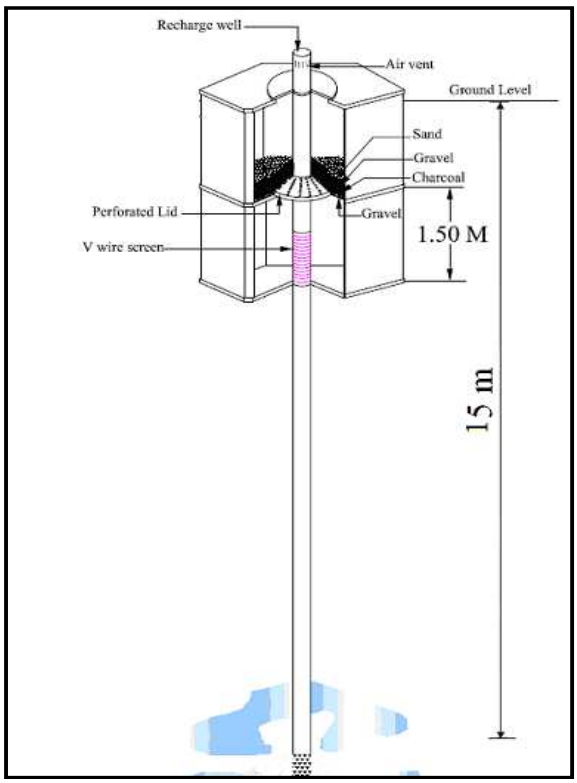

Figure 1. Schematic Diagram of Recharge Well

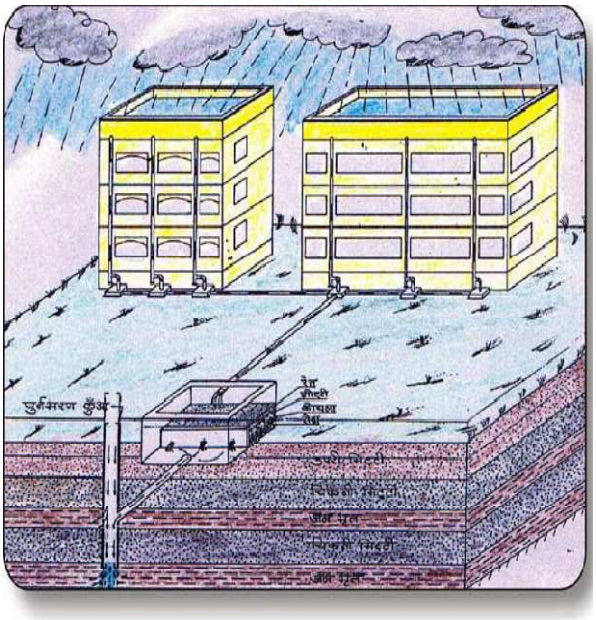

Figure 2. Schematic Diagram for Rain Water Harvesting

Land Environment

Company ensures that contamination minimum due to the spillage and washing water. Washing water will be collected through appropriate channels and taken to ETP for treatment. To avoid leaching entire washing area will be paved. Treated effluent is/will utilized for gardening/plantation after ensuring norms specified by CPCB by which impact on soil and ground water shall be insignificant

Management of Solid/Hazardous Waste

Domestic waste generated from canteen should be converted into manure and used for green belt development as company is implementing the same management for the existing plant. Management of wastes like hazardous waste, ETP sludge, fly ash etc., should be as followed:

- Entire hazardous waste shall be properly collected and stored as per Hazardous Waste Management & Handling Rules, 1989 and its amendments.
- Hazardous waste should be segregated as per the hazardous condition and stored separately with proper management system and maintain all records.

Noise Environment

During the operational phase, noise generation shall be from D.G Sets, machinery, equipment, pumps, motors, from unloading of raw materials etc. (Industry waste management Plan Guide, 2011) However, implementation of the EMP for the noise can maintained the noise level within the CPCB standards. Following precautionary measures should be adopted to control the noise level:

- Noise generating sources and their platforms shall be maintained properly to minimize noise vibrations generated by them
- Personnel working near the noisy machines in different plant locations, shall be provided with well designed ear muffs /plugs (effective noise reduction 10-15 dBA), use of which will be strictly enforced.
- Sophisticated and low noise generating equipments shall be selected.
- Green belt should be developed to act as a noise barrier.
- It would be ensured that there would not be any operator near the noise generating equipments on continuous basis.
- Noise barriers/shields in the form of walls, beams should be provided around the units wherever found feasible

- Training to personnel shall be imparted to generate awareness about effects of noise and importance of using PPEs.

Biological Environment

Green Belt Development (Action Plan): Greenbelts are an effective mode of control of air pollution, where green plants form a surface capable of absorbing air pollutants and forming a sink of pollutants. Leaves with their vast area in a tree crown, sorbs pollutants on their surface, thus effectively reduce pollutant concentration in the ambient air. Often the adsorbed pollutants are incorporated in the metabolic pathway and the air is purified. Plants grown to function as pollution sink are collectively referred as greenbelts. An important aspect of a greenbelt is that the plants are living organism with their varied tolerance limit towards the air pollutants. A green belt is effective as a pollutant sink only within the tolerance limit of constituent plants. Planting few, known pollutant sensitive species along with the tolerant species within a green belt however, do carry out an important function of indicator species. Apart from function as pollution sink, greenbelt would provide other benefit like aesthetic improvement of the area and providing suitable habitats for birds and animals.

Selection of Plants for Greenbelts: The main limitation for plants to function as scavenger of pollutants are, plant's interaction to air pollutants, sensitivity to pollutants, climatic conditions and soil characteristics. While making choice of plants species for cultivation in green belts, due consideration has to be given to the natural factor of bio- climate. Xerophytes plants are not necessarily good for greenbelts; they with their sunken stomata can withstand pollution by avoidance but are poor absorber of pollutants. Character of plants mainly considered for affecting absorption of pollutant gases and removal of dust particle are as follows.

For absorption of Gases:

Tolerance towards pollutants in question, at concentration, that is not too high to be instantaneously lethal

1. Longer duration of foliage
2. Freely exposed foliage
3. Adequate height of crown
4. Openness of foliage in canopy
5. Big leaves (long and broad laminar surface)
6. Large number of stomatal apertures

For Removal of Suspended Particular matter:

1. Height and spread of crown.
2. Leaves supported on firm petiole
3. Abundance of surface on bark and foliage
4. Roughness of bark
5. Abundance of auxiliary hairs
6. Hairs or scales on laminar surface
7. Protected Stomata.

Roadside Plantation: Roadside plantation plays a very important role for greening the area, increasing the shady area, increasing aesthetic value and for eco-development of the area. The approach roads to project site, colony, etc. can be planted with flowering trees. Trees can be planted to increase aesthetic value as well as shady area along the roads. The selected plant species list is given for Roadside plantation.

Table 1. Species for Plantation along the roadside

S. No.	Based on Color	S. No.	Based on Color
	Yellow Flowered Trees		
1.	*Acacia auriculaeformis*	10.	*Erythrina parcelli*
2.	*Acacia baileyana*	11.	*Laburnum anagyroides*
3.	*Acacia dealbata*	12.	*Michelia champaca*
4.	*Acacia decurrens*	13.	*Parkinsonia aculeata*
5.	*Acacia implexa*	14.	*Peltophorum pterocarpum*
6.	*Anthocephalus chinensis*	15.	*Pterocarpus dalbergioides*
7.	*Bauhinia tomentosa*	16.	*Schizolobium excelsum*
8.	*Cassia calliantha*	17.	*Tabebuia spectabillis*
9.	*Cassia fistula*	18.	*Thespesia populnea*
	Red flowered trees		
1.	*Brownea grandiceps*	*5.*	Saraca asoca
2.	*Erythrina blakei*	*6.*	SPATHODEA CAMPANULATA
3.	*Erythrina laurifolia*	*7.*	*Wrightia coccinea*
4.	*Erythrina variegate*	*8.*	
	Scarlet flowered trees		
1.	*Barringtonia acutangula*	5.	*Callistemon lanceolatus*

2.	*Brassia actinophylla*	6.	*Delonix regia*
3.	*Brownea coccinea*	7.	*Stenocarpus sinuatus*
4.	*Butea monosperma*		
	Pink flowered trees		
1.	*Bauhinia purpurea*	5.	*Hibiscus collinus*
2.	*Cassia javanica*	6.	*Kleinhovia hospital*
3.	*Cassia nodosa (red)*	7.	*Lagerstroemia speciosa*
4.	*Cassia renigera*		
	Blue flowered trees		
1.	*Bolusanthus speciosus*		
2.	*Jacaranda acutifolia*		
	White flowered trees		
1.	*Albizia lebbeck*	8.	*Millingtonia hortensis*
2.	*Bauhinia acuminate*	9.	*Mimusops elengi*
3.	*Calophyllum inophyllum*	10.	*Plumeria alba*
4.	*Kydia calycina*		
5.	*Magnolia grandiflora*		
6.	*Magnolia pterocarpa*		
7.	*Mesua ferrea*		

Table 2. List of Suitable Ornamental Climbers/Shrubs as Plantation inside Garden and Open spaces

Family	Scientific Name	Common English Name	Flowering Season
Bignoniaceae	*Bignonia ventusa*	Golden shower	Jan-Feb
	Bignonia capreolata	Trumpet Flower	March-April
	Bignonia unguis –cati	Cat's claw	April
	Bignonia speciosa	Handsome flower	March April
	Tecoma satans	Yellow bell	Throughout the year
	Tecoma radicans	Trumpet vine	Throughout the year
Caesalpiniaceae	*Caesalpinia pulcherrima*	Peacock flower	April-June
Rubiaceae	*Ixora coccinea*	Scarlet Ixora	Throughout the year
	Ixora rosea	Pink Ixora	Aug-Sept
	Ixora parviflora	Small Flowered Ixora	March-April
	Ixora barbata	Brarded Ixora	April-May
	Ixora lutea	Yellow Ixora	Throughout the year
Euphorbiaceae	*Euphorbia pulcherrima*	Christmas Flower	Dec-Jan
Apocynaceae	*Thevetia peruviana*	Trumpet Flower	Throughout the year
	Alemanda nerifolia	-	April-June
	Nerium Indicum	Oleander	Throughout the year
	Catharanthus roseus	Periwinkle	
Malvaceae	*Hibiscus mutabilis*	Changeable rose	September-October
	Hibiscus schizopetalus	Coral Hibiscus	April-September
	Hibiscus rosa –sinensis	Chinese Rose	Throughout the year
Nyctaginaceae	*Bougainvillea spectabilis and different varieties*		Throughout the year With seasonal bloom

Guidelines for Plantation: Width of the green belt in the available land area may prove difficult for many industries to attain for one or more reasons. Hence it can be decided to have green belt in places available around the industry (source oriented plantation) as well as around the nearby habituated area (receptors oriented plantation). The choice of plats for green belt should include shrubs and trees. The intermixing of trees and shrubs should be such that the foliage area density in vertical is almost uniform. The pit size has to be either 45 cm x 45 cm x 45 cm or 60 cm x 60 cm x 60 cm. Bigger pit size will be considered at marginal and poor quality soil. Soil used for filling the pit should be mixed with well decomposed farm yard manure or sewage sludge at the rate of 2.5 kg (on dry weight basis) and 3.6 kg (on dry weight basis) for 45cm x 45 cm x 45 cm and 60 cm x 60 cm x 60 cm size pits respectively. The filling of soil has to be completed at least 5-10 days before actual plantation. Healthy sapling of identified species should be planted in each pit with the commencement of monsoon. Provision for

regular and liberal watering during the summer period during the commissioning stage of the plant will be arranged from the local available resources. After the proposed plant became operational, the authorities responsible for plantation will also make adequate measures for the protection of the saplings. The trees and shrubs selected from the above mention list based on its availability shall be, planted as greenbelt of 10-20 m width around the plant boundary. The plantation will be in this recommended pattern as listed in table below.

Table 3. Three Tire Plantation Management

Tire	Habit	Height (M)	Rows
1st Tire (Towards boundary)	Trees	10-20	3
2ndTire (Middle layer)	Small tress	5-10	2
3rd Tire (Towards Plant)	Shrubs	1-5	Thick pattern

Corporate Social Responsibility Plan

Corporate Social Responsibility is a continuous commitment to behave fairly in contributing to the economic and social development, improving the quality of life of the workforce and peripheral development and also providing respectful treatment to the environment. Community or the society plays a very important role in the success of any organization. Corporate Social Responsibility is the continuing commitment by industry to behave ethically and contribute to economic development while improving the quality of life of the workforce and their families as well as of the local community and society at large". The primary focus should be on women, children and youth and below poverty line families for achieving overall sustainable development of the community. Corporate Social Responsibility (CSR) policy must give special emphasis on triple bottom line–social, economic, cultural upliftment and environmental initiatives to make it sustainable. A fund under the name CSR will be created for development of infrastructure in the project affected area.

Infrastructure Development: As a part of Corporate Social Responsibility, project developer would aim at the improvement in the living standards of inhabitants in the project area by not only by being a catalyst for development but also will develop infrastructure in the area. Provisions should be made by the project proponent for the infrastructure development programme in the project area as per the needs of the area development.

Setting up of Health Care Facilities: There is a need to provide a healthcare unit in the project affected area. In order to promote cleanliness and hygiene assistance for construction of community toilets in surrounding villages shall be provided.

- In addition the following activities would also be promoted.
- Arrangements of regular Medical Camps for villagers, labours and employees and their family members.
- Eye Checking / Operation Camps/ infectious diseases.
- Mobile Dispensary.

However most of these aspects have already been discussed and provided for in the Public Health Delivery System. The treatment will not given only to employee but also given to close family members (Kumar, 2013).

ECONOMIC DEVELOPMENT

The project authority requires labourers, colony, vehicles and other staff for the mining works. There would be more requirements of food grains, vegetables, milk, clothing and other grocery items. As a result, business activities would increase in the area. The local inhabitants would be benefited by these activities. For this purpose, Village hat (markets) can be set up where considerable amount of locally grown commodities can be supplied to meet their requirements. These will be helpful in the upliftment of local economy (Kumar 2013; Jorg, 2004).

Income Generation Schemes: The local people (such as rural artisans/small traders and self employed persons) will be assisted to start various suitable self-employment occupations, which include dairy farming, poultry, weaving, bakery, handicraft, cottage industries unit/shops and hiring of vehicle to the corporation.

Sponsoring Self-Help Groups: Sponsoring the SHGs would increase the quality of local people. Besides, the promotion of savings, this will also enhance the marketability of local products such

as local handicrafts, fruits, minor forest produce, etc. Special emphasis and attention would be given to women of the area to hone their skill and awareness would be raised regarding the gender sensitivity issues.

Community Welfare Centers: It is also proposed that project developer will develop Community Welfare Centers and community halls wherein locals can organize functions and engage in meaning activities and partake technical advice for tackling issues related to their community.

Project Implementation Centers (PICs): PICs should be instituted for dissemination and grievance redressed. If someone has a complaint about how they or their property is being treated during project implementation, they can come to the nearest PIC and explain their complaint. The staff of PIC will have continued ongoing consultations with the local communities and they give formal updates on the project every 6 months and publish a newsletter on the project.

Telecommunication Facilities: In the age of ultra fast communication, telephones, landline and mobile, internet and satellite television act are most important ways of empowerment and development of remotely located communities. These have become part of everyday life and are the prime catalysts for the improvement of quality of life. The project affected area is completely devoid of these facilities. Therefore, communication facilities include ground based T.V. towers, satellite based TV, cell phone towers and network in this area would be a boon for the local population who have no connectivity in case of any emergency. Another neglected facility is that of lack of post office facilities. Therefore it is proposed to set up at least one post office is suggested in the area. It can be located near the proposed main project office and colony for the project. Initially post office can function even from rented premises the funds for which can be provided from CSR.

Skill Development Centers: It is proposed to develop infrastructure and industrial training centers to preserve and revitalize the traditional indigenous handicrafts, handlooms, basketry and sericulture products. It will help in incorporating work ethics and enterprise in the local population. The emphasis would be given to upgrade the local skills and providing exposure to outside world wherein they can interact will with the people of other cultures and skills.

Setting up of Recreation Facilities: There is a need to set up recreation facilities like development of tourist view points, parks, etc. in the vicinity of the project area.

Literacy Promotion Programme: Under this programme assistance to the existing schools would be provided by way of Construction and repairs of Schools buildings located in the affected zone villages Supply of Furniture, Lighting arrangements, etc.

- Distribution of School Uniforms, Books, stationery, bags etc. to students.
- Arrangements of Sports meets and Sport Training Camps in school.

Special efforts will be made for the Promotion of Girl Child education by

- Introduction of scholarships for girl students in the schools
- Special Attention on education, training and rehabilitation of mentally & physically challenged children/persons will be given.

Income Generating Activities/Projects

- ITI training for Tribal Youths.
- Assistance for goat Projects for Tribal Women.
- Assistance for poultry farming.
- Priority to Local Community in Employment through various Job Contracts.
- Assistance for Fruit bearing tree plantations

Capacity building training programs

Capacity building programmes would be implemented for the development of skill development programmes.

i) **Vocational Training:** Creating institutions to impart vocational training for acquiring and upgrading technical skills with a view to enhance employability. Establishing partnerships with District Administration and various Non Governmental Organizations to assist gainful self-employment schemes for the unemployed youth in the area, such programs would include:

- Organization of training programs in driving of 4 Wheelers and Auto, Welding and fabrication, TVs, Radio, other electronic appliances mechanism.
- Training programs on tailoring, embroidery, bamboo crafting to women.
- Donate sewing matching for tribal woman.

ii) **Sponsoring Self-Help Groups:** Sponsoring the SHGs would increase the quality of life of local people. Besides, the promotion of savings, this will also enhance the marketability of local products such as local handicrafts, fruits, minor forest produce, etc.

General Welfare Activities

- Supply of Furniture, Lighting arrangements for Gram Panchayat building
- Construction of raining shelter for Community
- Adopting of a village
- Supply and Erection of Solar Street Light System
- Organize camps for importance of hygiene
- Arrange training programs for farmers for settled agriculture
- Donations/ funds to various non-governmental organizations for the implementation of welfare activities

Sports Promotion Schemes: Construction of Volleyball ground and Sport Complex with in acquired land. Encouraging sports talents by promoting and organizing various sports events. Monthly stipend must be given for training and dietary expenses along with necessary sporting equipment. Village level tournaments must be organized under various disciplines to encourage sports and to identify young talents (UNIDO, 2002).

Promotion of Local Cultural Activities

- Conservation of native tribal culture
- Training on Traditional Arts like Music, Dance, Drama, Painting, etc.
- Training in Handicrafts
- Contribution/Grants for staging Drama/Village fair, etc.

Occupational Health and Safety

Following measures should be adopted in the plant:

- Regular inspection and maintenance of pollution control systems.
- All measures related to safety such as safety appliances, training, safety awards, posters, slogans will be undertaken.
- The workers exposed to noisy sources will be provided with ear muffs/plugs.
- Adequate facilities for drinking water and toilets will be provided to the employees.
- The fire and safety equipment will be properly utilized and maintained regularly.
- The health of the workers will be regularly checked by a well qualified doctor and proper records will be kept for each worker.

General Considerations

For good housekeeping of the proposed project, following measures will be planned:

- Maintaining cleanliness of roads to prevent accumulation of dust and waste material.
- Inculcating positive attitude among employees for good house-keeping.
- Maintaining hygienic conditions in canteens, near drinking water source and toilets.

Waste-Minimization, Recycle/Reuse/Recover Techniques, Energy and Natural Resource Conservation

The possibility of reuse/ recycle and other cleaner production options for reduction of wastes is given below. The management is committed for futuristic development in cleaner production.

Waste-Minimisation: Process optimization by using latest technology equipment.

Recycle/Reuse/Recover: Treated effluent should be reused in green belt plantation, dust suppression etc. within the premises. The solid wastes generated should be recycled in the following ways and same method shall be adopted for the proposed scenario;

i. Used/spent oil should collect and should be re-used as lubricants in the machineries within the premises only.

ii. Discarded drums or containers will sell to CPCB authorized vendor after decontamination.

Natural Resource Conservation: To conserve ground water, rain water harvesting will be carried out to store rain water for future use and also to recharge ground water before its get evaporated.

ENVIRONMENTAL MANAGEMENT CELL

The project proponent should proposed Environment Policy as per rules and regulations.

Environmental Policy has its standard operating procedure to bring into focus any infringement/deviation/violation of the environmental or forest norms and reporting of non compliance /violations of environmental norms to the Board of Directors of the company. In addition to preparing an EMP, it is also necessary to have a permanent organizational set up to ensure its effective implementation. The company should create a team consisting of officers from various departments to co-ordinate the activities concerned with management and implementation of the environmental control measures. This team undertakes the activities of monitoring the stack emissions, Ambient Air Quality, Noise level etc. either departmentally or by appointing external agencies wherever necessary. Regular monitoring of environmental parameters are being carried out to find any deterioration in environmental quality and also to take corrective steps, if required, through respective internal departments. The Environmental Management Cell also collects data about health of workers, Green Belt Development etc.

The EMC shall also be responsible for monitoring of the plant safety and safety related systems which include:

- Checking of safety related operating conditions.
- Visual inspection of safety equipments.
- Preparation of a maintenance plan and documentation of maintenance work specifying different maintenance intervals and the type of work to be performed.

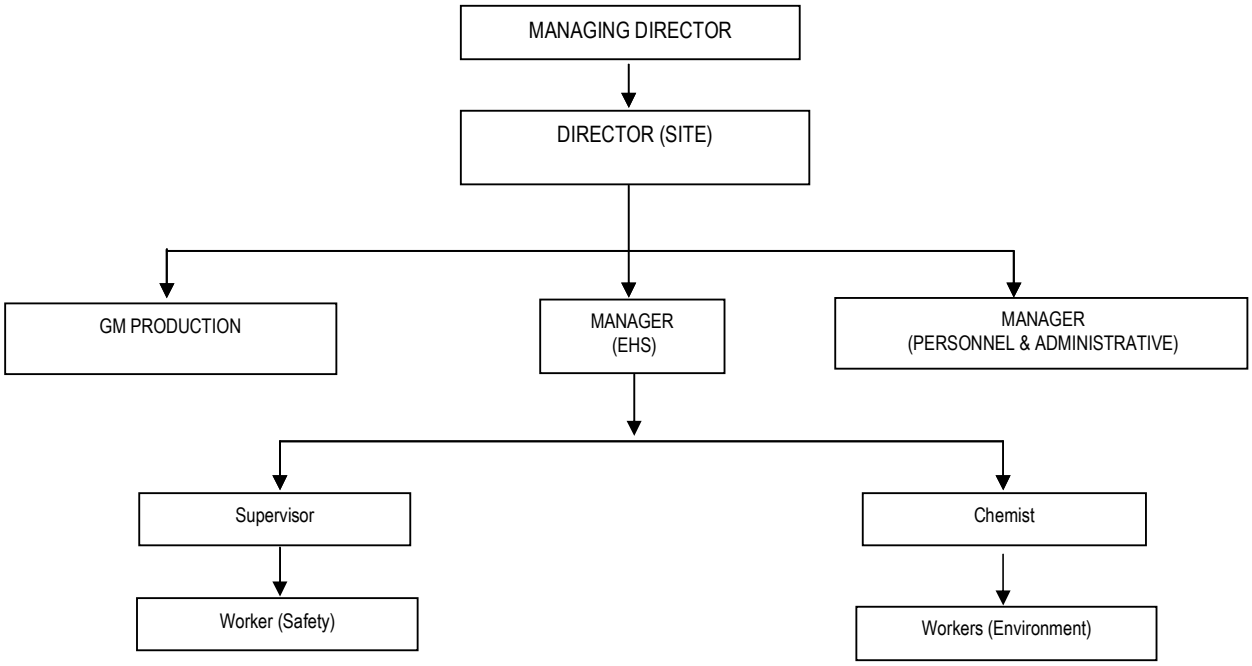

Figure 3. Sample Organogram of Environment Management Cell

BUDGETORY PROVISIONS FOR EMP

Adequate budgetary provisions have been made by proponent. The management for execution of environmental management plans should be framed. The detailed capital and recurring (per annum) budget should be earmarked for pollution control/monitoring equipment; operation and maintenance of pollution control facilities (Verspagen, 2000).

CONCLUSION

The chemical industries are effluent generating industries. In Gujarat, many industries are on closures due to pollution load and no proper mitigation measures to control the pollution. Zero effluent discharge is the scheme to restore the industries. The environmental pollution is major concern in developing countries. Proper environmental management plan make it sustain. Green belt development can mitigate

90% of fugitive emission and odor nuisance. Therefore, a proper EMP should be suggested and implemented in the chemical industries.

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REFERENCES

Adrian J. Bailey (2000). Industrialization and Economic Development in Advanced Placement Human Geography, Journal of Geography 99:142-15

Aghion, P. Burgess, R., Redding, S., and Zilibotti, F. (2006). The unequal effects of liberalization: Evidence from Dismantling the License Raj in India. Discussion Paper No. 5492, Centre for Economic Policy Research (CEPR), February 2006, 31 p.

Environmental Management Plan (EMP) (2004). Environmental Health & Safety Procedure Manual Harper College Illinois.

Environmental management Plan Report (EMP) (2010). Environmental Impact Assessment (EIA) for RTIP at Jubail II. Available online at http://www.agaportal.de/pdf/nachhaltigkeit/eia/eia_saudi_petroch_1.pdf

Industry waste management Plan Guide (2011). The Department of Environmental Affairs and Development Planning in Partnership with Danida and WSP Environmental (Pty) Ltd. Cape Town Available online at http://www.westerncape.gov.za/other/2011/8/industry_waste_management_plan_guideline.pdf

Jorg Mayer (2004). Industrialization in Developing Countries: Some Evidence from A New Economic Geography Perspective, United Nations Conference on Trade and Development Available online at http://unctad.org/en/docs/osgdp20048_en.pdf

Kumar Ashok (2013). Study of Common Property Resources (CPR) with special reference to water and biological resources at projected area near Village Ninat, Bardoli, District-Surat. *Oct. Jour. Env. Res* 1(4):319-331 ISSN 2321-3655

UNIDO (2002). Industrial development report 2002/2003. Competing through innovation and learning. United Nations Industrial Development Organization.

Verspagen, B. (2000). Growth and structural change: Trends, patterns and policy options. Paper prepared for the conference on "Wachstums- und Innovationspolitik in Deutschland und Europa. Probleme, Reformoptionen und Strategien zu Beginn des 21. Jahrhunderts", Potsdam, 14 April 2000. First draft, April 2000.

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