To Study The Environmental Impact Assessment (EIA) for Construction Projects.

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Abstract: Indian construction industry is rapidly growing at a rate of 9.2% as against the world average of 5.5%. To study the beneficial or harmful effect; evaluation of any project through EIA has become a must. The environment is degrading severely by so many factors, some of which are caused by the activities of Construction Projects. This paper is to study environmental impact of construction project and its mitigation measures. For the present Environmental Impact Assessment study, the attributes of environment considered are: Noise Level Study; Water environment; Air environment (Meteorology, ambient air quality); Ecological Damage Assessment (vegetation, ecosystem, etc.); and Land use pattern (Geology, Geo-hydrology, land use, solid waste disposal etc.); Socio-economic environment (Demography, occupational structure, educational, medical facilities, literacy etc.). This aims to define the project in a systematic manner and suggest possible mitigation measures for development. The primary purpose of this study is to establish Eco-friendly management of the construction activities. The present article reviews the various steps involved in EIA, environmental effects of construction industry and EIA with relation to construction industry.

Keywords: Environmental Impact Assessment (EIA), Construction Industry, Environmental Impact, Impact Assessment, Mitigation Measures, Sustainable Development.

I. Introduction

The purpose of this Environmental Impact Assessment (EIA) is to identify, evaluate and report the environmental and socio-economic effects of the proposed Expansion and modernization of the Project. It is a process of identification, prediction, evaluation, and mitigation of biophysical, social and other relevant effects of developmental activity on environment prior to make commitment is. This process includes identification of mitigation measures that will be used to reduce or eliminate potential adverse effects, where appropriate. Environmental Impact Assessment is usually considered as the appraisal of impacts that any developmental activity may affect on the environment. Environmental impacts may be positive or negative, harmful of beneficial. EIA process implemented prior to any developmental project in order to ensure that no adverse impact will be faced by the environment. Many developing Asian countries have been facing serious issues originated due to increase of environmental pollution. India is also experiencing environmental degradation due to rapid growth in economic, Population, Urbanization and industrialization.

Indian construction industry is rapidly growing. Major environmental impacts of construction projects are habitat destruction, loss of arable land, loss of biodiversity, waste disposal, pollution, desertification, soil erosion and material wastage etc. Human activities are both beneficial and harmful for environment such as biological, cultural, social, economic impacts and so on and they must be taken into consideration when the development projects or plans are evaluated. According to International Association for Impact Assessment Act, the purpose of EIA process is to ensure the decision makers and consider all expected impacts of any project and their effects when deciding a project. In this view, EIA process should be used as a decision making tool rather than decision aiding tool. EIA method helps in providing a guideline to select and design the project, plan or activity with long term viability and to improve cost effectiveness.

1.1 Environmental Impacts of Construction Projects

Erection of edifice and road and rail network affects the environment in primarily two ways – by overriding resources and by producing contaminants and throw away. The construction business accounts for approximately 45-50 percent of comprehensive power consumption, just about 50 percent of all-inclusive water usage, and more or less 60 percent of the total usage of unprocessed or raw materials. Alternatively, the construction sector chips in 23 percent of atmospheric contamination, 50 percent of climate change gases, 40 percent of drinking water contamination, in addition to an added 50 percent of landfill wastes. It is imperative that construction companies ought to put a spotlight further on diminishing waste fabrication, capitalizing on the reuse of salvage, and crafting sustainable buildings. With industrialization and urbanization, ensuing growth in urban solid and liquid wastes is a relatively recent development in India. Construction activities further add-on to the ever increasing solid wastes. Additionally, rising concentrations of greenhouse gases (GHGs) such as carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O) from various anthropogenic activities in the atmosphere which definitely included construction have been posing threat to the environment. As against the global average of 5.5%, Indian construction industry is hastily budding at a pace of 9.2%. Buildings as are designed and constructed today contribute to serious environment problems. The constructions of buildings have made cities dense and their growth vertical.

Thus the various effects of construction can be summarized as: Change in land use pattern, Re-development of active urban land from single storey structure to high-rise/high density structure, clearing of surface vegetation, rise in green house gas emissions, removal of topsoil due to excavation, change in topography, change in drainage blueprint of the region, abridged ground water revival, noise pollution owing to the use of heavy machineries, temperature rise of 1-2^{o}C in urbanized area due to higher absorptive surfaces,

disposal/reuse of construction debris, discarded electronic waste, cables etc, which are noxious to environment, added load on sewers and waste carrying pipe lines and solid waste management, mostly inorganic.

1.2 EIA in India:

EIA in India was started in 1976-77, when the Planning Commission asked the then Department of Science and Technology to examine the river-valley projects from the environmental angle. This was subsequently extended to cover those projects, which required approval of the Public Investment Board. These were administrative decisions, and lacked the legislative support. The Government of India enacted the Environment (Protection) Act on 23rd May 1986. To achieve the objectives of the Act, one of the decisions taken was to make EIA statutory. After following the legal procedure, a notification was issued on 27th January 1994 and subsequently amended on 4th May 1994, 10th April 1997 and 27th January 2000 making environmental impact assessment statutory for 30 activities. This is the principal piece of legislation governing EIA in India. Besides this, the Government of India under Environment (Protection) Act 1986 issued a number of notifications, which are related to environmental impact assessment. These are limited to specific geographical areas, and are summarized below:

- Prohibiting location of industries except those related to Tourism in a belt of 1 km from high tide mark from the Revdanda Creek up to Devgarh Point (near Shrivardhan) as well as in 1 km belt along the banks of Rajpuri Creek in Murud Janjira area in the Raigarh district of Maharashtra (6th January 1989).
- Restricting location of industries, mining operations and regulating other activities in Doon Valley (1st February 1989).
- Regulating activities in the coastal stretches of the country by classifying them as coastal regulation zone and prohibiting certain activities (19th February 1991).
- Restricting location of industries and regulating other activities in Dahanu Taluka in Maharashtra (6th June 91).
- Restricting certain activities in specified areas of Aravalli Range in the Gurgaon district of Haryana and Alwar district of Rajasthan (7th May 1992).
- Restricting industrial and other activities, which could lead to pollution and congestion in the north west of Numaligarh in Assam (July 1996).

The scope of the EIA was set out in the Terms of Reference (Volume 3, Appendix A) for the project. The terms require the EIA to address the following:

- Provide information on the environmental resources and resource uses that could be affected by the construction, operation and reclamation of the project. Provide a sufficient base for the prediction of positive and negative impacts and the extent to which negative impacts may be mitigated by planning, project design, construction techniques, operational practices and reclamation techniques. Discuss how the EIA report ensures that the same level of information is provided for all phases of the project;
- Quantify and assess impact significance where possible, taking into consideration spatial, temporal and cumulative aspects. Discuss the sources of information used in the assessment. Information sources will include literature and previous baseline reports and environmental studies, operating experience from current oil sands operations, industry study groups, and traditional knowledge and government sources. Identify any limitations or deficiencies that the information may place on the analysis or conclusions in the EIA report. Discuss how these limitations or deficiencies will be addressed within the current EIA report;
- Describe the stakeholder consultation process (including, but not limited to, the public, Aboriginal people, industry and regulatory representatives). Where required, undertake studies and investigations to obtain additional information for establishing a sound baseline in the Study Area(s). From a broad-based examination of all ecosystem components including previous environmental baseline work, describe and rationalize the selection of key components and indicators examined; and
- for each environmental parameter:
  - Describe baseline conditions (includes existing and approved facilities and activities). Comment on whether the available data are sufficient to assess impacts and mitigation measures. Identify environmental disturbance fromprevious activities that have now become part of baseline conditions,
  - describe the nature and significance of the environmental effects and impacts associated with the development activities. Discuss the impacts of both the baseline case and the application case (includes baseline conditions and project),
  - present plans to minimize, mitigate or eliminate negative effects and impacts and discuss the key elements of such plans,
  - identify residual impacts and comment on their significance,
  - present a plan to identify possible effects and impacts, monitor environmental impacts and manage environmental changes to demonstrate the project is operating in an environmentally-sound manner,
  - present a plan that addresses the adverse impacts associated with the project that may require joint resolution by government, industry and the community,
  - Describe how this plan will be implemented and how it will incorporate the participation of government, industry and the community, and summarize the mitigation measures, which KNOC is committed to implement inthe project.

1.3 Principle of EIA

It is important to recognize that there is a general principle of assessment that applies to EIA, and to other assessment processes. There are several other processes that relate closely to the review of environmental impacts that may result from a proposed project. The following are well recognized processes:

- Social Impact Assessment
- Risk Assessment
- Life Cycle Analysis
- Energy Analysis
- Health Impact Assessment
- Regulatory Impact Assessment
- Species Impact Assessment
- Technology Assessment
- Economic Assessment
- Cumulative Impact Assessment
- Strategic Environmental Assessment
- Integrated Impact Assessment

1.4 Purpose of EIA:

EIA is a process with several important purposes, which can be categorized as follows:

1. **To facilitate decision-making:** For the decision-maker, for example the local authority, it provides a systematic examination of the environmental implications of a proposed action, and sometimes alternatives, before a decision is taken. The decision-maker along with other documentation relating to the planned activity can consider the environment impact statement (EIS).
2. **To aid in the formation of development:** Many developers see EIA as another set of hurdles for them to cross in order to proceed with their various activities. They may also see the process involved in obtaining the permission from various authorities as costly and time-consuming. In reality, however, EIA can be of great benefit to them, since it can provide a framework for considering location and design issues and environmental issues in parallel. It can be an aid to the formulation of developmental actions, indicating areas where the project can be modified to minimize or eliminate altogether the adverse impacts on the environment. The consideration of environmental impacts early in the planning life of a development can lead to environmentally sensitive development; to improved relations between the developer, the planning authority and the local communities; to a smoother planning permission process and sometimes to a worthwhile financial return on the expenditure incurred.
3. **To be an instrument for sustainable development:** The key characteristics of sustainable development include maintaining the overall quality of life, maintaining continuing access to natural resources and avoiding lasting environmental damage. Institutional responses to sustainable development are, therefore, required at several levels. For example, issues of global concern, such as ozone-layer depletion, climate change, deforestation and biodiversity loss, require a global political commitment to action. The United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro in 1992 was an example of international concern and also of the problems of securing concerted action to deal with such issues. Governments have recognized the interaction of economic and social development and the ecosystems, and the reciprocal impact between human actions and the bio-geophysical world. While there are attempts to manage this interaction better, investigation reveal disquieting trends that could have devastating consequences for the quality of the environment. These trends are likely to be more pronounced in developing countries where, because of greater rates of population growth and lower current living standards, there is more pressure on environmental resources.

Assessment of cumulative effects will be an integral component of the EIA report. This included a comprehensive summary of all proposed monitoring, research and other strategies orplans to minimize mitigate and manage any potential adverse effects.

1.5 Revised Environmental Clearance Procedure in India

In 1994 a clearance procedure was issued that followed EIA Notification 1994.

According to the 1994 clearance procedure the MOEF has issued sectoral guidelines and environmental appraisal questionnaires and needed following documents:

- Filled in application form (as per Schedule II of EIA Notification).
- A summary of the project/feasibility report (1 copy).
- EIA (EIS)/EMP report (20 copies).
- Risk analysis on on-site emergency preparedness plan (20 copies) in case of projects involving hazardous substances.
- Site clearance from MOEF for site-specific projects mentioned in the EIA notification.
- Consent to establish from SPCB.
- NOC from the local authorities (e.g., District Collector).
- Commitment regarding the availability of water and electricity from the appropriate agencies.
- Approval of the Chief Controller of Explosives under the Petroleum Act and Rules for layout and storage of hazardous substances and from the Directorate of Industrial Safety and Health under the Factories Act and Rules.
- Comments/Observations/Recommendations of the Chief Wildlife Warden in case a wildlife habitat/migration path exists within 25 km of project site.
- Comprehensive summary rehabilitation plan, where displacement of more than 1,000 people is anticipated.

- Copy of the application forwarded to the state government, in case of diversion of forest land.
- Copy of the application forwarded to the state government in case the CRZ notification applies.
- Clearance from the Airport Authority of India, if applicable.
- Details of the public hearing conducted by SPCB and copies of the advertisements issued for public hearing.
- Filled-in environmental appraisal questionnaires issued by MOEF, along with the attachments (mentioned in the questionnaire).

As per the EIA notification, the appropriate authority is empowered to decide whether the project proponent has to conduct a rapid or comprehensive EIA.

There were some constraints in the procedure that include:

- Burdensome procedure
- Disproportionate details sought with applications
- Delay in appraisal meetings
- Time consuming and requiring undue effort
- Reopening of technical issues during various stages of appraisal
- Poor quality of EIA studies by consultants
- Delays by other concerned agencies

Due to these reasons re engineering was done of the EIA process implementation based on project chosen. Background of this reengineering is that; MoEF conducted a review on previous EC process which is comprehensive under the Environmental Management Capacity Building Project in 2001, reformation in investment approvals and implementation procedures was set up by central government with the help of Govindarajan committee. Due to consistency in studies with both the organizations there was a strong necessity for reforms in the EIA notification 1994.

1.6 Objectives of EIA notification 2006

The objectives of EIA Notification, 2006 inter alia include:

(i) To formulate a transparent, decentralized and efficient regulatory mechanism to integrate environmental concerns into developmental process with a view to facilitating sustainable development.

(ii) To ensure incorporation of necessary environmental safeguards at planning stage in the project cycle, so as to ensure minimal impact on different components of environment.

(iii) To ensure involvement of stakeholders in public consultation process through public hearing and to ascertain the views of the public on the proposed project or activity.

The salient features of EIA notification, 2006

The salient features of EIA Notification, 2006 inter alia include:

(i) The EIA Notification, 2006 has categorized the projects into two categories namely; Category 'A' and Category 'B' based on their impact potential.

(ii) Category 'A' projects will be appraised at the Central level while Category 'B' project at the State level.

(iii) State level Environment Impact Assessment Authorities and Committees (SEIAAs and SEACs) have been constituted for the purpose of appraisal of Category 'B' projects.

(iv)The stage of scoping for prescribing terms of reference by the Regulatory Agency for the EIA studies has been incorporated in accordance with the International practice. It is expected to improve the quality of EIA thereby improving the quality of decision making and minimizing the delays.

(v) The public consultation process has been made more structured. It has two components i.e. comments through correspondence and by public hearing at site. Provision to videograph the proceedings of the public hearing has been made.

(vi) NOCs from other regulatory agencies such as SPCB etc. are not a pre-requisite for considering application for environmental clearance.

To formulate a transparent, decentralized and efficient regulatory mechanism to:

- Incorporate necessary environmental safeguards at planning stage.
- Involve stakeholders in the public consultation process.
- Identify developmental projects based on impact potential instead of the investment criteria.

It also stated that; all new projects listed in schedule, expansion and modernization of existing projects and those activities that show change in product mix require environmental clearance before setting up.

1.7 Need of EIA for construction projects

A high standard of environmental quality and sustainability requires for construction is characterized by clean environment and eco-friendly building with safe and health comfort, energy efficiency, water efficiency, ambient air quality, parking area and green cover area including open spaces. EIA of construction projects focuses on the prediction of environmental impact of the different components of the construction activity, ways and means to reduce adverse impacts by shaping the project to suit local environmental conditions, and presents the predictions and options to the decision-makers. Some important components of quality of life in urban neighborhoods are summarized as follows:-

- **Environment**: important component of quality of life
- **Physical**: air quality, water quality, derelict land, open space, noise
- **Built**: building type, condition, appearance
- **Social**: education, community participation, services, crime, health, mental health.
- **Economic**: employment and income

1.8 EIA procedure for construction projects

EIA procedure systematically examines both positive and negative impacts of the proposed project and ensures that these impacts are taken into account during the project design. The building construction project falls under 8(a) category of EIA notification 2006 (as amended) by Ministry of Environment and Forests (MoEF). It is required to prepare EIA report on the basis of guidance manual and then submitted to the appropriate authority. The Generalized Flow sheet of EIA is Given Below in **Figure 01**.

The EIA is therefore based on predictions. These impacts can include all relevant aspects of the natural, social, economic, and human environment. The study, therefore, requires a multi-disciplinary approach and should be done very early at the feasibility stage of projects.

1.9 The Benefits of Environmental Assessment

Most governments and donor agencies acknowledge the contribution of EA to improved project design. The weakness of EA in the past has been largely due to poor techniques and the failure to pay attention to findings at the implementation stage. A review of current environmental practices found the major benefits of the EA process for project sponsors to be:

- Reduced cost and time of project implementation.
- Cost-saving modifications in project design.
- Increased project acceptance.
- Avoided impacts and violations of laws and regulations.
- Improved project performance.
- Avoided treatment/clean up costs.

The benefits to local communities from taking part in environmental assessments include:

- A healthier local environment (forests, water sources, agricultural potential, recreational potential, aesthetic values, and clean living in urban areas).
- Improved human health.
- Maintenance of biodiversity.
- Decreased resource use.
- Fewer conflicts over natural resource use.
- Increased community skills, knowledge and pride.

II. STUDY AREA

The entire study was conducted at Swargate Underground Metro Station Pune, Maharashtra, located at Latitude $18^{0}19^{'}56.29^{''}$N and Longitude $73^{0}51^{'}28.29^{''}$E. Today it is an important educational, industrial hub. The intricate network of creek, tanks and groundwater forms the city‘s essential blue-green infrastructure, providing water, drainage and sanitation for domestic, agricultural and industrial use. This will lead to further pressures on infrastructure, housing and basic services.

(Photo no 01- Layout of Swargate Underground Metro Station Pune.)

2.1 Study Area-Background:

The study area details are listed below in the **Table no 01**. Pollutants and its characteristics in study area are given below in **Table no 02**. Environmental Aspects of Study Area are given below in **Table no 03**.

2.2 Study area-Environmental Survey

According to, EIA notification 2006, any new project or Expansion/Modernization of existing projects requires submitting a Form-1(Details of the project) consists of Name, Location, nearest places, project facilities etc mention in the above table I & II and Form-1A (Information Checklist) consist of primary and secondary impact of the project. Information checklist consists of series of questions based upon the environmental parameters. It can be evaluated by extensive field checks and questionnaire surveys. The selected study area can be surveyed under visual and behavioral observation to gather the required information for the questionnaires.

2.3 Baseline Data of Study area

Baseline environmental status forms the basis for evaluation of the construction activities on the existing conditions. This can be broadly grouped into physical, social, aesthetic and economic environment. Physical environment includes air, water, land, aquatic and terrestrial flora & fauna, civic infrastructure, public services, etc. Social environment includes demography, community facilities and services, community characteristics, employment centers, commercial facilities servicing the area, etc. Aesthetic environment includes historical monuments, archaeological or architectural sites at and in the vicinity of the construction activities. Economic environment covers employment levels, sources and levels of income, economic base of the area, land values, land ownership etc.

2.4 Scope of Baseline Studies

For the present Environmental Impact Assessment study, the attributes of environment considered are:

i. Noise Level Study;

ii. Water environment;
iii. Air environment (Meteorology, ambient air quality, etc.);
iv. Land use pattern (Geology, Geo-hydrology, land use, solid waste disposal etc.);
v. Socio-economic environment (Demography, occupational structure, educational, medical facilities, literacy etc.)

It is important to define the study area for conducting the Environmental Impact Assessment Study which could reflect the changes due to the construction activities. The present study was carried out in 10 km radius of the construction activities. The environmental parameters are studied to establish an existing environmental condition of an area covering 10-km radius, which is considered as an impact zone.

i. **Noise level study**

Noise is generated from various construction activities. Noise is a prominent feature of the environment including noise from transport, industry and neighbors. An important part of noise assessment is the actual measurement of the noise levels. Traffic noise produced by vehicles operating on highways has been the source of concern all over the world. The traffic noise of motor vehicles, construction activities such as movement of heavy vehicles, operation of construction equipment and transportation of materials in urban areas may lead to the environmental problems which might affect adversely human health, poor working efficiency and productivity in the study area.

To control noise pollution precautionary measures are taken like, the machinery which was used for construction was of high standard and was adhering to international standard. These standards itself take care of noise pollution control/vibration control and air emission control. Hence insignificant impacts due to construction machinery are envisaged. Apart from this, the construction activities was/is being restricted to daytime only and the labors were provided with Personal Protective Equipment. The Ambient Noise Quality Standards are given below in **Table no 04**.

ii. **Water quality study:**

Water is an essential thing for basic utilities and day to day domestic purposes. As well as water is need for construction activities. Therefore, the study of water quality is important for EIA, hence, Water analysis of physico-chemical and parameters related to health were carried out as per the Standard IS 10500 to assess baseline water quality. The results of the water quality along with the parameters which were monitored are tabulated below in **Table no 05**.

Both surface and ground water resources were identified within the study area. However the upcoming developments will not affect these water bodies directly or indirectly. The drinking water is provided through municipal water supply pipelines in study area.

iii. **Air Quality Monitoring**

Air pollution during construction activity is mainly due to dust generation and gaseous emission from vehicular movement. Such emission was temporary and controlled by providing below mentioned precautionary measures to control air pollution:

- Peripheral barricading to prevent dust emission.
- Stacking of all the construction materials was confined within the select areas of the project site to avoid dust emissions from building materials.
- The particulate matter generated due to the vehicular movement during construction was reduced by frequent sprinkling of water on the road surfaces and on other areas where dust arises due to material handling.
- Vehicles hired for bringing construction material are maintained in good operable condition and conform to air and noise emission standards prescribed by SPCB/CPCB.
- The vehicles operated only during non-peak hours at site resulting in minimal vehicular emissions. Hence, there is no emission from the project site activities.

Air quality was monitored at study area location for peak hour (10.30am to 4.30pm). Air pollution is the addition of gases, chemicals and particulate matter into the atmosphere. Large quantities of dust become wind borne and were carried away depending on the wind velocity and wind direction. National Ambient Air Quality Standards (NAAQS) are given below in **Table no 06**.

***iv*. Land use pattern/soil**

The plot area of the project is 41,972 Sq.meter. Existing/Proposed land use details are tabulated below in **Table no 07**.

For construction of the project excavation was carried out for foundation & basement of the building. The project activities have not affected surroundings & any significant land disturbance resulting in soil erosion, subsidence and instability. The area is not susceptible to erosion. 50% of excavated earth / soil were reused for backfilling, internal roads & other paved areas within premises. Balance excavated earth was used for other projects in the vicinity. Land/soil environment was temporarily affected due to activities like site preparation, excavation, material handling & storage etc. during construction phase.

Loss of Top soil

The primitive impact of any development starts with ground clearance and leveling. The loss of top soil will directly impact the fertility level of the soil at site. Top soil was reused in a stretch of 150 m long & 1.5 m wide along 18 m wide road on north side of the project site for landscaping/greenbelt development. Thus, no loss of top soil occurred.

Loss of vegetation and habitats

The site comprised of with vegetation of few shrubs and grasses and trees. There were 422 trees and 128 trees of them, were transplanted and remaining trees are available at location, hence, for development of the project no major disturbance to local ecology was occurred. In addition, 15,772 Sq.meter of total plot area has been earmarked for green belt development. The greenbelt development will be maintained.

Diverting course of natural drainage

The ground surface of the project was almost level. The project is not likely to alter or obstruct any natural drainage courses. There is no natural watercourse passing through the project site. Hence the project does not involve alteration of natural drainage system. As a

result of excavation of topsoil during construction phase, the impact on drainage pattern and run off characteristics have been restricted to the small area.

Loss of area for ground water recharging

Proper drainage systems are provided to deal with the storm water in case of rain. Proper rain water drainage facility has been provided and the run-off generated has been used for recharging the ground water level. No groundwater abstraction carried out for the construction and the water during the construction phase was supplied through tankers.

As remediation plan for the loss of recharge of annual runoff due to construction from the project site, the roof top runoff & surface runoff is diverted into recharge pits located within the project site. 2 nos. of recharge pits have been provided in the project site to recharge the surface runoff.

Solid waste

There was Bus stand and vegetation also available nearby on land posses for the project before starting of current project. Hence, demolition was carried out and waste generated before starting the new construction was disposed according to the MPCB guidelines. The solid waste generated during construction activities is limited to project site only. These are segregated manually to remove non-reusable waste and reusable wastes and are reused for backfilling, internal road development up to the maximum possible extent. The non-reusable waste is disposed of by selling to approve vendors.

***v*. Socio-Economic Environment**

The project falls under Maharashtra state, Pune district. Study area is covered by Pune Municipal Corporation. The entire area consists of urban population. The study area consists of 1 Municipal corporation. For the same study area however, census data for year 2011 is available. Total population of male is 11237 and female population is 10596. The study area is predominantly Hindu, Muslim and others. Most of the people belong to the General, Schedule Cast, Schedule tribe Muslims and OBC. There is very small amount of population of Scheduled tribe. In the study area it was observed that primary as well as higher level education facilities are very good. The basic infrastructure of school and colleges is fairly well constructed. School gets the electricity regularly and water. During the primary survey it has been observed that the Municipal Corporation is having schools up to senior secondary level and College.

Main source of drinking water is water supply by Municipal Corporation. Other water resources such as wells bore well, lakes etc.

Mode of transport is road. The nearest railway station is Pune Junction. The field can be divided into infrastructure, vehicles and operations. Transport is important because it enables trade between people, which is essential for the development of civilizations.

Mainly the study area consists of urban area i.e. Municipal Corporation and Census towns' area. In the outskirts there are some villages where crops like wheat etc. are grown.

2.5 Mitigation Measures

The main aim of the mitigation measures to protect and enhance the existing environment of the study area.

The measures should have positive effects on environment. Environmental mitigations are essential and shall be undertaken in various phase of project cycle viz. preconstruction, construction and operation stage of the any project. As per the noise quality, water quality and air quality records of study area, the noise quality in some of the places that can be exceed the standards level. The water quality parameters are under permissible limits. The another main components of ambient air quality results within limits, namely suspended particulate matter as per the standards of National ambient air quality standards (NAAQS). Hence our study area does not affect by air pollution but we need mitigation measures required to prevent noisy environment. So we suggest some mitigation measures to control the noise pollution by installation of barriers, strong leafy trees, limitation of vehicle speed and provide sound proof doors and windows are proposed in our study area. The environmental monitoring can be done periodically once in three month of frequency of sampling and analysis of ambient air quality, stack emission from DG set, ambient noise level and treated sewage to maintain the eco friendly environment as well as to reach as sustainable campus in future.

III. Methodology

3.1 Environmental Impact Assessment

The term EIA refers to the process of identifying, predicting, evaluating and mitigating the environmental consequences of any development projects and to decrease the possible adverse impacts. It is also one of the most popular decision-making tools and has been integrated in the regulatory system of many countries.

Based on the project types and severity of impact, the EIA can be conducted by two types. They are,

Rapid EIA

- This is carried out for projects having limited (or) less adverse impacts.
- Baseline data (or) information is collected for only one season (other than monsoon)
- Time frame for Rapid EIA is Shorter (3 months)

Comprehensive EIA

- This is carried out for projects having series of adverse impacts.
- Baseline data (or) other related information for three seasons (other than monsoons)
- Time frame for Comprehensive EIA is more than a year

3.2 Hierarchy in EIA

The EIA studies are broadly categorized as:

(i) Site selection studies: These studies involve an evaluation of the alternative sites with respect to environmental and project attributes such as proximity to raw materials, infrastructure facilities, markets, etc. These studies aim at ranking site alternatives for objective decision-making.

(ii) Rapid or comprehensive studies: Rapid studies refer to the assessment based on a one-season monitoring (i.e., 3-month period), whereas comprehensive studies relate to the assessment based on a three-seasons monitoring (i.e., 9- month period) of baseline data. Rapid EIA facilitates decision-making in situations where a fair amount of knowledge exists about the proposed site or the impacts of

the proposed development. It also helps in identifying significant issues for comprehensive EIA. Essentially, rapid and comprehensive studies differ with respect to timeframes required for baseline data collection.

(iii) Regional studies: These relate to the development in/of a region based on seasonal data collection and address themselves to the analysis of assimilative capacity of air, water and land components of the environment.

(iv) Carrying capacity studies: The scope of a carrying capacity study is extended to the analysis of supportive capacity in the region with respect to resource availability/ utilization, supply/demand, infrastructure/congestion and assimilative capacity/residuals.

3.3 EIA SYSTEM

Step 1- Screening

This entails the application of EIA to those projects that may have significant environmental impacts. It is quite likely, however, that screening is done partly by the EIA regulations, operating in a country at the time of assessment.

Based on a project application, a decision needs to be made whether the development requires an EIA. For any work that will alter the physical nature of the land, the person proposing the development must submit an EIA screening application.

An Approving authority is any public authority or person authorized under a written law to approve a development proposal. Examples of approving authorities include:

- Ministry of Environment and forest (under Environmental protection act,1986)
- Directorate of Town and Country Planning (under Town and Country Planning Act, 1971)
- Pollution control board (under Prevention and Control of Pollution Act,1981).

According to the EIA notification 2006, proposals that come under category-A and category-B will require EIA.

Under category-B, any proposal that could come in general condition and special condition it can be treated as category-A. The category can be divided on the basis of threshold limit mentioned in the notifications amendments.

Step 2- Scoping

This step seeks to identify, at an early stage, the key, significant environmental issues from among a host of possible impacts of a project and all the available alternatives.

It involves activities like formal and informal meeting with all affected people, physical site inspection, public participation, and writing up a Terms of Reference [TOR] for the conduct of the EIA study. However, the data collected from site inspection and information collated from face-to-face meeting can be provided as input into the system for further processing and subsequent TOR Report and EIA decision.

Step-3 Data collection

The baseline data collection also cannot be computerized. Due to changes in site variations, climatic factor, local peoples and environmental conditions the computerized process is not suit but the data collected from site inspection and information collated from face-to-face meeting can be provided as input into the system for further processing and subsequent TOR Report and EIA decision.

Step 4-Consideration of alternatives: This seeks to ensure that the proponent has considered other feasible approaches, including alternative project locations, scales, processes, layouts, operating condition and the *no-action* option.

Step 5-Description of the project/development action: This step seeks to clarify the purpose and rationale of the project and understand its various characteristics, including the stages of development, location and processes.

Step 6-Description of the environmental baseline Data: This includes the establishment of both the present and future state of the environment, in the absence of the project, taking into account the changes resulting from natural events and from other human activities.

Step 7-Identification of key impacts: This brings together the previous steps with a view to ensuring that all potentially significant environmental impacts (adverse and beneficial) are identified and taken into account in the process.

Step 8-The prediction of impacts: This step aims to identify the likely magnitude of the change (i.e., impact) in the environment when the project is implemented in comparison with the situation when the project is not carried out.

Step 10-Evaluation and assessment of significance of Impacts: This seeks to assess the relative significance of the predicted impacts to allow a focus on key adverse impacts. Formal definition of significance is the product of consequence and likelihood as

Significance =Consequence X Likelihood

Step 11-Mitigation and Environmental Management Plan (EMP): The implementation of an EMP, mitigation measures are some of the weaknesses in EIA system. This step of EIA can check for regulatory compliance of climate change regulations and other pollution levels.

This involves the introduction of measures to avoid, reduce, remedy or compensate for any significant adverse impacts.

Step 12-Public consultation and participation:

The public should be able to view the Application and its related information online. All the data and information collected so far in the process of the application is available online for public knowledge. The EIA process becomes transparent and accountable. The public can air their concerns about the proposed development via online submissions or attend public scoping meetings to be heard. The applicant and the processing authority are present to answer questions.

This aims to assure the quality, comprehensiveness and effectiveness of the EIA, as well as to ensure that the public's views are adequately taken into consideration in the decision-making process.

Step 13-EIS presentation: This is a vital step in the process. If done badly, much good work in the EIA may be negated.

Step 14-Review: This involves a systematic appraisal of the quality of the EIS, as a contribution to the decision-making process.

Step 15-Appraisal: At this stage, decisions are made by the relevant authority of the EIS (including consultation responses) together with other material considerations as to whether to accept, defer or reject the project. In India the online submission of TOR and EIA report are available on e-Government Portal of MoEF and State Environmental impact Assessment Authority (SEIAA) website. An

applicant who is not happy with the rejection of his EIA may appeal the decision using the online system. A resubmission appeal needs to contain strategies for mitigating those environmental impacts.

Step 16-Post-decision monitoring: Monitoring and EMP are same part of the process. Development projects are monitored to check whether it is complying or not with the required regulations. A monitoring component can be added into the system.

This involves the recording of outcomes associated with development impacts, after the decision to proceed with the project. It can contribute to effective project management.

Step 17-Auditing: This follows monitoring and involves comparing actual outcomes with predicted outcomes, and can be used to assess the quality of predictions and the effectiveness of mitigation. It provides a vital step in the EIA learning process.

IV. RESULTS AND DISCUSSIONS

Developing nation like India needs developmental projects for social and economic development. In many case, poor EIA for developmental projects leads to permanent environmental damage such as climate change, environmental degradation, natural resources depletion, and loss of biodiversity and also affect human beings. A detailed EIA study is a contribution for Effective impact assessment process, Environmental monitoring, Eco-friendly building and Sustainable development.

V. CONCLUSION

Environmental Impact Assessment (EIA) can be defined as a Process, providing an anticipatory and preventive mechanism for environmental management and protection to achieve sustainable development. EIA certainly plays a vital role in assessing the environmental impacts of surrounding developmental project. It is a study of the effects of a proposed project, plan or program on the environment. In other words, EIA is an administrative process that identifies the potential environmental effects of any proposal along with its advantages and disadvantages on environment. Positive effects are maximized whereas; adverse effects are minimized to greatest possible extent.

It can be concluded on a positive note that due to the adequate provision and efficient operation of proposed environmental management systems and mitigation measures, the project activities during the operation phase would have manageable & largely have reversible impacts on the environment, and on balance the project would be beneficial to surrounding communities and the region.

Planned approach is essential for integration between urban development, environmental conservation and overall wellbeing of people. Thus creation and maintenance of eco-friendly and sustainability is a future consideration of environment to save the resources, environmental quality and human health also. So every developmental projects need an effective EIA preparation as well as existing projects also must need to maintenance the environmental quality by properly doing of environmental monitoring program and also good environmental management plan (EMP) is needed to ensure the mitigation measures specified in the EIA report. This paper shows to suggest that EIA documentation process and environmental monitoring can be recommended to done as systematic to solve the problems and issues in the current manual EIA process.

FIGURES:

1. Generalized Flow sheet of EIA:

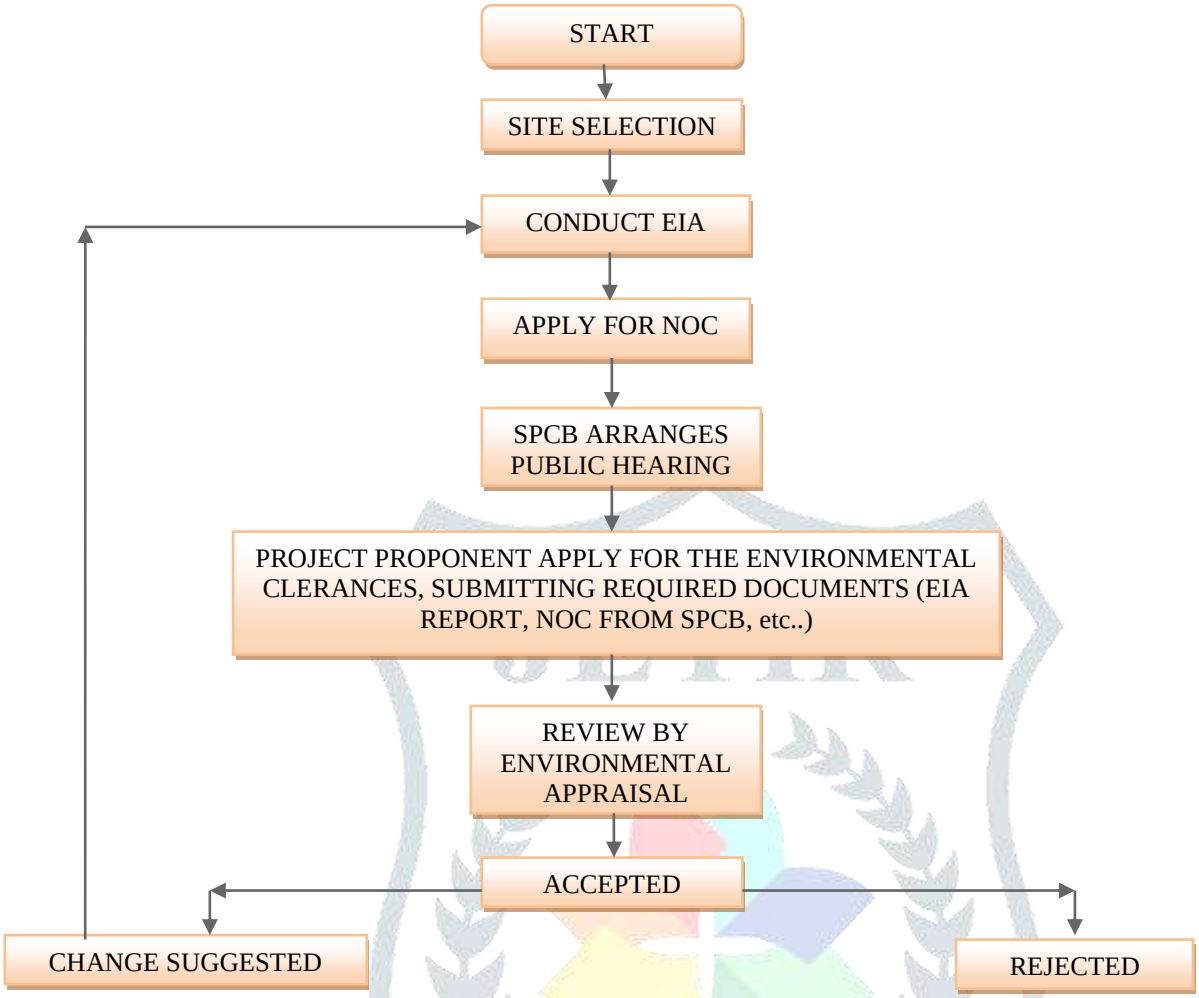

Figure-1 Generalized Flow Sheet of the EIA Process

TABLES:

Table no 01. Details of Study area

Sr.No	Parameters	Details of Study Area
1.	Study Location	Swargate
2.	Nearest Railway Station	Pune Railway Station
3.	Source Of Supply Water	Borewell- For Construction Activity Monicipal Water Supply- For Domestic Use.
4.	Nearest City	Pune
5.	Nearest Water Bodies	Mutha Canal and Mula-Mutha River
6.	Nearest Highway	NH04
7.	Nearest Sensitive Zone	Hospitals
8.	Nearest Airport	Pune Airport
9.	Nearest Forest	Parvati Hills, Katral Tekdi.

Table no 02. Pollutant and Characteristics

Sr. No.	Activity / Area	Pollutant	Pollutant Characteristics	Frequency
CONSTRUCTION PHASE				
1.	Construction Site Preparation	Air emissions – SPM, PM_{10}, CO, NO_x, SO_2	Dust from constructionactivities and excavation. Particulates, NO_x and COfrom vehicle exhaust	Temporary during construction phase only- bulk of the emissions areexpected from ground working and leveling activities

		Earth / solid waste	Solid waste from construction activity and excavation .	Periodic.
		Noise	Noise generated from constructionequipment and machinery	Temporary during initialconstruction phase
2.	Labor Camps	Sewage	Sewage generatedfrom temporarylabor camps	Temporary – during the initial constructionphase
		Solid Waste	Solid Waste generatedfrom temporarylabor camps	Temporary – during the initial constructionphase
FUNCTIONAL PHASE				
1.	Vehicular movement	Air emissions and Noise	Vehicle exhaust emissions	Continuous / Periodic
2.	Diesel generators	Air emissions	SO_2, NOx,SPM, CO from fuelburning	Periodic during power failure
		Noise	Noise due to running of equipment	Periodic during powerfailure
		Hazardous Waste	Used Oil Generation	Periodic, during oil changes
3.	Sewage treatment Plant	Solid Waste	Settled and stabilized sludge	Continuous
		Treated Water	Treated sewage used for horticulture	Continuous
4.	Diesel Storage	Solid Waste	Settled sludge during tank cleaning	Occasional
		Oil	Oil spillage– Accidental large spills due to pipe rupture Oil Spillage- Small quantities	Accidental / Only due to poor housekeeping
5.	LPG Cylinders	Thermal/Blast Effect	Accidental Explosion due to LPG leaks and fire	Accidental
6.	Maintenance and housekeeping	Wastewater	Floor washing	Continuous
		Solid Waste	Used equipment parts and garden wastes	Continuous
7.	Air conditioners	Air emission	Ozone Depleting Substance release	Continuous
8.	Vehicle Parking	Oil Spills	Minor oil leaks in parking lot	Continuous– small quantities

	Area			
9.	Storm water drains	Wastewater	Contamination on discharge from site – Mainly suspended solids	During rainy season

Table no 03. Environmental Aspects of Construction activities and Use

Sr. No.	Area	Aspect
I.	Energy conservation	Solar Heat GainsSolar Heating Day lighting DesignNatural Ventilation Thermal Transfer Value ofBuilding Material Energy Efficient Building Servicesand Equipment Public Area LightingExterior Lighting
II.	Water Conservation	Water Metering Reuse of recycled Water Gardening Water Source Bathroom Fittings Rainwater Harvesting
III.	Internal Roads andAccesses	Pedestrian Access Ramps for Disabled PersonsRoad Painting and Signage Speed Breakers
IV.	Material Use	Construction Materials SelectionPaint Selection Use of Recycled Materials Use of Ozone DepletingSubstances Use of Permanent Timber forPermanent Works Use of Timber for TemporaryWorks
V.	AestheticsDuring Functional Use	Stilt parking Visitors Parking Vehicle Washing ArrangementsPlayground for children Service Roads for Walking Air Conditioning ArrangementsStandby Power Supply Provision for Garden and ComplexMaintenance Staff
V.	Facilities forBuilding Complex Servants	Servant Quarters Rest Rooms with toilets forSecurity Persons Rest Rooms and Eating Places forDrivers
VI.	Location with respectto Potential Hazards	Contaminated LandIndustrial Area Solid Waste Disposal Area Municipal Wastewater Treatment Plant Hazardous Waste DisposalFacilities Sea coast

Table no 04. Ambient Noise Quality Standards

Area Code	Category of Area/Zone	Limits in dB(A) Leq	
		Day Time	Night Time
(A)	Industrial area	75	70
(B)	Commercial area	65	55
(C)	Residential area	55	45
(D)	Silence Zone	50	40

Table no 05. Water Quality standards

Sr. No.	Parameters	Unit	Permissible limits
1.	Colour	Hazen	25
2.	Odour	-	Unobjectionable
3.	pH	-	6.5 - 8.5
4.	Temperature	°C	NS
5.	Suspended Solids	mg/lit	NS
6.	Oil & Grease	mg/lit	0.03
7.	Total Residual Chlorine	mg/lit	--
8.	Total kjeldahl Nitrogen (TKN)	mg/lit	--
9.	Chlorides	mg/lit	NS
10.	Bio-Chemical Oxygen Demand (5 days at 20°C)	mg/lit	NS
11.	DO	mg/lit	NS
12.	Lead	mg/lit	0.05
13.	Chromium as Cr+6	mg/lit	NS
14.	Total Chromium	mg/lit	0.05
15.	Copper as Cu	mg/lit	1.5
16.	Zinc as Zn	mg/lit	15
17.	Cadmium	mg/lit	0.01
18.	PO4	mg/lit	--
19.	Sulphide	mg/lit	--
20.	Phenol	mg/lit	0.002
21.	Manganese as Mn	mg/lit	NS
22.	Iron as Fe	mg/lit	1.0
23.	NO3	mg/lit	--

Note: N.D:- Not Detected, N.S:- NOT Specified

Table no 06. National Ambient Air Quality Standards (NAAQS)

Sr. No.	Pollutants	Time Weighted Average	Concentration in Ambient Air (in µg/m^3 except indicated)	
			Industrial Residential, Rural and Other Areas	Sensitive Area
	Sulphur	Annual Average*	50	20

1	dioxide (SO_2)	24 Hours**	80	80
2	Nitrogen Dioxide (NO_2)	Annual Average *	40	30
		24 Hours**	80	80
3	Particular Matter (Size less than 10 µg) or PM_{10}	Annual Average *	60	60
		24 Hours**	100	100
4	Particular Matter (Size less than 2.5 µg) or $PM_{2.5}$	Annual Average *	40	40
		24 Hours**	60	60
5	Lead (Pb)	Annual Average *	0.50	0.50
		24 Hours**	1.0	1.0
6	Carbon monoxide (CO)	8 Hour Average	02 mg/m^3	02 mg/ m^3
		1 Hour Average	04 mg/ m^3	04 mg/ m^3
7	Ammonia (NH_3)	Annual Average *	100	100
		24 Hours**	400	400
8	Benzene (C_6H_6)	Annual Average *	05	05
9	Benzo (a) Pyrene (BaP)- particulate phase only	Annual Average *	01	01
10	Arsenic (As)	Annual Average *	06	06
11	Nickel (Ni)	Annual Average *	20	20
12	Ozone (O3)	8 Hour Average	100	100
		1 Hour Average	180	180

Table no 07: Existing/Proposed Land use Details.

Land Use Details	Existing (Sq.meter)	Proposed (Sq.meter)	Grand Total (Sq.meter)
Green Belt Area	15,772	15,772	15,772
Open Land	21,450	21,450	21,450
Road/Paved Area	4750	4750	4750
Total Land			41,972

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