

A review on Environmental Impact Assessment of Construction Projects

Vivek Kumar Tiwari¹, Anjali Verma^{1*}, Akash Kumar² and Manjul Gupta²

¹Department of Environment Science, Babashaheb Bhimrao Ambedkar (A Central) University, Lucknow-226025

²Paramarsh Consultancy Service for Environment, Viram Khand 4 H. NO 97 Gomti Nagar, Lucknow

Abstract: *The environment is degraded severely by so many factors, some of which are caused by the activities of Construction Projects. The integration of environment into development planning is the most important tool in achieving sustainable development. EIA certainly has a vital role to play in addressing environmental issues surrounding project development. EIA is considered the starting point in the process of implementing sustainable development agendas. In terms of benefits, it has identified EIAs as the most effective tool for integrating environmental concerns in development planning and implementation. EIA also provide a good example on how a combination of 'top-down' and 'bottom-up' approaches could improve democracy and service delivery. The present review focuses on EIA process, which is necessary for providing an anticipatory and preventive mechanism for environmental management and protection in any development.*

Key-words: *EIA, Construction Projects*

I. Introduction

Environmental Impact Assessment (EIA) is a process to assess the environmental consequences of any project and design proper mitigation plans to minimize the possible adverse impacts [1]. 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 [2]. EIA is used to identify, predict, evaluate and mitigate the environmental, social and other potential impacts and consequences of projects prior to major decisions being taken and commitments made to recommend suitable mitigation measures and to decrease possible adverse impacts [3]. It is a good management tool to predict the type, magnitude and probability of environmental and social changes likely to occur as direct or indirect result of a plan or policy and to decrease adverse impacts [4,5,6]. 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 or beneficial. EIA process implemented prior to any developmental project in order to ensure that no adverse impact will be faced by the environment. 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 [7, 8]. 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 [9,10]. According to International Association for Impact Assessment Act [11], 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.

II. Types Of Eia

EIA are of several types such as Climate Impact Assessment, Demographic Impact Assessment, Development Impact Assessment, Ecological Impact Assessment, Economic, Environmental Auditing, Environmental Management Systems, Health Impact Assessment, Risk Assessment, Social Impact Assessment, Strategic Impact Assessment, Technology Assessment etc.

III. Objectives Of Eia For Construction Projects

EIA has been used as an effective tool in decision making process for housing projects affecting environmental factors. Objectives of EIA which are considered for housing projects can be summarized as follows:

- 3.1 To predict environmental impacts of construction projects due to land use change or modifications.
- 3.2 Decision makers considering the environmental costs and benefits before construction projects are started.
- 3.3 Reduce adverse impacts during the construction phase.

- 3.4 To ensure that the environmental considerations are explicitly addressed and incorporated into the development and decision-making process.
- 3.5 To avoid, minimize or offset the adverse significant biophysical, social and other relevant effects on environment.
- 3.6 To protect the productivity and capacity of natural systems.
- 3.7 To promote sustainable colonies and can optimize resource use as well as management opportunities in future.

IV. Need For Environmental Clearance

To safeguard the environment from adverse effects of developmental construction activities, MoEF has issued some mandatory regulations. As per the notification S.O. 1533 E dated 14th September, 2006, Environmental Impact Study (EIA) is mandatory for any construction projects with built-up area of more than 1,50,000 m². Since the built-up area of the present project is 69,361.83 m², it does not require detailed EIA study, only clearance has been called for from concerned authorities (SEAC) through the EIA Proposal consisting of Form 1, Form 1A and Conceptual Plan. The study would facilitate PP to obtain Environmental Clearance (EC) from the SEAC, UP, Government of India as per the above mentioned notification.

V. Basic Principles of EIA

An EIA process should be Ideally meet the values are given such as:

- 5.1 Integrity: The EIA process should be fair, objective, unbiased and balanced
- 5.2 Utility: The process should provide balanced information for decision making
- 5.3 Sustainability: The EIA process should result in environmental safeguards
- 5.4 Purposive- should inform decision-makers of about environmental protection and community well-being.
- 5.5 Rigorous- should apply 'best practicable' science, employing methodologies and techniques appropriate to address the problems.
- 5.6 Practical- should result in providing information and acceptable and implementable solutions for problems faced by proponents.
- 5.7 Relevant- should provide sufficient, reliable and usable information for development planning and decision-making.
- 5.8 Cost-effective- should impose minimum cost in terms of time and finance with meeting accepted requirements and objectives of EIA.
- 5.9 Efficient- should achieve the objectives of EIA within the limits of available information, time, resources and methodology.
- 5.10 Focused- should concentrate on significant environmental impacts effects and key issues.
- 5.11 Participative- should provide appropriate opportunities to involve the interested and affected public and their concerns in the documentation and decision-making.
- 5.12 Inter-disciplinary- should involve the appropriate techniques and experts in relevant bio-physical and socio-economic disciplines including the use of traditional knowledge as relevant.
- 5.13 Credible- Professionalism, rigor, fairness, objectivity, impartiality and balance should be subject to independent checks and verification.
- 5.14 Integrated- should address the inter-relationships of social, economic and biophysical aspects.
- 5.15 Transparent- should have clear, easily understood requirements for EIA content; ensure public access to information.
- 5.16 Systematic- should consider of all relevant information on the affected environment, of proposed activity and their impacts, and of the measures necessary to monitor the residual effects.

VI. Environmental Impacts

Environmental impacts resulting from proposed actions can be grouped into following Categories:

- 6.1 Beneficial or Harmful
- 6.2 Reversible or irreversible
- 6.3 Repairable via management practices or irreparable
- 6.4 Short-term or long-term
- 6.5 Temporary or continuous
- 6.6 Occurring during construction phase or operational phase
- 6.7 Local, regional, national or global
- 6.8 Accidental or planned (recognized before hand)
- 6.9 Direct (primary) or Indirect (secondary)
- 6.10 Cumulative or single

VII. Parameters to determine the significance of the identified impacts

Factors affecting the significance of the identified impacts of any developmental activity eventually.

Such factors include the following:

- 7.1 Threshold Limit
- 7.2 Effectiveness of EIA
- 7.3 Mitigation measures
- 7.4 Study area location, size
- 7.5 Relative contribution of effects of other actions
- 7.6 Rarity of species
- 7.7 Significance of local effects
- 7.8 Magnitude of change
- 7.9 Creation of induced actions
- 7.10 Degree of existing disturbance

VIII. Participants in EIA process

EIA process involves many grouped by their role definition within the process. The following parties may be identified:

8.1 The project proponent: The project proponent is the person or groups of person who wish to formulate or carry out a proposed development activity. The proponent has to approach the concerned SPCB/ Impact Assessment Agency for consent and clearance.

8.2 The Competent authority: The pollution Control Board is the Competent Authority responsible for assessing the compliance of a proposed development with current operational standards. In case, the proposed development requires EIA, the PCB is responsible for the organization of the public consultation process.

8.3 The Impact Assessment agency: The IAA evaluates and assesses the EIA report. If a project is accepted, the IAA also prepares a set of recommendations and conditions for its implementation based on this assessment. Conditions and recommendations will also be made available to the public on request through SPCB. During the implementation and operation of the project, the IAA is also responsible for the monitoring process.

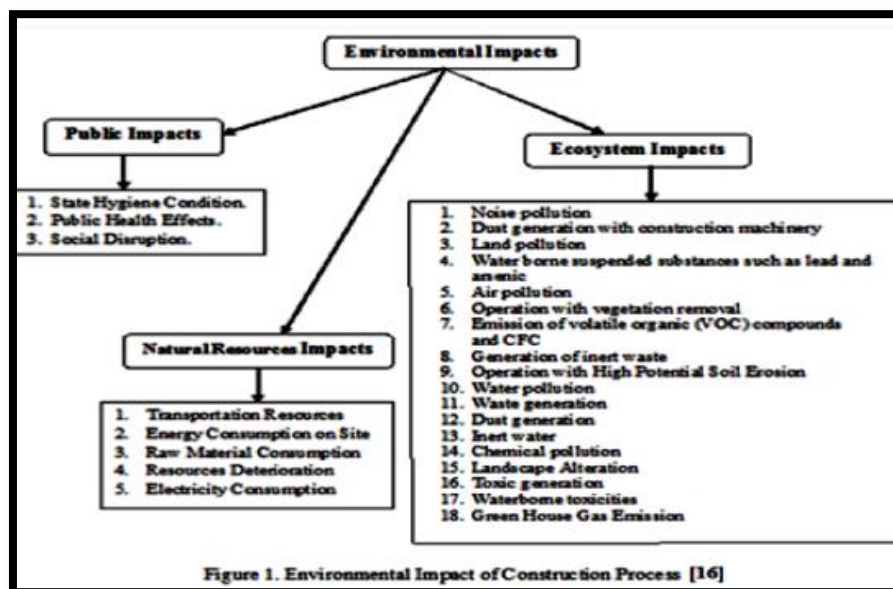
8.4 The public: The general public or interest group has an important role to play in EIA. All these affected parties is information and to supply their views on any proposed development requiring environmental assessment.

The EIA process in India is made up of the following phases:

- 8.1 Screening
- 8.2 Scoping
- 8.3 Baseline data collection
- 8.4 Impact prediction
- 8.5 Assessment of alternatives, control measures and environmental impact statement
- 8.6 Public hearing
- 8.7 Environment Management Plan
- 8.8 Decision making
- 8.9 Monitoring the clearance conditions

IX. Environmental Impacts Of Construction Project

EIA is an important management tool to identify the major environmental impacts of construction projects to improve the effectiveness of environmental management systems. Prediction of the environmental impacts of construction project before the construction work, leads to improvements in the environmental performance of construction projects and sites. A construction project causes great impact on environment. It is necessary to provide mitigation measures to minimize the fast growing threat of environmental impacts of building construction projects. Environmental impacts of building construction activities may vary from country to country. Major environmental impacts of construction projects are such as waste disposal, pollution, resource use and habitat destruction, desertification, soil erosion and material wastage etc. Building construction activity such as use of resources like timber and non- fuel materials etc. Construction project leads to habitat destruction, loss of arable land, and loss of biodiversity etc. The determination on the major environmental impacts with mitigation measures was studied by [12]. [13, 14, 15] studied on environmental impacts and about 26 subcategories of environmental impacts were identified. [Figure 1] provides the subcategories of environmental impacts across construction process.



X. Conclusion

Environmental Impact Assessment (EIA) can broadly 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.

Acknowledgements

Authors express their sincere thanks to Prof. Mohammad Yunus (Vice-Chancellor, Mohammad Ali Jauhar Rampur University, Rampur, India) and Dr. Venkatesh Dutta (Assistant Professor, Department of Environmental Science, B.B.A.U, Lucknow), for providing the necessary facilities for conducting this study.

References

- [1] B. R. Sadler, and Verheem, Strategic Environmental Assessment - status, challenges and future directions. The Hague. Ministry of Housing, Spatial Planning and the Environment of the Netherlands, (1996).
- [2]. P.B. Barlett, and J.J. Prior, The Environmental Impact of Buildings. Building Research Establishment (BRE) Information Paper, BRE, UK, (1991), 18-19.
- [3]. T. Kaya, and C. Kahraman, An integrated fuzzy AHP-ELECTRE methodology for environmental impact assessment. Expert Systems with Applications, 38(7),(2011), 8553-8562.
- [4]. F. Vanclay, and D. A. Bronstein, Environmental and social impact assessment. New York: Wiley, (1995).
- [5]. N. Harvey, Environmental impact assessment: procedures, practice, and prospects in Australia. Oxford, Oxford Univ. Press ,(1998).
- [6]. S. Momtaz, B. Taylor, and S. Lockie, Independent social impact assessment: proposed castle hope dam Calliope River and Awoonga Dam upgrade, Queensland, Rockhampton, Central Queensland University, (1998).
- [7]. V. Puri, P. Chakraborty, and S. Majumdar, A Review of Low Cost Housing Technologies in India. In Advances in Structural Engineering, (2015), 1943-1955.
- [8]. X. Deng, Y. Hu, Y. Deng, and S. Mahadev, An Environmental impact assessment based on the numbers. Expert Systems with Applications, (2014), 635-643.
- [9] B.A Dutta, and Sengupta. I, Environmental Impact Assessment (EIA) and Construction International Research Journal of Environment Science ,3,(1), (2014), 58-61.
- [10] B. K Dutta, and S. Bandopadhyay S, Environmental Impact Assessment and Social Impact Assessment – Decision Making Tools for Project Appraisal in India. International Journal of Human and Social Sciences, 5, 6 (2010).
- [11]. International Association for Impact Assessment-IAIA The reviewed Act of Impact Assessment, IAIA London, (2000).

- [12]. M. Gangoells, M. Casals, M. Gassó, S. Forcada, N. Roca, X. and Fuertes, A. Assessing concerns of interested parties when predicting the significance of environmental impacts related to the construction process of residential buildings". *Building and Environment*, 46, (2011),1023-1037.
- [13]. M. Gangoells, M. Casals, S. Gassó, N. Forcada, X. Roca, and A. A Fuertes, methodology for predicting the severity of environmental impacts related to the construction process of residential buildings. *Building and Environment* 44, (2009), 558-571.
- [14]. L.Y. Shen, W.-S. Lu, H. Yao, and D.H. Wu A computer-based scoring method for measuring the environmental performance of construction activities. *Automation in Construction* 14, (2005), 297-309.
- [15]. V.W.Y. Tam, C.M. Tam, S.X. Zeng, and K.K. Chan Environmental performance measurement indicators in construction. *Building and Environment* 41, (2006), 164-173.
- [16]. S. Zolfagharian, M. Nourbakhsh, J. Irizarry, A. Ressang, and M. Gheisari, Environmental Impacts Assessment on Construction Sites, *Construction Research Congress Journal*, (2012), 1750-1759.