



# Environment Impact Assessment in Theory and Practice

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**ABSTRACT:** The comprehensive treatment of environmental impact assessment (EIA) provides an authoritative contemporary review of theory and practice over the past ten years. EIA is viewed as both science and art, reflecting the concern both with technical aspects of appraisal and the effects of EIA on the decision-making process. Adopted in many countries, with different degrees of enthusiasm, since its inception in the early 1970's, EIA is established as a major procedure for assessing the environmental implications of legislation, the implementation of policy and plans and the initiation of development projects. EIA is increasingly an essential part of environmental management

**KEYWORDS-**environment, impact, assessment, theory, practice, legislation, projects, management

## I. INTRODUCTION

- Environmental Impact Assessment (EIA) is a process of evaluating the likely environmental impacts of a proposed project or development, taking into account inter-related socio-economic, cultural and human-health impacts, both beneficial and adverse.
- UNEP defines Environmental Impact Assessment (EIA) as a tool used to identify the environmental, social and economic impacts of a project prior to decision-making. It aims to predict environmental impacts at an early stage in project planning and design, find ways and means to reduce adverse impacts, shape projects to suit the local environment and present the predictions and options to decision-makers.
- Environment Impact Assessment in India is statutorily backed by the Environment Protection Act, 1986 which contains various provisions on EIA methodology and process.

### History of EIA in India

- The Indian experience with Environmental Impact Assessment began over 20 years back. It started in 1976-77 when the Planning Commission asked the Department of Science and Technology to examine the river-valley projects from an environmental angle.
- Till 1994, environmental clearance from the Central Government was an administrative decision and lacked legislative support.
- On 27 January 1994, the then Union Ministry of Environment and Forests, under the Environmental (Protection) Act 1986, promulgated an EIA notification making Environmental Clearance (EC) mandatory for expansion or modernisation of any activity or for setting up new projects listed in Schedule 1 of the notification.[1,2]
- The Ministry of Environment, Forests and Climate Change (MoEFCC) notified new EIA legislation in September 2006.
  - The notification makes it mandatory for various projects such as mining, thermal power plants, river valley, infrastructure (road, highway, ports, harbours and airports) and industries including very small electroplating or foundry units to get environment clearance.
  - However, unlike the EIA Notification of 1994, the new legislation has put the onus of clearing projects on the state government depending on the size/capacity of the project.

### The EIA Process

EIA involves the steps mentioned below. However, the EIA process is cyclical with interaction between the various steps.



- Screening: The project plan is screened for scale of investment, location and type of development and if the project needs statutory clearance.
- Scoping: The project's potential impacts, zone of impacts, mitigation possibilities and need for monitoring.
- Collection of baseline data: Baseline data is the environmental status of study area.
- Impact prediction: Positive and negative, reversible and irreversible and temporary and permanent impacts need to be predicted which presupposes a good understanding of the project by the assessment agency.
- Mitigation measures and EIA report: The EIA report should include the actions and steps for preventing, minimizing or by passing the impacts or else the level of compensation for probable environmental damage or loss.
- Public hearing: On completion of the EIA report, public and environmental groups living close to project site may be informed and consulted.
- Decision making: Impact Assessment Authority along with the experts consult the project-in-charge along with consultant to take the final decision, keeping in mind EIA and EMP (Environment Management Plan).
- Monitoring and implementation of environmental management plan: The various phases of implementation of the project are monitored.
- Assessment of Alternatives, Delineation of Mitigation Measures and Environmental Impact Assessment Report: For every project, possible alternatives should be identified, and environmental attributes compared. Alternatives should cover both project location and process technologies.
  - Once alternatives have been reviewed, a mitigation plan should be drawn up for the selected option and is supplemented with an Environmental Management Plan (EMP) to guide the proponent towards environmental improvements.
- Risk assessment: Inventory analysis and hazard probability and index also form part of EIA procedures.

#### Stakeholders in the EIA Process

- Those who propose the project
- The environmental consultant who prepare EIA on behalf of project proponent
- Pollution Control Board (State or National)
- Public has the right to express their opinion
- The Impact Assessment Agency
- Regional centre of the MoEFCC

#### Salient Features of 2006 Amendments to EIA Notification[3,5]

- Environment Impact Assessment Notification of 2006 has decentralized the environmental clearance projects by categorizing the developmental projects in two categories, i.e., Category A (national level appraisal) and Category B (state level appraisal).
  - Category A projects are appraised at national level by Impact Assessment Agency (IAA) and the Expert Appraisal Committee (EAC) and Category B projects are appraised at state level.
  - State Level Environment Impact Assessment Authority (SEIAA) and State Level Expert Appraisal Committee (SEAC) are constituted to provide clearance to Category B process.
- After 2006 Amendment the EIA cycle comprises of four stages:



- Screening
- Scoping
- Public hearing
- Appraisal
- Category A projects require mandatory environmental clearance and thus they do not undergo the screening process.
- Category B projects undergoes screening process and they are classified into two types.
  - Category B1 projects (Mandatorily requires EIA).
  - Category B2 projects (Do not require EIA).
- Thus, Category A projects and Category B, projects undergo the complete EIA process whereas Category B2 projects are excluded from complete EIA process.

#### Importance of EIA

- EIA links environment with development for environmentally safe and sustainable development.
- EIA provides a cost effective method to eliminate or minimize the adverse impact of developmental projects.[7,8]
- EIA enables the decision makers to analyse the effect of developmental activities on the environment well before the developmental project is implemented.
- EIA encourages the adaptation of mitigation strategies in the developmental plan.
- EIA makes sure that the developmental plan is environmentally sound and within the limits of the capacity of assimilation and regeneration of the ecosystem.

#### Shortcomings of EIA Process

- Applicability: There are several projects with significant environmental impacts that are exempted from the notification either because they are not listed in schedule I, or their investments are less than what is provided for in the notification.
- Composition of expert committees and standards: It has been found that the team formed for conducting EIA studies is lacking the expertise in various fields such as environmentalists, wildlife experts, Anthropologists and Social Scientists.
- Public hearing:
  - Public comments are not considered at an early stage, which often leads to conflict at a later stage of project clearance.
  - A number of projects with significant environmental and social impacts have been excluded from the mandatory public hearing process.
  - The data collectors do not pay respect to the indigenous knowledge of local people.
- Quality of EIA: One of the biggest concerns with the environmental clearance process is related to the quality of EIA report that are being carried out.
- Lack of Credibility: There are so many cases of fraudulent EIA studies where erroneous data has been used, same facts used for two totally different places etc.[9,10]
- Often, and more so for strategic industries such as nuclear energy projects, the EMPs are kept confidential for political and administrative reasons.



- Details regarding the effectiveness and implementation of mitigation measures are often not provided.
- Emergency preparedness plans are not discussed in sufficient details and the information not disseminated to the communities.

#### Way Forward

- Independent EIA Authority.
  - Sector wide EIAs needed.
  - Creation of a centralized baseline data bank.
- Dissemination of all information related to projects from notification to clearance to local communities and the general public.
- Applicability: All those projects where there is likely to be a significant alteration of ecosystems need to go through the process of environmental clearance, without exception.
- No industrial developmental activity should be permitted in ecologically sensitive areas.
- Public hearing: Public hearings should be applicable to all hitherto exempt categories of projects which have environmental impacts.
- The focus of EIA needs to shift from utilization and exploitation of natural resources to conservation of natural resources.
- It is critical that the preparation of an EIA is completely independent of the project proponent.
- Grant of clearance: The notification needs to make it clear that the provision for site clearance does not imply any commitment on the part of the impact Assessment agency to grant full environmental clearance. [11,12]
- Composition of expert committees: The present executive committees should be replaced by expert people from various stakeholder groups, who are reputed in environmental and other relevant fields.
- Monitoring, compliance and institutional arrangements:
  - The EIA notification needs to build within it an automatic withdrawal of clearance if the conditions of clearance are being violated and introduce more stringent punishment for noncompliance. At present the EIA notification limits itself to the stage when environmental clearance is granted.
  - The composition of the NGT needs to be changed to include more judicial persons from the field of environment.
  - Citizen should be able to access the authority for redressal of all violation of the EIA notification as well as issues relating to non-compliance.
- Capacity building: NGOs, civil society groups and local communities need to build their capacities to use the EIA notification towards better decision making on projects.

## II. DISCUSSION

Environment Impact Assessment or EIA can be defined as the study to predict the effect of a proposed activity/project on the environment. A decision making tool, EIA compares various alternatives for a project and seeks to identify the one which represents the best combination of economic and environmental costs and benefits.

EIA systematically examines both beneficial and adverse consequences of the project and ensures that these effects are taken into account during project design. It helps to identify possible environmental effects of the proposed project, proposes measures to mitigate adverse effects and predicts whether there will be significant adverse environmental effects, even after the mitigation is implemented. [13,15] By considering the environmental effects of the project and their mitigation early in the project planning cycle, environmental assessment has many benefits, such as protection of environment, optimum utilisation of resources and saving of time and cost of the project. Properly conducted EIA also



lessens conflicts by promoting community participation, informing decision makers, and helping lay the base for environmentally sound projects. Benefits of integrating EIA have been observed in all stages of a project, from exploration and planning, through construction, operations, decommissioning, and beyond site closure.

EIA is one of the successful policy innovations of the 20th Century for environmental conservation. Thirty-seven years ago, there was no EIA but today, it is a formal process in many countries and is currently practiced in more than 100 countries. EIA as a mandatory regulatory procedure originated in the early 1970s, with the implementation of the National Environment Policy Act (NEPA) 1969 in the US. A large part of the initial development took place in a few high-income countries, like Canada, Australia, and New Zealand (1973-74). However, there were some developing countries as well, which introduced EIA relatively early - Columbia (1974), Philippines (1978).

The EIA process really took off after the mid-1980s. In 1989, the World Bank adopted EIA for major development projects, in which a borrower country had to undertake an EIA under the Bank's supervision [17,18]

Table : Evolution and history of EIA

	Development of EIA
Pre-1970	Project review based on the technical/engineering and economic analysis.  Limited consideration given to environmental consequences.
Early/mid – 1970s	EIA introduced by NEPA in 1970 in US.  Basic principle: Guidelines, procedures including public participation requirement instituted.  Standard methodologies for impact analysis developed (e.g. matrix, checklist and network).  Canada, Australia and New Zealand became the first countries to follow NEPA in 1973-1974. Unlike Australia, which legislated EIA, Canada and New Zealand established administrative procedures.  Major public inquiries help shape the process's development.
Late 1970 and early 1980s	More formalised guidance.  Other industrial and developing countries introduced formal EIA requirements (France, 1976; Philippines, 1977), began to use the process informally or experimentally ( Netherlands, 1978) or adopted elements, such as impact statements or reports, as part of development applications for planning permission (German states [lander], Ireland).  Use of EA by developing countries (Brazil, Philippines, China, Indonesia)  Strategic Environment Assessment <sup>[1]</sup> (SEA), risk analysis included in EA processes <sup>[2]</sup> .  Greater emphasis on ecological modelling, prediction and evaluation methods.  Provision for public involvement.



	Coordination of EA with land use planning processes.
Mid 1980s to end of decade	In Europe, EC Directive on EIA establishes basic principle and procedural requirements for all member states.[19,20]  Increasing efforts to address cumulative effects.  World Bank and other leading international aid agencies establish EA requirements.  Spread of EIA process in Asia.
1990s	Requirement to consider trans-boundary effects under Espoo convention.  Increased use of GIS and other information technologies.  Sustainability principal and global issues receive increased attention.  India also adopted the EIA formally.  Formulation of EA legislation by many developing countries.  Rapid growth in EA training.
Source: International Study of the Effectiveness of Environmental Assessment, final report, Environmental assessment in a changing world, Prepared by Barry Sadler, June 1996.	
[1]Definition of SEA: Policy tool to assess the environmental consequences of development policies, plans and programmes [2]Definition of risk assessment: An instrument for estimating the probability of harm occurring from the presence of dangerous conditions or materials at a project site. Risk represents the likelihood and significance of a potential hazard being realized[21,22]	

History of EIA in India  
The Indian experience with Environmental Impact Assessment began over 20 years back. It started in 1976-77 when the Planning Commission asked the Department of Science and Technology to examine the river-valley projects from an environmental angle. This was subsequently extended to cover those projects, which required the approval of the Public Investment Board. Till 1994, environmental clearance from the Central Government was an administrative decision and lacked legislative support.

On 27 January 1994, the Union Ministry of Environment and Forests (MEF), Government of India, under the Environmental (Protection) Act 1986, promulgated an EIA notification making Environmental Clearance (EC) mandatory for expansion or modernisation of any activity or for setting up new projects listed in Schedule 1 of the notification. Since then there have been 12 amendments made in the EIA notification of 1994.

The MoEF recently notified new EIA legislation in September 2006. The notification makes it mandatory for various projects such as mining, thermal power plants, river valley, infrastructure (road, highway, ports, harbours and airports) and industries including very small electroplating or foundry units to get environment clearance. However, unlike the EIA Notification of 1994, the new legislation has put the onus of clearing projects on the state government depending on the size/capacity of the project.

Certain activities permissible under the Coastal Regulation Zone Act, 1991 also require similar clearance. Additionally,



donor agencies operating in India like the World Bank and the ADB have a different set of requirements for giving environmental clearance to projects that are funded by them.[23]

### **III. RESULTS**

The EIA process

The stages of an EIA process will depend upon the requirements of the country or donor. However, most EIA processes have a common structure and the application of the main stages is a basic standard of good practice.

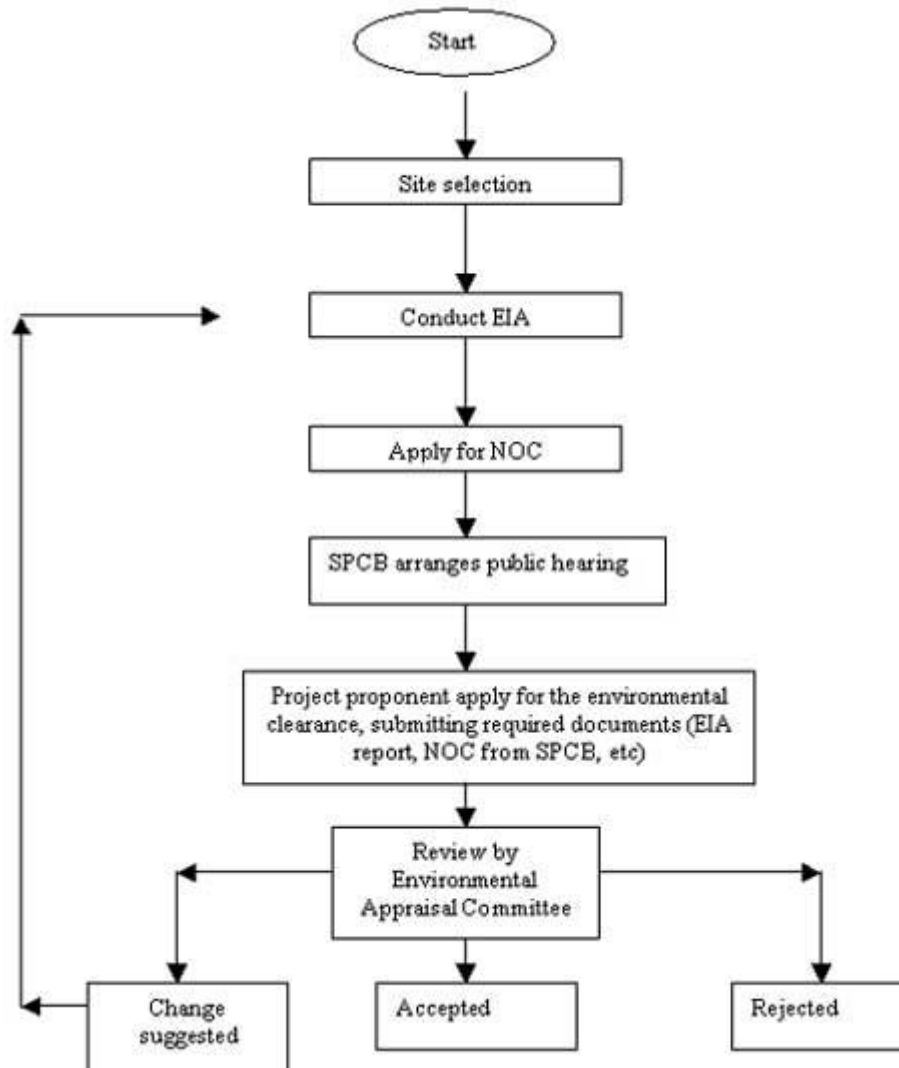
The environment impact assessment consists of eight steps with each step equally important in determining the overall performance of the project. Typically, the EIA process begins with screening to ensure time and resources are directed at the proposals that matter environmentally and ends with some form of follow up on the implementation of the decisions and actions taken as a result of an EIA report. The eight steps of the EIA process are presented in brief below:

- Screening: First stage of EIA, which determines whether the proposed project, requires an EIA and if it does, then the level of assessment required.
- Scoping: This stage identifies the key issues and impacts that should be further investigated. This stage also defines the boundary and time limit of the study.
- Impact analysis: This stage of EIA identifies and predicts the likely environmental and social impact of the proposed project and evaluates the significance.
- Mitigation: This step in EIA recommends the actions to reduce and avoid the potential adverse environmental consequences of development activities.
- Reporting: This stage presents the result of EIA in a form of a report to the decision-making body and other interested parties.
- Review of EIA: It examines the adequacy and effectiveness of the EIA report and provides the information necessary for decision-making.
- Decision-making: It decides whether the project is rejected, approved or needs further change.
- Post monitoring: This stage comes into play once the project is commissioned. It checks to ensure that the impacts of the project do not exceed the legal standards and implementation of the mitigation measures are in the manner as described in the EIA report.



The overview of the EIA process is represented in figure 1.

Figure 1: Generalised process flow sheet of the EIA process



Source: The manual in perspective, EIA Training Resource Manual, United Nations Environment Programme, 2002

Forms of impact assessment  
 There are various forms of impact assessment such as Health Impact Assessment (HIA) and Social Impact Assessment (SIA) that are used to assess the health and social consequences of development so that they are taken into consideration along with the environmental assessment. One of the forms of impact assessment is strategic environment assessment, which is briefly discussed below:

i. Strategic environment assessment

Strategic Environment Assessment (SEA) refers to systematic analysis of the environmental effects of development policies, plans, programmes and other proposed strategic actions. This process extends the aims and principles of EIA upstream in the decision-making process, beyond the project level and when major alternatives are still open. SEA represents a proactive approach to integrating environmental considerations into the higher levels of decision-making.

Despite its wide use and acceptance, EIA has certain shortcomings as a tool for minimising environmental effects of





development proposals. It takes place relatively late at the downstream end of the decision making process, after major alternatives and directions have been chosen [22,23]

Table : Difference in EIA and SEA

Environment impact assessment	Strategic environment assessment
§ Takes place at end of decision-making cycle	§ Takes place at earlier stages of decision making cycle
§ Reactive approach to development proposal	
§ Identifies specific impacts on the environment	§ Pro-active approach to development proposals
§ Considers limited number of feasible alternatives	§ Also identifies environmental implications, issues of sustainable development
§ Limited review of cumulative effects	§ Considers broad range of potential alternatives
§ Emphasis on mitigating and minimizing impacts	§ Early warning of cumulative effects
§ Narrow perspective, high level of detail	§ Emphasis on meeting environmental objectives, maintaining natural systems
§ Well-defined process, clear beginning and end	§ Broad perspective, lower level of detail to provide a vision and overall framework
§ Focuses on standard agenda, treats symptoms of environmental deterioration	§ Multi-stage process, overlapping components, policy level is continuing, iterative
	§ Focuses on sustainability agenda, gets at sources of environmental deterioration
Source: EIA Training Resource Manual, 2nd edition, 2002, United Nations Development Programme	

SEA had limited development and implementation till 1990. However, after 1990, a number of countries in developed economies adopted SEA. Some countries such as Canada and Denmark have made provision for SEA of policy, plans and programmes separately from EIA legislation and procedure. Other countries such as Czech Republic, Slovakia, etc have introduced SEA requirements through reforms in EIA legislation and in case of United Kingdom through environmental appraisal. While in New Zealand and Australia, it is a part of resource management or biodiversity conservation regimes. The adoption of SEA is likely to grow significantly in the coming years especially with directives by European Union and Protocol to the UNECE Convention on Transboundary EIA by signatory countries (with a provisional date of May 2003 for completion).

Comparative review of EIA procedures and practices

Developed countries	EIA in developing countries	EIA in India
Well-framed EIA legislation in place. For instance, in Canada, Canadian Environmental Assessment Act regulates EIA while EU countries are guided by Directive on EIA (1985).	Lack of formal EIA legislation in many developing countries. For instance, EIA is not mandatory in many African countries	Formal legislation for EIA. It has been enacted by making an amendment in the Environment Protection Act 1986.
In developed countries, active involvement of all participants including competent authority, government agencies and affected people at early stages of the EIA. This makes the process more robust	Limited involvement of public and government agencies in the initial phases. This often results in poor representation of the issues and impacts in the report, adversely affecting the quality of the report.	Limited involvement of public and government agencies in the initial phases.



and gives a fair idea of issues, which need to be addressed in the initial phase of EIA.		
Integrated approach to EIA followed. All aspects including social and health taken into account.	Mainly environmental aspects considered. Poor on social or health aspects.	No provision in place to cover landscape and visual impacts in the Indian EIA regulations
Proper consideration of alternatives in EIA	The consideration of alternatives in developing countries is more or less absent.	Same as developing countries
The process of screening is well defined. For instance, in EU countries competent authorities decide whether EIA is required after seeking advice from developer, NGO and statutory consultees. In Japan, screening decision is made by the authorizing agency with respect to certain criteria. In Canada, federal authority determines whether an environmental assessment is required or not.	In developing countries, screening practice in EIA is weak. In most cases, there is a list of activities that require EIA but without any threshold values.	Screening done on the basis of a defined list. Threshold values on the size of the project has been used to decide whether the project will be cleared by the state government or the central government.
Scoping process is comprehensive and involves consultation with all the stakeholders. In many countries like US, Netherlands, Canada and Europe, the involvement of the public and their concern are addressed in the scoping exercise. Besides this, funding organisations such as World Bank, ADB and ERDB have provision for consultation with the affected people and NGOs during identification of issues in scoping exercise.	Scoping process in most developing countries is very poorly defined. In many countries including China, Pakistan, etc. there is no provision for scoping. In some countries like in Nigeria and Indonesia, a term of reference is followed for scoping while in some countries like Ghana, Taiwan and Chile, a general checklist is followed. In countries where it is undertaken, there is no public consultation during scoping. Moreover, in most developing countries, scoping is often directed towards meeting pollution control requirements, rather than addressing the full range of potential environmental impacts from a proposed development.	Earlier scoping was done by consultant or proponent with an inclination towards meeting pollution control requirements, rather than addressing the full range of potential environmental impacts from a proposed development. However, the new notification has put the onus of scoping on the expert committee based on the information provided by the proponent. Consultation with public is optional and depends on the discretion of the expert committee.
Most reports in local language	Most reports in English and not in the local language.	Most reports in English and not in the local language. In some case, executive summary is translated into local language.
A multi-disciplinary approach. Involvement of expert with expertise in different areas.	Lack of trained EIA professionals often leads to the preparation of inadequate and irrelevant EIA reports in developing countries	Same in India. Preparation of EIA is done by consultants. Therefore, the selection criterion for the organisation is fees/cost rather than the expertise of EIA team.
Two tier of EIA review, One conducted after the completion of EIA to check the adequacy and effectiveness of EIA and the second	Poor review or monitoring.	In India too, EIA review is not upto the marks. The review agency called Impact Assessment Agency (IAA)



done before decision-making.		lacks inter-disciplinary capacity. No representation of NGO in IAA, which is a violation of the EIA notification.
Expertise in EIA: The International Association for Impact Assessment (AIA) and other organisations demonstrate that there are a large number of individuals with the capability to design, conduct, review and evaluate EIAs from countries of the North. The major portion of teaching about environmental assessment also takes place in industrial countries.	The expertise in EIA is slowly developing. In most cases, students from the developing countries go to the developed countries to gain knowledge of the subject.	Expertise in this area is developing.
Source: Compiled by Industry & Environment Unit, Centre for Science & Environment, 2006		

#### IV. CONCLUSION

The EIA report is the most important and tangible output of an EIA process. Therefore, the effectiveness of the EIA system of a country depends largely on the quality of the EISs. The EIS is the product of an EIA process and, as such, the quality of the document is likely to be closely associated with the quality of the whole EIA process. This can be supported by the findings of the empirical study of Wende (2002) where the author shows that there is a clear relationship between the quality of EISs and the effectiveness of the EIA system.

A number of studies were conducted in both developed and developing countries on EIS quality (Glasson et al., 2005; Pinho et al., 2007; Sandham and Pretorius, 2008). These studies identified deficiencies in the contents of EISs, determined factors influencing the quality of EISs, and suggested improvements in the quality of EISs. Therefore, after the analysis of institutional requirements of an EIA system, it is imperative to look at the quality of EISs as a key aspect of the EIA system in Bangladesh.[24]

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