

Environmental Impact Assessment System and Process in Developing Countries

Ramesh Prasad Bhatt

School of Science and Engineering, Atlantic International University, Honolulu, USA

Email: drrameshbhatta@gmail.com

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Abstract

Environmental impact assessment (EIA), a decision-making process for project appraisal and sustainability adopted globally as an administrative process to identify, predict, evaluate, and monitor projects from their feasibility, pre-construction, construction, and operation stages to mitigate the adverse impacts and enhance the beneficial impacts for the protection of the affected environment. The study objective is to explore global EIA systems and processes and find shortcomings and implications for making the best instrument or tool to protect the natural environment from man-made activities over the project cycle. For this, the relevant literature on the EIA system and process was reviewed and evaluated through the application of quantitative and qualitative approaches, including the assessment of legal instruments and the adoption of EIA methodologies in developing countries. EIA, initiated in the 1970s in the US and Australia, expanded to developing countries and was amended in East and Southeast Asia from the 1970s to the 2000s. The evaluation assessed that the South Asian countries follow UNEP and IAIA guidelines, utilizing national laws and expert consultations, with screening criteria and administrative processes based on established environmental legislation. Ad hoc, checklist, matrix, network, overlay, cost-benefit analysis, and predictive or simulation in EIA practice are used to assess the environmental impacts of development activities. Failure to recommend major projects undermines public trust and prevents mitigation measures from being implemented. Most developing countries have followed EIA to fulfill the legal requirement with shadow-off monitoring and follow-up rather than to upset, reduce, or compensate for the project impacts as per size, location, and severity of the project area. The research and guidelines outlined in the IAIA principles and process have synthesized the best EIA practices worldwide. Public participation, impact coverage, scientific mitigation, transparent evidence-based approaches, monitoring, follow-up, legitimate approaches, and future appraisal opportunities are major concerns to be included in best EIA practice.

Keywords

EIA, Process and Practice, Evolution, Developing Countries, Legal Instruments, Implications

1. Introduction

Environmental assessment (EA) is a globally applied process with common features and principles that used in various policy, developmental, and geographical settings, institutionalized under various legal arrangements and informally through development planning and resource management systems. Environmental assessment (EA) and environmental impact assessment (EIA) are critical processes for planning and decision-making in sustainable development. EA assesses the potentials and capacities of natural systems, whereas EIA identifies, predicts, evaluates, and mitigates the impacts of proposed projects. EIA guides environmentally sound decision-making by ensuring that projects are designed, planned, and built in accordance with environmental standards and management objectives. It also includes a follow-up process, monitoring, management, audit, and evaluation requirements, and the ability to learn from past mistakes in order to make future improvements. EA is a participatory ex-ante assessment framework for policies, plans, programs, and projects that was introduced in the United States in 1969 as part of the National Environmental Policy Act. It has grown to include health impact assessment, social impact assessment, sustainability assessment, and other types of impact assessment around the world. In 187 of the 195 recognized, EIA for the project is legally required [1].

Because the implications of anthropogenic actions on environmental transformation have been recognized, more than 190 countries around the world have implemented EIA systems [2] [3]. EIA evaluates the environmental impacts of projects, plans, and programs in a comprehensive and organized manner, thereby improving the information base for decision-making in national planning and sustainable development [4]. The International Study of EA Effectiveness used self-administered country status reports to create an overall profile of the use of EA in decision-making and compiled a portfolio of case studies on the breadth of its contributions to informed decision-making and the realization of environmental benefits. Human activities are causing significant changes in natural cycles and systems, resulting in ecological change. Development activities have cumulative effects that are comparable to biophysical processes. The risks and consequences are serious, threatening ecological breakdown and social conflict. Environmental Assessment (EA) is critical for developing policies and managing the effects of development [5]. Owing to this fact, the purpose of the study is to explore EIA practice and processes worldwide, emphasizing developing countries, and to find the shortcomings and implications of the tool.

Numerous international initiatives have been implemented over the last three

decades to accelerate project development processes, particularly in infrastructure planning. These initiatives are frequently linked to “simplifying” environmental assessments, other environmental assessments (EAs), and related licensing and permitting applications [6] [7] [8]. Previously, these efforts focused on reducing the number of EAs as well as the timeframes and administrative burdens associated with them [9]. According to Fisher B. Thomas et al. 2023, these initiatives have included replacing or abolishing EIA and SEA for specific applications.

At the single project level, the EIA also failed to present a comprehensive integral analysis, resulting in conclusions about the social, socioeconomic, and environmental costs and the selection of the project as the preferred alternative [10]. An EIA, due to its predictive nature, inherent uncertainties, data gaps, subjective components, and implicit and explicit assumptions, makes the study sensitive to potential biases in evaluation [11] [12]. The EIA is frequently chastised for failing to assess the ecological significance of potential changes [13]. The reliance solely on qualitative data, such as species lists, distribution, and habitats, is regarded as a serious shortcoming in environmental assessment [14] [15] [16] [17]. A quantitative approach must take statistical design into account [18] [19] [20]. Several studies thus showed that poor technical appraisal in EIA conduction, monitoring, and follow-up EIA implementation makes it ineffective.

EIA became widely used globally in the 1980s as a result of numerous recommendations made by international organizations, especially the European Union (EU) and the Organization for Economic Cooperation and Development (OECD). The 1990s saw the conclusion of numerous international treaties and protocols containing provisions relating to EIAs, in addition to the 1982 adoption of the United Nations Law of the Sea Treaty. These included the United Nations Framework Convention on Climate Change (1992), the Protocol on Environmental Protection to the Antarctic Treaty (1991), the Biodiversity Treaty (1992), and the Convention on EIA in a Transboundary Context (also known as the Espoo Convention) (1991). The UNEP adopted the “Goals and Principles of EIA” in 1987, promoting the introduction and promotion of EIA systems in member countries and developing international procedures for transboundary impacts.

Developing countries introduced EIA systems in the 1970s and 1980s, despite their several constraints in implementation. The majority of Asian countries have implemented EIAs, which were initially aimed at pollution control and industrial development. EIAs now address environmental, economic, social, and cultural concerns. People are demanding better environmental quality and greater involvement in development decisions as their living standards rise. EIAs are becoming more inclusive, requiring governments to rethink their guiding principles. The main limitation is the timing of assessments within the development project cycle, which makes EIA findings difficult to accept [21]. Based on a quantitative literature review, this study proposes solutions for improving environmental impact assessment (EIA) systems.

2. Material and Methods

Different sources regarding the evolution of the EIA system and process were reviewed, including national and international databases, source books, journals, EIA training manuals, and websites. The national-level policy documents, including the international treaties and conventions, and a comparative review of the documents on the best practices of the EIA were reviewed. An extensive review of Nepal's policy-level documents, namely EIA Guidelines 1993, EPA 1996, 2019 and EPR 1997, 2020, and other sectoral policies and guidelines, was made. The most recent sources of data and information for the study were a thorough review of EIA reports and consultation with concerned stakeholders.

The evolution of EIA practice worldwide is based upon the administrative process; thus, enforcement of policies, acts, and rules was reported with an emphasis on developing countries, highlighting South Asia. In Nepal's case, the EPA and EPR are the main legal instruments. The EIA process was implemented with the endorsement of EPA 1997 in Nepal and amendment in EPA 2019; a detailed process was assessed and gaps and contracts were identified. All collected and reviewed data were further computed, analyzed, and presented in tabular and graphic forms. The best practices of EIA worldwide were synthesized through research and guidelines highlighting the IAIA principles and process. Based on the comparative and analytical review, the study has identified further constraints in the EIA system worldwide and made recommendations for further improvement of the EIA system and process in developing countries through the assessment of detailed studies and EIA practice worldwide.

3. Result

3.1. Understanding the Environmental Impact Assessment

Impact assessment (IA) is a structured process that assesses the effects of proposed actions on people and the environment, allowing for modification or abandonment if necessary. Impact Assessment (IA) types include environmental, social, business, economic, human, and corporate social responsibility (CSR) impact assessments. Common impact assessment methods include expert judgment, quantitative models, cumulative impact assessment, matrices and interaction diagrams, the Rapid Impact Assessment Matrix (RIAM), and the Battelle Environmental Evaluation System. The Agency oversees the process of assessment and engagement, works with other jurisdictions and state authorities, and leads Crown consultations via cooperation, delegation, and substitution. EIA, a multidisciplinary, worldwide accepted environmental management tool, evaluates the impact of individual projects, while Strategic Environmental Assessment (SEA) evaluates the effects of policies and programs. Worldwide Environmental Impact Assessment (EIA) is defined in several ways, as presented in **Table 1** below:

Table 1. Evaluation of environmental definitions.

Definitions	System and Process
“a process by which information about the environmental effects of a project is collected and taken into account by the relevant decision-making body before a decision is given on whether the development should go ahead or not” [22].	Feasibility study and Screening [23], Scoping and baseline studies, impact prediction, mitigation, findings, monitoring
“a science and an art, as it uses a combination of scientific approaches to investigate, evaluate, and predict the environmental impacts while accepting the social-political nature of decision-making and the public participation of stakeholders during the planning and implementation of developmental projects [24].”	The evolution of impact assessment theory has included looking for insights in other related and better-theorized fields, such as political science.
‘the process of identifying, predicting, evaluating, and mitigating the biophysical, social, and other relevant effects of development proposals prior to making major decisions and commitments’ [25].	Principles and best practices of IA, EA, EA, SIA, HIA, SEA, Performance Criteria, follow-up, public participation
“An environmental impact assessment (EIA) is an analytical process that systematically examines the possible environmental consequences of the implementation of projects, programs, and policies” [26]	<i>Strategic environmental assessment (SEA) is an extension of project-level EIA to plan, program, and policy levels.</i>
“Environmental Impact Assessments (EIA) are interdisciplinary analyses of the natural, human health, and socio-cultural effects that are expected to result from public and private sector actions such as development projects” [27].	EIA is currently established in more than 100 countries and is required by many funding agencies.
“An environmental impact assessment is an assessment of the possible positive or negative impact that a proposed project may have on the environment, together consisting of the environmental, social, and economic aspects” [28]	SEA has been identified as a critical tool for moving environmental and social safeguard policies “upstream” in order to ensure compliance with national, regional, and sectoral programs.
Kjørven, O., and Lindhjem, H. (2002) defined EA as a procedure that ensures that the environmental consequences of decisions are considered before they are made.” Individual projects, such as a dam, highway, airport, or factory, can undergo environmental assessment under the “Environmental Impact Assessment” (EIA) Directive”.	SEA, in conjunction with Project EIA, provides a comprehensive view of environmental issues, early alternative elimination, and improved planning and management.
“Environmental Impact Assessment (EIA) is a system for identifying and implementing measures to mitigate the environmental impacts of development projects.” EIA could be a useful tool in achieving sustainable development” [29]	In developing countries, the SEA good practice guidance can be implemented using a set of case-based “rules of thumb.”
EIAs are distinct in that they do not require decision-makers to adhere to a predetermined environmental outcome but rather to account for environmental values in their decisions and to justify those decisions in light of detailed environmental studies and public comments on the potential environmental impacts of the proposal. The goal of these studies is to avoid, minimize, or mitigate any significant negative impact on the public by regularly updating decision-makers and informing the affected public through proposed actions and suggested alternatives [30].	An EO, like a traditional EIA, focuses on baseline conditions, impacts, opportunities, and program modifications. It produces a brief document that is especially useful for developing countries that want to finish quickly while adhering to SEA principles.
The field of ex-post evaluation analyzes EIA and SEA effectiveness, performance, benefits, and factors contributing to their success or failure [31].	EIA follow-up covers a family of components and tools as defined in relation to individual proposals.

3.2. Evolution of EIA

President Richard Nixon of the United States signed the National Environmental Policy Act of 1969 (NEPA) on January 1, 1970. NEPA, which was designed to supplement other laws and programs, employs the Environmental Impact As-

essment (EIA) process to integrate environmental information generation and dissemination, fostering stakeholder collaboration in contentious decisions [32].

With the establishment of the International Association for Impact Assessment in 1981, those interested in the study and application of technology assessment, SIA, and impact assessment now have access to a global forum. In 1986, the World Bank made a public pledge to incorporate EIAs into their project appraisal procedures. The 1987 publication of *Our Common Future* by UNCED provided additional evidence in support of the World Bank's decision.

The first international document to include EIA was the 1974 "Declaration on Environmental Policy" by the OECD. This declaration established the direction for environmental policy in OECD member nations and was the result of follow-up activities following the 1972 United Nations Conference on the Human Environment. According to Article 9 of the declaration, it is imperative that major public or private activities' environmental impacts be evaluated before they are implemented. The OECD "Council Recommendation on Assessment of Projects that May Have Significant Effects on the Environment" (1979), which has eight articles covering recommendations for EIA procedures of member countries, is the oldest declaration and recommendation pertaining to issues relating to environmental impact assessment procedures. An ad hoc committee on environmental assessment was formed in 1983. The Council of Development Assistance (DAC) adopted several recommendations in 1985 and 1986, including "Council Recommendations on Environmental Assessment of Development Assistance Projects and Programmes," "Good Practices for Country Environmental Surveys and Strategies," "Good Practices for Environmental Impact Assessment of Development Projects," "Guidelines for Aid Agencies on Involuntary Displacement and Resettlement in Developing Countries," and "Guidelines for Aid Agencies on Global Environmental Problems in 1991." [33]

In 1992, the OECD issued guidelines for good EIA practices (OECD, 1992). Environmental Impact Assessment (EIA) is widely used as a decision-making tool around the world, but its impact on development decisions is limited. According to the OECD, a stronger foundation for EIA is required through ongoing research, training, and guidance for practitioners [34]. In 1987, UNEP established the goals and principles of EIA for member countries, and in 1988, it provided guidance on basic EIA procedures. In 1980, the World Conservation Strategy emphasized the integration of environmental concerns with development. Environmental Impact Assessment (EIA) became part of World Bank policy in 1987, with Asian Development Bank guidelines following in 1990. Lohani, B. *et al.*'s 1997 ADB report has emphasized its significance. The EU EIA directive was adopted in 1985 and mandated a defined EIA for projects with significant environmental impact, requiring member countries to implement formal EIA systems by 1988. In the "5th Action Plan on the Environment: Towards the Realization of Sustainable Development" (1993), the revised bill, passed in

1995, introduced SEA. This approach aims to implement environmental conservation from policymakers to project implementation, and discussions for its adoption are currently underway. The World Bank is a multilateral development bank that provides loans and financing to developing countries as well as project authorization assistance. Its Environmental Policy and Procedures, which were adopted in 1984, place a premium on environmental considerations in project planning. The World Bank introduced the EA Directive (OD) in 1989, and its operational directives were published in 1999 [35]. The evolution of EIA is presented in **Table 2** below:

Table 2. History of environmental impact assessment.

Year	Country/ Organizations/Agencies	Act/laws
1970	USA (California)	National Environment Policy Act (NEPA) 1969, California Environmental Quality Act (CEQA) of 1971
	USA	US Environmental Policy Act, 1969
1972	UN	UN Stockholm Declaration outlines 29 principles concerning the environment and development
1974	Australia	Environmental Protection (Impact of Proposals) Act
1975	Philippines	Environment Policy
1975	Thailand	Environmental Quality Act
1975	West Germany	Cabinet Resolution, 1975
1976	France	Law on Protection of Nature
1977	Brazil	Introduces EIA legislation
1979	China	Environmental Protection Law
1979	China	Environmental Protection Law, 1979
1981	Israel	Environmental Protection Service 1973
1982	Costa Rica	Introduces EIA legislation
1983	Pakistan	Pakistan Environmental Protection Act (PEPA) 1997
1984	Canada	Federal Environmental Assessment and Review Process Guidelines Order
1984	Japan	Principles for Implementing EIA by Environmental Agency
1984	World Bank	WB begins to promote EIA in its policies
1985	European Union	EU implements the EIA Directive
1986	India	Environment Protection Act
1986	Sri Lanka	National Environmental Act
1988	Tunisia and Sri Lanka	Introduce EIA legislation
1986	Western Australia	Environmental Protection Act 1986
1986	Italy	Introduces EIA legislation
1987	The Netherlands	EIA Policy, 1986, The Netherlands introduces EIA legislation 1987

Continued

1987	Malaysia	Environmental Quality (Prescribed Activity) (EIA) Order
1987	UNEP	<i>Implements rules to introduce and promote EIA</i>
1989	World Bank	The World Bank establishes the EIA Operation Directive (OD)
1991	New Zealand	Resource Management Act
1992	Belize and Estonia	Introduce EIA legislation
1992	UN	UN declares EIAs a “national instrument”
1994	Nicaragua	introduces EIA legislation
1994	Vietnam	Environmental Protection Law
1995	Romania	introduces EIA legislation
1995	Bangladesh	EIA Guideline 1992, EIA legislation in 1995 and EIA rules in 1997
1996	Montenegro and Nepal	introduce EIA legislation
1999	Ecuador and Ireland	<i>Introduce EIA legislation</i>
2002	UNEP	<i>UNEP highlights the need for EIA</i>
2002	Lebanon	<i>Introduces EIA legislation</i>
2006	Panama	<i>Introduces EIA legislation</i>
2009	Honduras	A new regulation was enacted by SINEIA to update and modernize the EIA system.

Asia

Asia, the largest continent, accounts for 9% of the Earth’s surface area and has the world’s longest coastline, stretching for 62,800 kilometers. It is bounded by the Pacific, Indian, and Arctic Oceans and comprises eastern Eurasia. Asia is divided into 49 countries, five of which are transcontinental and partly located in Europe. Russia is classified as a European country. The United Nations Statistics Division (UNSD) divides Asia into regions based on statistical criteria rather than political affiliations. North Asia (Siberia), Central Asia (The stans), West Asia (Middle East and Caucasus), South Asia (Indian subcontinent), East Asia (Far East), and Southeast Asia are among these regions [36].

Despite rapid economic growth, Asia is home to the world’s poorest people. Poverty leads to overexploitation of natural resources, resulting in deforestation, soil erosion, and water pollution. Economic growth that is well-planned can alleviate poverty and improve quality of life, but uncontrolled growth can increase environmental pressure and degradation and jeopardize ecological and economic systems [37]. Sustainable development integrates environmental, economic, and social needs for short-term living improvement as well as the support of future generations. Environmental issues in Asia, as well as the promotion of sustainable development, should take into account regional characteristics. EIA is critical in addressing environmental issues and promoting sustainable develop-

ment, and developing Asian countries recognize its value in development planning [38]. Despite limited implementation, EIA has made significant progress in Asia over the last 25 years. Understanding the institutional factors that influence EIA effectiveness is critical for assessing progress [39].

Environmental Impact Assessment Process in the Asian Context

Environmental Impact Assessment (EIA) is a multi-step process that examines a variety of issues to determine the feasibility of a project. It entails screening, scoping, preparing an initial environmental examination (IEE) report, reviewing, approving, and managing the environment. Post-audit and evaluation are also included in some jurisdictions, usually after the project is operational. From the 1970s to the 2000s, the East and Southeast Asia region's EIA systems and laws were implemented, with most being amended to expand coverage, improve administration, increase public participation, and improve enforcement. This review focuses on East and Southeast Asia, including Cambodia, China, Indonesia, Japan, Korea, Lao PDR, Mongolia, the Philippines, Singapore, Thailand, and Vietnam, with a separate section on the Hong Kong Special Administrative Region. The SEA includes Hong Kong SAR, China, and Vietnam, and the region has a well-established EIA system. Korea has a prior PERS system, Japan has SEA practice at the local government level, and Hong Kong (SAR) has a policy-planning EA system. Early laws and regulations on the environment in the region are: Cambodia Environmental Protection and Natural Resource Management Law 1996 China Environmental Protection Law 1978 Hong Kong Water Pollution Control Ordinance 1980 Indonesia Environmental Management Act No. 4 1982 Japan Cabinet Directive 1972 Korea Environmental Preservation Act 1977 Lao PDR Lao LDR Constitution 1991 Mongolia Environmental Protection Law 1996 Philippines Environmental Policy Presidential Decree No. 1151 1977 Singapore Environmental (Public Health) Act 1969 Thailand Enhancement and Conservation of the National Environmental Quality Act 1992 Vietnam Environmental Protection Law 1994.

Environmental Impact Assessments (EIAs) in China are mandated by the Environmental Protection Law, which has been in effect since 2003. EIAs are required for all projects with negative environmental impacts, regardless of sector, and projects involving foreign capital must meet the same environmental management standards [40].

Europe and Central Asia

Environmental Impact Assessment (EIA) has been mandated in the European Union (EU) since 1985. Screening, scoping, review procedures, public participation, and post-project monitoring are all elements shared by the World Bank and EU systems. Central and East Europe, Turkey, newly independent states (NIS), and South East Europe are the three groups of ECA countries. Only Bulgaria, Romania, and Turkey are currently negotiating harmonization of their environmental legislation with EU directives. Most ECA countries have EA legislation and specific regulations for conducting EIA or SEE, and the majority of ministerial-level authorities have an environment ministry. Laws require intera-

agency coordination, but they do not specify procedures or timelines

The World Bank assessment of the EIA systems of 28 ECA countries identified strengths and weaknesses and suggested recommendations for the World Bank and member countries. Most ECA countries have EA legislation in place, with specific regulations for conducting EIA or SEE. Most ECA countries have a ministerial-level authority with an environment ministry. Interagency coordination is a general term that does not specify procedures or timing [41].

Africa

The integration of EIA concerns in Africa was first considered in 1982 in South Africa, and most African governments began preparing to formalize EIA legislation following the Rio Earth Summit in 1992. To achieve EIA objectives, a high-performing and effective EIA system is required. Some African countries, including Egypt, Ghana, Mauritius, South Africa, Kenya, and Tanzania, have a high-quality EIA system, particularly in terms of regulatory framework. Others, including Ethiopia, Kenya, and Mauritius, have legal frameworks in place for Strategic Environmental Assessment (SEA) [42].

Most African countries have legislation to support project categorization, information collection, and compliance monitoring, but they lag in information transparency and EIA consultant accreditation. Regarding the ratings, Ghana, Namibia, and Zambia scored 50% of the total marks, while Kenya, Mozambique, Tanzania, and Zambia scored above 60%. Kenya, Mozambique, Tanzania, and Zambia scored more than 60% in project categorization, information collection, compliance monitoring, and EIA consultant accreditation, while five of the following other countries did not [43].

Ghana: To oversee environmental affairs, the Ghana Environmental Protection Council (EPC) was established in 1974 and amended in 1976. A committee was formed in 1985 to create an Environmental Impact Assessment (EIA) system, which resulted in the National Environmental Management Plan (NEAP) in 1989 [44].

Mozambique: In 1990, the government of Mozambique established the National Environmental Commission (NEC) to address outdated environmental policies. The Ministry for Coordination of Environmental Affairs (MICOA) was established in 1994 to ensure sustainable development. The National Environmental Management Programme (NEMP) was established in 1996, which resulted in the Framework Environmental Act (FEA) in 1997. The first EIA regulation was enacted in 1998, with the final regulation enacted in 2015 and the Ministry of Land and Environment (MTA) taking over in 2020.

Kenya: EIA and public participation in environmental law are mandated by Kenya's Environmental Management and Coordination Act (EMCA) of 1999. The provisions of the Act are governed by the Environmental (Impact Assessment and Audit) Regulations of 2003.

Ethiopia: Ethiopia's Environmental Policy was established in 1997 with the goal of improving citizens' health and quality of life. The government issued En-

Environmental Impact Assessment Proclamation 299 in 2002, requiring an EIA process for negative environmental impacts. The EPA revised EIA procedures and guidelines in 2003.

Namibia: Under the Petroleum and Minerals Acts, Namibia implemented EIA as part of oil and natural gas projects. The Ministry of Environment and Tourism created the Green Plan in 1992, and the Environmental Management Act (EMA) for EIA regulations was established in 2007. These regulations were published in the Gazette in 2012.

Tanzania: Tanzania's government established the National Environment Management Council in 1983, which resulted in the passage of laws such as the 1997 NEP, NSSD, and NEAP, all of which focused on EIA for sustainable development.

3.3. South Asia Region

Environmental Impact Assessment (EIA) has been adopted as the primary environmental management tool for public and private investments in the South Asia region (SAR). SAR EIA systems differ in nature and objectives despite being based on the United States National Environmental Protection Act. These systems, which are supported by international organizations and development banks, necessitate an assessment of environmental impacts as well as mitigation measures tailored to specific investment projects. EIA evolution in South Asia, a sub region of Asia that includes modern states such as Afghanistan, Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan, and Sri Lanka, was examined. It is dominated by the Indian subcontinent and borders East Asia, Central Asia, West Asia, and Southeast Asia. The EIA process is based in Afghanistan, Bhutan, Bangladesh, India, and the Maldives (Generalized EIA Process, UNEP, 2002). **Afghanistan:** In 2005, the Afghan cabinet approved a draft environmental law that introduced the concept of environmental impact assessment (EIA) and established the Islamic Republic of Afghanistan Environment Law, 2007. EIA regulations endorsed in 2008 define the EIA process as screening, assessment, review, and decision-making. Following international best practices is recommended and results in a Certificate of Compliance. The primary documents are a screening report, an EIS, and a mitigation plan. The National Environmental and Social Impact Assessment Regulations (2017) amend the EIA Regulations (2008) and give the NEPA formal oversight responsibility for the SIA as well as the EIA [45]. EIA stages are relatively common, and the process can be described as a generic process in Afghanistan (Figure 1).

Bangladesh: To strengthen the National Conservation Policy in Bangladesh, the National Environmental Management Action Plan and Environment Conservation Act, 1995 and the Environment Conservation Rules, 1997, were introduced, formalizing the concept of initial environmental examination prior to environmental impact assessment. In Bangladesh, the EIA process is critical for

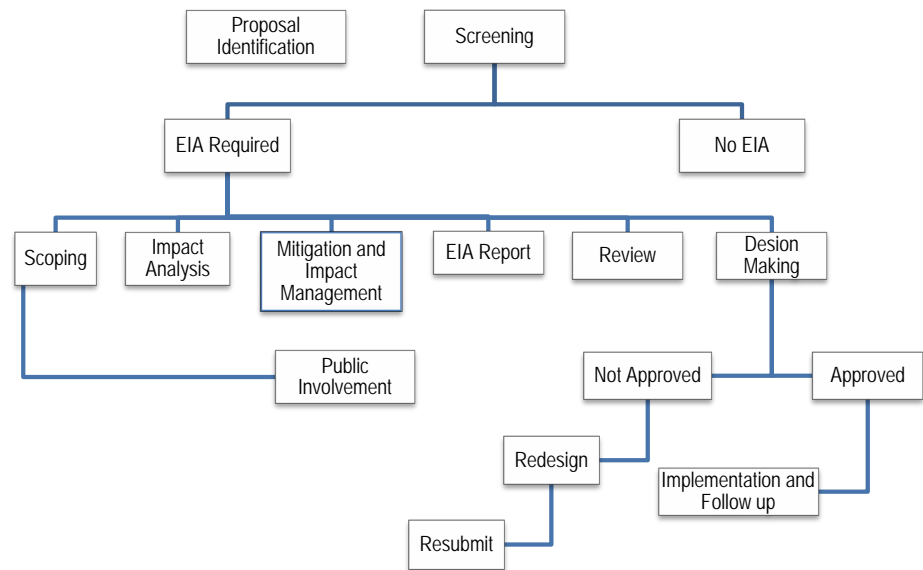


Figure 1. EIA process in Afghanistan [46].

Red category projects that require a Site Clearance Certificate, an EIA report, and an application for an Environmental Clearance Certificate. Following EIA approval, the certificate, which includes the EIA report, Environmental Management Plan, and no objection certificate, is issued. Gas line connections, industrial unit trials, and project operations cannot take place without them [47]. Bangladesh's EIA system follows seven evaluative criteria: legal/administrative support, preliminary assessment, detailed assessment, EIA study review, decision-making, follow-up, and administrative support.

Bhutan: Bhutan enacted the Environmental Assessment Act in 2000 to assess the environmental impact of strategic plans, policies, and projects. The Environmental Assessment Act of 2000 and the Regulation for Environmental Clearance of Projects of 2002 govern this act. In 1987, the Royal Society for the Protection of Nature (RSPN) was founded. The RGOB's overarching environmental act is still in its early stages of development. In 1999, the EA (Environmental Assessment) guidelines were published. The EA Act was passed by the National Assembly in July 2000, and associated regulations are being developed [48]. Under the Environmental Assessment (EA) Act of 2000 and the Regulation for Environmental Clearance of Projects of 2002, Bhutan's development projects are required to conduct an EIA. The EA Act and Regulation establish procedures for assessing environmental effects and developing policies to mitigate negative effects and promote environmental benefits. Environmental clearance is administered and granted by the National Environmental Commission (NEC). Concept, feasibility, design and engineering, implementation, and monitoring and evaluation are the six stages of a development project. EIA is critical at each stage, which includes site selection, screening, preliminary assessment, impact evaluation, baseline data collection, and regulatory agency review. Environmental safeguards, operating conditions, and management are established, and mon-

itoring requirements are identified and developed [49].

India: In India, the Department of Science and Technology investigated river valley projects in 1976-77. With subsequent amendments, the Environment (Protection) Act of 1986 made EIA mandatory for 30 activities. The 1986 Environment (Protection) Act made EIA mandatory for 30 activities. The Environment Protection Act of 1986, which also issued several EIA notifications, is the primary piece of legislation governing EIA in India. The Environmental Impact Assessment (EIA) notification, issued in 1994 and amended in 1997 and 2000, is the primary piece of legislation governing EIA in India. The EIA Notification 2020, which will be published in the Official Gazette, will replace 2006 and eliminate the need for public consultation on certain operations. Accredited ACO, Central Pollution Control Board, Green Building Certificate, Corporate Environment Responsibility, and Eco-Sensitive Area/Zone are all important terms. In India, the EIA process begins with a scoping exercise to determine key impacts. For each possibility, prediction studies are conducted to ensure realistic and affordable solutions. The effectiveness of improvements must be measured, and alternatives are chosen based on their environmental impact, economic benefit, or both. Since the 2006 Amendment, India's EIA process has evolved into four stages: screening, scoping, public hearing, and appraisal. Category A projects require mandatory clearance, whereas Category B projects are screened and classified as B1 or B2 [50].

Nepal: In Nepal, the importance of EIA was emphasized in the seventh five-year plan (1985-1990). Only after the 8th Plan period (1992-97) was the concept of sustainable development integrated into Nepal's development planning process, and clear environmental policies and action plans were initiated and developed. The Eighth Five-Year Plan emphasized the importance of an EIA system. With the establishment of the Environmental Impact Study Project (EISP) in 1982, Nepal's sixth plan (1980-85) recognized the need for an Environmental Impact Assessment (EIA). The seventh plan (1985-1990) established environmental conservation policies, requiring guidelines to incorporate environmental factors into project formulation in order to minimize negative effects on the ecological system [51]. The National Planning Commission developed the National EIA Guidelines in 1993. In 1997, the GoN issued the first Environment Protection Act (EPA) and Environment Protection Rules (EPR), which were replaced by the EPA in 2019 (2076) and the EPR in 2020 (2077) under the new federal governance system [52]. Nepal's EIA process is based on the Environmental Protection Act and Regulations. The EIA process starts with the identification of the proposal as per the screening criteria of the environmental legislation and goes through the process of approving the TOR and scoping document. A detailed EIA study commenced after the approval of SD and ToR from the Ministry of Forests and Environment. Based on the EPR formats and criteria, prepare the EIA for approval and implement the project, followed by the environmental regulation.

National-level EIA policies and Legislation in Nepal: According to Article 30(1) of the Constitution, everyone has the right to live in a healthy and clean environment. Similarly, Article 30(2) states that victims of environmental pollution and degradation have the legal right to be compensated by the pollutant. It has made the right to live in a clean and healthy environment a fundamental right for all people (Article 30(1)). The victim has the legal right to seek compensation for any injury caused by environmental pollution or degradation (Article 30(2)).

It also declares that these provisions shall not be deemed to preclude the making of necessary legal provisions for a proper balance between the environment and development in the nation's development works. According to the constitution, it is a matter of state policies related to developing balanced, environmentally friendly, quality, and sustainable physical infrastructure while giving priority to regions lagging behind in terms of development (Article SI(f-2)) and enhancing local public participation in the development process (Article SI(f-3)).

Nepal Environmental Policy and Action Plan (NEPAP) was formulated in 1993 as continuous effort to incorporate environment concerns into the Nepal's development processes. NEPAP was prepared in response to the growing global awareness about the importance of maintaining a balance between economic development and environmental conservation. NEPAP emphasized the need for mitigating adverse environmental impacts to address urban and industrial development, air and water pollution and infrastructure development. The National Environmental Policy endorsed in 2019 aims to efficiently and sustainably manage natural resources, balance development and environmental conservation to achieve sustainable development, protect national heritage, reduce the negative effects of development projects and human actions, and integrate environmental concerns with development plans through appropriate institutions.

Environment Protection Act 2019 has been complemented by Rule 3 of the Environmental Protection Rules 2020 to carry out the Brief Environmental Study of the projects mentioned in Schedule 1, an Initial Environmental Examination of the projects mentioned in Schedule 2 and an Environmental Impact Assessment of the projects mentioned in Schedule 3 (**Table 3**). To amend and consolidate the Environmental Law Preamble of Nepal, the date of authentication of the Environment Protection Act, 2019 (2076) was on 2076.06.24 (October 11, 2019), Act No. 9 of 2019 (2076) (**Table 3**). The objectives of amending and consolidating existing environmental protection legislation (EPA and EPR 1997) are to protect a clean and healthy environment, compensate victims for any damage caused by environmental pollution or degradation, maintain a proper balance between environment and development, and mitigate adverse environmental impacts on the environment and biodiversity.

Pakistan: EIA was established as a legal process in Pakistan in 1983 under the

Table 3. Highlights of EPA 2019 and EPR 2020 as an EIA process in Nepal.

Section	Highlights of Environmental Protection Act (EPA 2076) 2019
<i>Section 3 (Chapter 2)</i>	Prepare Environmental Study Report
<i>Sub Section 3.1</i>	A proponent must prepare an environmental study report for a proposal as prescribed. The environmental study report prepared in accordance with subsection (1) must be submitted for approval to the following body in accordance with the prescribed process: (a) To the prescribed body in the case of a brief environmental study report or preliminary environmental examination of a development project of national priority, a project to be implemented upon Investment Board approval, a project of national pride, a development or construction work or project falling under the jurisdiction of the Federation in accordance with the prevailing, a project that necessitates construction work in more than one province, or a project specified by the Government of Nepal, and to the Ministry in the case of an environmental impact assessment,
<i>Sub Section 3.2</i>	(b) In the case of a proposal relating to development, construction work, or a project pertaining to a matter falling under the jurisdiction of the Provincial Government, to the body prescribed by the relevant Provincial law, (c) In the case of a brief environmental study report or initial environmental examination report on a proposal relating to development, construction work, or project pertaining to a matter falling under the jurisdiction of the local level, to the body designated by the concerned local law, and in the case of an environmental impact assessment report, to such body of the provincial government as prescribed by the provincial government.
<i>Sub Section 3.3</i>	Notwithstanding anything in sub-sections (1) or (2), nothing prevents the approval of environmental study reports submitted for approval at the time of the Act's commencement in accordance with the legal provisions in effect at the time of submission.
<i>Sub Section 3.4</i>	Notwithstanding anything else in this section, an environmental study report is not required for reconstructing a heritage considered an ancient monument in accordance with the law relating to ancient monuments.
<i>Sub Section 3.5</i>	In preparing an environmental study report, the proponent must hold a public hearing on the proposal as prescribed.
<i>Section 4</i>	Provision for detailed analysis of the alternatives of the proposal
<i>Sub Section 4.1</i>	The proponent shall conduct a detailed analysis of the potential adverse environmental effects of implementing such a proposal, as well as various alternatives for mitigating such effects, and recommend the alternative that is appropriate for implementing the proposal, as well as the grounds and reasons why that alternative is implementable.
<i>Sub Section 4.2</i>	In preparing the environmental study report required by subsection (1), the proponent shall include, among other things, the potential short-term, mid-term, and long-term environmental effects of project implementation, as well as the method and process to be used to mitigate those effects.
<i>Section 5</i>	<i>Scoping and work schedule</i>
<i>Sub Section 5.1</i>	<i>Prior to preparing the environmental study report of any proposal pursuant to this Act, the concerned body must approve the scope of such a proposal, in the case of a brief environmental study and initial environmental examination, and the scope and work schedule, in the case of an environmental impact assessment.</i>
<i>Sub Section 5.2</i>	<i>Other provisions concerning the scoping and preparation of the work schedule referred to in subsection (1), as well as its approval, shall be as prescribed.</i>
<i>Section 6</i>	<i>Standards and quality to be maintained:</i>
<i>Sub Section 6.1</i>	In preparing an environmental study report in accordance with this Act, the proponent shall ensure that the standards and quality determined by the Government of Nepal are maintained.

Continued

<i>Sub Section 6.2</i>	If the report is submitted in violation of the standards or qualifications referred to in sub-section (1) or without complying with such standards, the consultant who prepared the report shall be barred from preparing an environmental study report for a period of not more than five years.
<i>Section 7</i>	<i>Environmental study report to be approved</i>
<i>Sub Section 7.1</i>	<i>If an environmental study report prepared in the context of the implementation of any proposal pursuant to Section 3 is received, the concerned body shall conduct the necessary investigation into the report.</i>
<i>Sub Section 7.2</i>	<i>The concerned body may form a committee comprised of a representative of that body, representatives of the relevant bodies concerned with the proposal, and, if necessary, a subject expert to investigate the environmental study report received pursuant to subsection (1) and provide advice and suggestions.</i>
<i>Sub Section 7.3</i>	<i>If, after reviewing the environmental study report received pursuant to sub-section (1), it appears that additional environmental study is required in relation to such a proposal, the concerned body shall direct the proponent to conduct, or cause to be conducted, the preliminary environmental examination in the case of the brief environmental study or the environmental impact assessment in the case of the brief environmental study.</i>
<i>Sub Section 7.4</i>	<i>In accordance with the order issued under subsection (3), the proponent shall conduct additional research and submit a report to the relevant body.</i>
<i>Sub Section 7.5</i>	<i>If, after conducting an investigation in accordance with this Section, it is determined that the implementation of such a proposal will not have a significant adverse impact on the environment, the concerned body shall approve such an environmental study report, after specifying the terms and conditions to be observed by the proponent, as required.</i>
<i>Sub Section 7.6</i>	All other provisions relating to the approval of the environmental study report must be followed.
<i>Section 8</i>	Proposal not to be implemented
<i>Sub Section 8.1</i>	No one shall implement or cause to be implemented any proposal unless the environmental study report has been approved in accordance with this Act.
<i>Section 9</i>	Strategic environmental assessment:
<i>Sub Section 9.1</i>	Prior to the implementation of any policy, program, or project specified by the Government of Nepal through a notification in the Nepal Gazette, a strategic environmental analysis of such policy, program, or project shall be carried out.
<i>Sub Section 9.2</i>	Other provisions concerning strategic environmental analysis shall be as prescribed.
<i>Section 10</i>	Environmental Management Plan
<i>Sub Section 10.1</i>	Prior to the implementation of a proposal, the proponent must prepare an environmental management plan in accordance with the requirements.
<i>Sub Section 10.2</i>	In preparing the environmental management plan required by subsection (1), the proponent must specify which measures to mitigate environmental adverse impacts will be implemented during the construction of the project and which will be implemented after the project's completion or during its implementation.
<i>Sub Section 10.3</i>	If it appears that the measures to mitigate environmental adverse impacts outlined by the proponent in the environmental management plan outlined in subsection (2) are ineffective, the concerned body may direct the adoption of other effective measures, and the concerned proponent shall comply.
<i>Sub Section 10.4</i>	The proponent shall develop a clear action plan for the implementation of the environmental management plan prepared in accordance with sub-section (1), implement it, and submit a progress report to the concerned body every six months after the start of project implementation.
<i>Sub Section 10.5</i>	<i>Priority shall be given to the operation of the program through the local community affected by the proposal's implementation when adopting measures to mitigate environmental adverse impacts during the implementation of the environmental management plan referred to in sub-section (1).</i>

Continued

<i>Section 11</i>	<i>Supplementary environmental impact assessment to be made</i>
<i>Sub Section 11.1</i>	<i>If a revision in the physical infrastructure, design, or form, transfer, or alter the structure of any project for which the environmental impact assessment report has been approved pursuant to Section 7, add the forest area, or increase the capacity of the project is required, the proponent shall conduct a supplementary environmental impact assessment to determine whether the operation of such a project is feasible.</i>
<i>Sub Section 11.2</i>	<i>In order to conduct the supplementary environmental impact assessment required by subsection (1), the proponent must submit an application to the concerned body, along with an analysis of the reasons for making changes in various components of the project and potential adverse environmental impacts from such changes, a comparative table based on environmental indicators, and other necessary justifications. Except where the concerned body has directed the proponent to submit a supplementary environmental impact assessment report, the proponent is not required to file an application.</i>
<i>Sub Section 11.3</i>	<i>If the content is found to be reasonable after conducting an investigation into the application received under subsection (2), the concerned body may grant permission for a supplementary environmental impact assessment study as prescribed.</i>
<i>Sub Section 11.4</i>	<i>All other provisions relating to the supplementary environmental impact assessment must be followed.</i>
<i>Section 35</i>	<i>Chapter 6. Fine and Compensation: Fine</i>
<i>Sub Section 35.1</i>	<i>If any person commits the following act, the relevant body may punish that person as follows: (a) A fine of not more than five hundred thousand rupees if, in the case of a proposal for which the brief environmental study report must be approved, the proposal is executed without having it approved or in a manner inconsistent with the approved report. (b) A fine of not more than one million rupees if any proposal is carried out without the approval of the initial environmental examination or in a manner inconsistent with the approved report. (c) A fine of not more than five million rupees if, in the case of a proposal for which an environmental impact assessment report must be approved, the proposal is carried out without having it approved or in a manner inconsistent with the approved report.</i>
<i>Sub Section 35.2</i>	<i>The concerned body can order an immediate stop to an act, approve an environmental study report if not approved, or improve the act if inconsistent with the report, and may impose a three-fold fine if not complied with.</i>
<i>Sub Section 35.3</i>	<i>If an individual acts inconsistently with the Act or its rules, guidelines, or norms, the concerned body may restrict their actions and punish them with a fine of up to three hundred thousand rupees, or impose a three-fold fine if not complied with.</i>
<i>Sub Section 35.4</i>	<i>If the act referred to in the order issued under subsections (2) or (3) is not performed, the act shall be restricted, and the concerned body shall send a request, accompanied by a recommendation, to take the necessary action to blacklist such a person or body.</i>
<i>Sub Section 35.5</i>	<i>If such a person or body is recommended under sub-section (4), the Department shall, if the content is reasonable, blacklist such a person or body for a period of one to five years</i>
<i>Sub Section 35.6</i>	<i>Notwithstanding anything in subsections (4) and (5), the Department shall conduct the necessary investigation into noncompliance with the order issued by it and take the action specified in subsection (5).</i>
<i>Sub Section 35.7</i>	<i>If a body is blacklisted under subsection (5), that person or body may not submit any proposal in that body's name or any name associated with that person or body for the duration of the blacklisting.</i>
<i>Sub Section 35.8</i>	<i>Before imposing the fine referred to in this section, the person, body, or project to be blacklisted must be given a reasonable opportunity.</i>
<i>Section 38</i>	<i>Environment protection plan to be developed: (1) The Government of Nepal may develop and implement an environment protection plan with the goal of preserving and promoting a clean and healthy environment.</i>
<i>Section 39</i>	<i>Monitoring and inspections to be performed.</i>

Continued

Section 39.1	<i>The Ministry or Department may conduct monitoring and inspections to determine whether or not this Act or the rules, guidelines, procedures, or standards established by it have been implemented.</i>
Section 39.2	<i>In order to protect and conserve the environment within its jurisdiction, the provincial government or local level may conduct monitoring and inspection to determine whether or not this Act or the rules, guidelines, procedures, or standards framed under this Act have been implemented.</i>
Section 39.3	<i>Other provisions relating to monitoring and inspection to be carried out in accordance with subparagraphs (1) or (2) must be as prescribed.</i>
Section 45	<i>Power to frame guidelines, procedures, and standards: Without prejudice to this Act and the rules framed under this Act, the Government of Nepal may frame and enforce necessary guidelines, procedures, and standards.</i>
Rule	<i>Highlights of the Environmental Protection Regulations (EPR) 2020</i>
Rule 3	<i>BES, IEE and EIA reports are to be prepared as per Schedules 1 and 2 respectively.</i>
Rule 4	<i>The proponent should prepare and submit a scoping report to the concerned agency or to the MoE for approval and, at the same time, publish an advance public notice which solicits the opinions and concerns of stakeholders over a 7-day period.</i>
Rule 5	<i>For BES as per schedule 6, for IEE as per Schedule 7 the proponent should prepare and submit the ToR to the concerned agency for approval; for an EIA report as per Schedule 8, the proponent should prepare and submit the ToR to the MoE for approval.</i>
Rule 6	<i>Conduction of Public Hearing: As per EPA Section 3, the proponent should conduct a public hearing at the project implantation area and collect the opinions and suggestions of the public.</i>
Rule 7	<i>Preparation of Environmental Study Reports</i>
Sub Rule 7.1	<i>The proponent should prepare a BES/IEE/EIA study report in accordance with Rule 4 Scoping Document, ToR as per Rule 5, and opinions and suggestions received from the public as per Rule 6.</i>
Sub Rule 7.5	<i>The BES report should be prepared as per the format given in Schedule 10 of the EPR, IEE as per Schedule 11, and EIA as per Schedule 12.</i>
Sub Rule 7.6	<i>The proponent should prepare an environmental study report with the involvement of experts as per Schedule 13.</i>
Sub Rule 7.7	<i>Environmental study reports, SD, and TOR prepared as per this regulation should be prepared in Nepali.</i>
Sub Rule 7.8	<i>In the case of the foreign investment in the project environmental study reports, SD and TOR prepared as per this regulation can be prepared both in English and Nepali.</i>
Rule 8	<i>Submission of an environmental study report for approval</i>
Sub-Rule 8.1	<i>The proponent should submit the BES, IEE, and EIA reports to the concerned departments or ministries and the EIA reports to the MOFE for approval in accordance with Rule 3 Sub rule 2 of the Act.</i>
Sub-Rule 8.8	<i>The environmental study report should be prepared and submitted to the concerned local governments and sectoral offices as per Schedule 14.</i>
Sub-Rule 8.11	<i>The proponent should submit BES, IEE, and EIA reports for approval within two years from the date of approval of the ToR and SD study reports.</i>
Rule 9	<i>Approval of Environmental Study Reports</i>
Sub Rule 9.1	<i>The concerned agency shall evaluate or review submitted environmental study reports as per Rule 8.</i>
Sub Rule 9.2	<i>The concerned body shall review the environmental study reports subject to sub-section (2) of Rule 7 of the Act.</i>

Continued

<i>Sub Rule 9.6</i>	<i>In the case of EIA reports received under Rule 8, the concerned body shall publish a seven-day public notice in any national daily newspaper for the collection of opinions. By downloading such reports from the website of the concerned body, the site is open to the public.</i>
<i>Sub Rule 9.7</i>	<i>Subject to sub-rule (6), on publication of the list, any person or institution shall send their complaints to the concerned authority within the stipulated time.</i>
<i>Sub Rule 9.8</i>	<i>Including the opinion received after completing the process of the environmental study reports mentioned in this rule within the framework of environmental studies, the response of such a proposal to the environment will be examined. In cases where a significant adverse environmental impact will not occur, the concerned body shall approve the study reports within 15 days for BES and IEE and 35 days for EIA.</i>
<i>Rule 11</i>	<i>General Procedures for Supplementary Environmental Impact Assessment</i>
<i>Sub Rule 11.1</i>	<i>Rule 11 of this Sub-Rule (3) is subject to the provisions of the supplementary environmental impact assessment. The concerned body can grant permission for the SEIA study.</i>
<i>Rule 12</i>	<i>Provision for Revised BES and IEE reports: After approval of BES and IEE study reports, relevant bodies shall approve the revision of study reports if the report has undergone changes in physical infrastructure, design, increase in capacity, change in form or structure, reduced capacity of the project, or increased or reduced numbers of trees to be felled.</i>
<i>Rule 13</i>	<i>Implementation of the Proposal: (1) Environmental study of any proposal by the proponent, If the proposal is accepted, it shall be implemented within three years of its approval.</i>
<i>Rule 45</i>	<i>Environmental Protection Plan</i>
<i>Sub Rule 45.1</i>	<i>The proponent shall monitor the project activities and their impacts during the construction and operation of the project, prepare a monitoring report, and submit it to the concerned agency.</i>

Environmental Protection Ordinance (PEPO), followed by the National Environmental Protection Act in 1997 and the National Environmental Policy in 2005. It is carried out for a variety of development projects, and its effectiveness can be enhanced through stakeholder involvement, transparency, resource allocation, and post-monitoring [53].

The Pakistan Environmental Protection Agency oversees and monitors EIA, divided into three schedules under the first-step screening process: initial environmental examination (IEE), detailed EIA study, and additional steps for projects requiring EIA. The second step is gathering baseline data on environmental parameters such as air, noise, water, landscape, and visual quality, as well as involving the scientific community and policymakers in the search for alternative solutions. The third step involves the collection of baseline data on environmental parameters, predicting impacts on new projects using historical data and expert judgments, and using EA methods such as checklists, matrices, networks, and mapping techniques. The fourth step assessed the project impacts and proposed mitigation measures to reduce or eliminate these negative effects. The fifth step prepared the Environmental Monitoring Plan (EMP) as a comprehensive framework outlining institutional arrangements, implementation responsibilities, monitoring requirements, schedules, training requirements, and budgets for EIA throughout the project life cycle. A sixth-step draft Environmental Impact Statement (EIS) is a detailed, easy-to-understand document that

covers all important aspects of a study and is submitted for review by the appropriate authority. The seventh step ensures public consultation in project preparation, the acquisition of local knowledge, and the resolution of conflicts. It should be inclusive, transparent, fair, and credible, providing critical information and feedback from stakeholders. Finally, based on public consultation and feedback, the project may be revised and resubmitted for review, with potential approval for implementation if relevant concerns are addressed [54].

Maldives: EIA is required by law in the Maldives through the Environment Protection and Preservation Act (EPPA) (4/93), which was enacted in 1993. EIA is required under Article 5(1) of the Act for all development projects that may have a significant environmental impact (EPPA 1993). The EPPA of the Maldives requires an EIA for all major environmental impacts in development projects. Guidelines were created in 1994 and updated in 2004. The first EIA regulations were developed in 2007, and they were revised and republished in 2012 (Figure 2). The Environmental Protection Agency (EPA) is in charge of enforcing these regulations [55]. In the late 1980s, UNEP worked with the Maldives government to investigate sea-level rise responses, which resulted in the National Environmental Action Plan and the recommendation of an Environmental Impact Assessment system.

Sri Lanka: The Central Environmental Authority (CEA) was established in Sri Lanka by the National Environmental Act No. 47 of 1980 for environmental

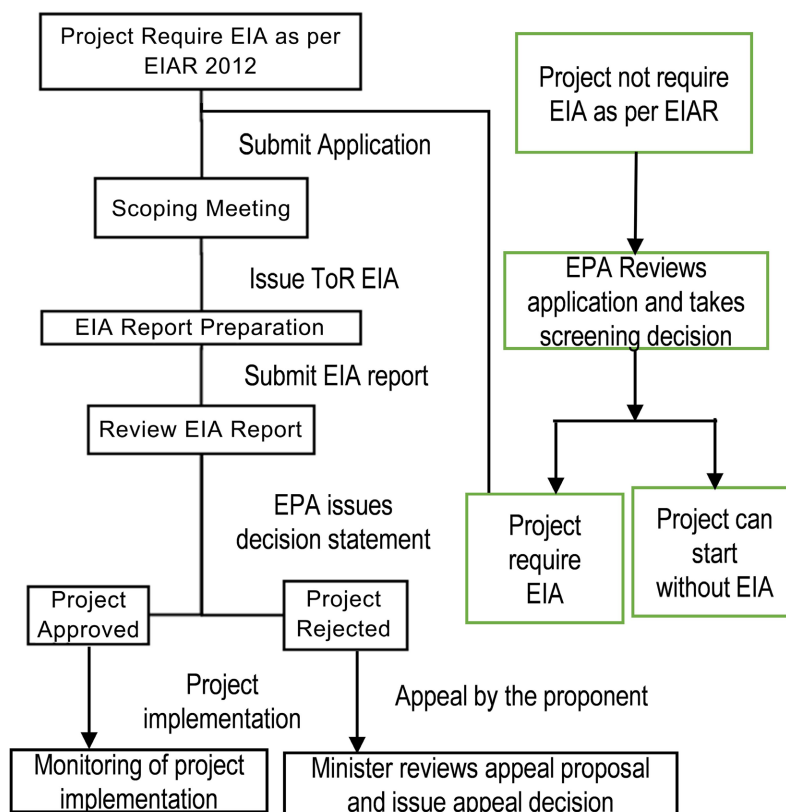


Figure 2. EIA process as per EIA regulation 2012 of Maldives.

management. The Coast Conservation Act No. 57 of 1981 established environmental assessment in coastal areas. EIA became a legal requirement in 1988 and was made mandatory in 1993. In 1999 and 2000, the NEA's EIA requirements were modified. Sri Lanka prioritizes economic development in order to raise living standards, with projects funded by both domestic and foreign funds. Private-sector projects are expanding. To achieve sustainable development, the National Environment Act established the Environmental Impact Assessment (EIA). EIA forecasts potential environmental impacts and recommends measures to mitigate negative effects while enhancing positive ones. For large-scale development projects or those in environmentally sensitive areas, the Environmental Impact Assessment (EIA) process is required. It is carried out by Project Approving Agencies (PAA), which are led by the Central Environmental Authority (CEA). Projects must submit either an Initial Environmental Examination (IEE) report or an Environmental Impact Assessment (EIA) report. For 30 days, EIA reports are available for public inspection and comment. Early in the project cycle, project proponents must submit preliminary information to the CEA. Screening, scoping, preparation, review, approval, and post-approval monitoring are the six major steps in the EIA process [56].

3.4. Evaluation of EIA Methodologies

Environmental impact assessment (EIA) and information technology advancements have increased the number of tools available, including GIS and expert systems. These systems employ checklists, matrices, networks, and impact rules to assist practitioners in screening, scoping, developing terms of reference, and conducting preliminary assessments. Although expert judgment is frequently used in identifying, measuring, and assessing impacts, many EIA applications are flawed due to the construction of quantitative representations of ordinal data. On the basis of impact identification strength, the following methodologies are used: (1) Adhoc methods (2) Matrices methods (3) Network methods (4) Overlay methods (5) Factor analysis is used to create an environmental index. (6) A cost-benefit analysis is performed (Table 4).

3.5. Assessment of Impacts

The assessment quantifies the cumulative environmental effect by evaluating the degree of change in measurable parameters as well as the spatial and temporal scope of these changes. The assessment, however, does not characterize or assess the cumulative environmental effects prior to mitigation. After mitigation, the project impact is defined as an impact that cannot be fully reserved. These attributes are included in the Table 5 [58]. The impact significance assessment is carried out in accordance with national and international quality standards, or, in the absence of such standards, the judgments underlying the attribution of significance are described.

Table 4. Evaluation of EIA methodologies.

(1) Adhoc methods	(2) Matrices methods	(3) Network methods	(4) Overlay methods	(5) Cost/benefit analysis
<i>Ad hoc methods assess potential impacts by listing potential environmental parameters such as flora and fauna. These methods entail specialists identifying impacts in their area, taking into account long-term, short-term, reversible, and irreversible natures. Types of ad hoc methodology include the opinion poll, expert opinion, and Delphi methods.</i>	<i>A simple interaction matrix developed by Leopold et al. in 1971 lists 100 project actions and 88 environmental characteristics and conditions, providing a framework for understanding potential environmental impacts [57]. The Checklist Methods used: Simple, Descriptive, Scaling and Scaling Weighting Checklist</i>	<i>The method used the matrix approach to identify primary and secondary impacts, resulting in the formation of an impact tree. This diagram, also known as a reference or sequence diagram, aids in the identification of cause-and-effect relationships and provides a visual representation of these relationships.</i>	<i>Overlay methods involve the creation of transparent maps to represent environmental characteristics, the collection of data on various variables, and the overlaid creation of a composite map. This map depicts the physical, social, ecological, and land-use characteristics of the area. The validity of the assessment is determined by the parameters chosen and the project alternatives.</i>	<i>Cost-benefit analysis is a systematic method for evaluating a project's costs and benefits, estimating the strengths and weaknesses of alternatives, and determining the best approach for achieving benefits while preserving savings. It is a standard tool for evaluating the economic analysis of development projects.</i>

Table 5. Impact assessment and evaluation of residual and cumulative environmental effects.

Change Environmental Effects	Projects, Activities and Actions	Proposed Mitigation/Compensation Measures	Follow-up or Monitoring
Direction	Duration	Reversibility	Prediction Confidence
P Positive A Adverse	ST Short-term MT Medium-term LT Long-term P Permanent	R Reversible I Irreversible	Confidence in the significance prediction, based on scientific information and statistical analysis, identified technical boundaries, professional judgment and known effectiveness of mitigation: L Low level of confidence M Moderate level of confidence H High level of confidence.
Magnitude	Frequency	Ecological/Socioeconomic Context	Likelihood
L Low M Moderate H High	O Occurs once. S Occurs sporadically at irregular Intervals R Occurs on a regular basis and at regular intervals C Continuous	U Undisturbed: Area relatively or not adversely affected by human activity D Developed: Area has been substantially previously disturbed by human development or still present N/A Not Applicable	If a significant environmental effect is predicted, the likelihood of that significant environmental effect occurring is determined, based on professional judgment: L Low probability of occurrence. M Medium probability of occurrence H High probability of occurrence
Geographic Extent		Significance	Other Projects, Activities, or Actions
S Site-specific L Local R Regional		S Significant N Not Significant	List of specific projects or activities that would contribute to the cumulative environmental effects.

The significance of project-related environmental effects is determined using a number of criteria, including direction, magnitude, geographic extent, duration,

frequency, reversibility, ecological and socioeconomic context, legislation, regulatory standards, and acceptability thresholds. These determinations guide of country's decision-making, ensuring trust in scientific data, technical boundaries, professional judgment, and mitigation effectiveness [59].

3.6. Best EIA Practice

Because of ongoing evaluations of its effectiveness, Environmental Impact Assessment (EIA) is constantly evolving. The principles for EIA follow-up, which include monitoring and evaluating the impacts of environmental performance management projects or plans, make EIA a catch-all term for all types of impact assessment, including strategic environmental assessment (SEA) at the plan, program, and policy levels. Screening a proposal, scoping to identify important issues and impacts, examining alternatives, impact analysis to predict environmental and social effects, mitigation and impact management to minimize or offset predicted adverse effects, and evaluating the significance of residual impacts to determine their acceptability are all part of the Environmental Impact Assessment (EIA) process. The process entails creating an environmental impact statement (EIS) or report and reviewing it to ensure that it accurately reflects the proposed impacts, mitigation measures, and public and affected community concerns. Approval or rejection of the proposal, monitoring its effectiveness, strengthening future EIA applications, and conducting environmental audits to optimize environmental management are all part of the decision-making process. The IAIA follow-up principles document outlines 17 best practices for EIA follow-up, including six guiding and 11 operating principles. They were previously organized under the headings Why?, Who?, What?, and How? [60].

4. Discussion

EIA is required by law in all countries, but the quality and scope vary. The highest-scoring countries are Estonia, Hungary, and Lithuania, while China outperforms all regions except Europe due to its early implementation and established system [61]. The effectiveness of China's Environmental Impact Assessment (EIA) reforms since 2015, with a focus on legislation, administration, and process, showed stricter regulations, streamlined EIA processes, and harsher penalties. However, the Environmental Protection Law's hierarchical position and coordination challenges persist [62].

The South Asian Subcontinent, which is home to one-fifth of the world's population, is facing environmental challenges as a result of industrialization and urbanization. South Asian governments have adopted Environmental Impact Assessments (EIA) as a project planning tool for environmental protection and sustainable development to address these issues. South Asian EIA systems adhere to internationally accepted procedures, such as project screening, scoping, and the development of Terms of Reference (TOR). It includes impact prediction, mitigation measures, monitoring plans, and environmental management

plans. All EIA systems require public participation, and approval of scoping and TOR may result in site clearance certificates and environmental clearance certificates. However, EIA implementation is frequently lacking in nationally funded projects, and monitoring in South Asian countries is inadequate [63].

Environmental Impact Assessments (EIAs) are widely used to evaluate and mitigate environmental impacts in the South Asian Region (SAR). While they may not improve environmental performance significantly, they can increase public participation and environmental awareness. However, EIAs frequently prioritize meeting legal requirements over concrete actions, resulting in ineffective public participation and generic recommendations. SAR EIA tools manage the environmental impacts of specific projects, acting as a replacement for environmental regulations and land-use planning. They aim to avoid and mitigate negative environmental effects due to a lack of legally established standards [64]. The EIA practice in Nepal has several shortcomings, including being advertised by the executive agency, hiring consultants without norms, hiring experts at a minimum wage, involvement of untrained experts, completing studies in less than a week, submitting superficial reports, adopting poor methodology and criteria, and not taking raised issues seriously. After the EIA study, the agency conducts a meeting and solicits comments, and the consultant's report is approved to fulfill the legal requirement. After approval of the report, there is no mechanism for monitoring and follow-up. Overall EIA system and process is only based upon the fulfillment requirement of administrative process for project implementation.

The findings of this study conclude that the region has administrative control over the legislation during the EIA process, with an overwhelming approach to offset, reduce, and compensate for negative environmental impacts during construction and operation. The focus is more on the implementation of management plans that have specific investments, whereas monitoring and follow-up are poor. Despite the fact that worldwide implementation of the EIA system and process has been adopted as a reference, the best practice in EIA is in processing.

The International Association of Environmental Assessments (IAIA) promotes the development and dissemination of concepts and practices related to environmental impact assessment (EIA). The Principles of EIA Best Practice are intended to provide guidance to IAIA members and others involved in the application of EIA processes, with an emphasis on the process as a whole and its application to all levels and types of proposals.

An EA best process is typically divided into seven stages, each with its own set of methods and steps [65]. The first stage, Proposal, is critical to the nature and development of the project. EA should begin early in the project's life cycle, with some processes offering terms of reference consultation with regulators [66]. Early communication between proponents, EA agencies, and stakeholders is critical for EA processes to be efficient and successful. Thus, EIA can be improved by incorporating best practices from previous cases, taking a holistic ap-

proach, involving diverse stakeholders, using credible data, encouraging participatory and scientific methods, ensuring accountability, and evaluating results with proper monitoring, backup, and follow-up [67] [68].

The second step, Screening, determines whether a proposal requires EA and the level of detail required, as well as whether public hearings or internal or agency-based reviews are required. Environmental Assessment (EA) legislation applies to a wide range of activities, including routine activities with predictable environmental consequences. To avoid larger impact issues, projects in some jurisdictions may be studied quickly at the screening stage. This helps determine whether a project requires a thorough or cursory review. Failure to recommend projects with significant impacts undermines public trust and prevents mitigation measures from being implemented. A well-structured screening process ensures adequate assessment rigor while avoiding unnecessary delays and costs. Effective screening requires clearly defined criteria and consistent procedures, such as legal requirements, scale, project nature, and the nature of the proponents [69] [70] [71]. Jurisdictions can pre-determine which projects need an Environmental Assessment (EA) or conduct preliminary studies to determine potential consequences and the need for an EA [72] [73].

Scoping is the third process of determining the scope of an environmental assessment (EA), focusing on key issues and significant impacts, and establishing the terms of reference while keeping time and resource constraints in mind. Authorities can define the scope of an environmental assessment (EA), with some offering flexible advice. The scoping stage outlines the assessment's key considerations, such as the type of project, potential impacts, baseline data availability, ecological indicators, and mitigation options. It also aids in the identification of information gaps and studies, as well as the proposed assessment methodology and timeframe [74]. The public's involvement is critical for defining the scope of an environmental assessment (EA), identifying significant impacts, and building relationships [75]. Early involvement fosters trust and prevents unnecessary delays by addressing key concerns before significant resources are spent on the project [76] [77].

Conducting the environmental assessment (EA) is a critical fourth stage in assessing a project's environmental impacts. It entails advanced data collection, impact prediction, impact evaluation, and mitigation measures [78]. The EA typically focuses on negative consequences, but it may also consider positive ones. Agencies, experts, independent bodies, monitoring, or data groups may provide input and recommendations during the review process. EA requires baseline data, which includes biophysical, economic, and social/cultural conditions [79]. According to Lawrence (2007), the value-driven significance of predicted impacts should be transparent, technically supported, and focused on key issues and objectives. Defining ecological components and acceptable thresholds aids in determining the significance of an impact. Understanding and accounting for a location's systemic qualities requires system-based or ecological infor-

mation.

Review following the completion of an assessment fifth stage, the EA report is presented to the EA agency for review, recommendation, and decision-making. The agency frequently defines the content, with some jurisdictions requiring pre-consultation or formal terms of reference. The information in the report is reviewed by the government or independent bodies, ensuring an independent and transparent process [80]. Public participation is encouraged, and stakeholder feedback is taken into account. The report is evaluated for completeness, accuracy, adherence to terms of reference, and compliance with regulated requirements during the review [81].

In practice, the sixth stage of decision-making can be complicated due to a variety of factors and criteria. Morrison-Saunders (2011) evaluated the fact that the EA processes frequently yield recommendations, with formal decision-making power typically concentrated at the political level. These suggestions can range from acceptance to rejection. The context for reviewing a proposal is determined by the jurisdiction, nature of the activity, and screening results. A review of low-public-concern activities may be conducted within an internal administrative setting, whereas a review of significant impacts may involve a public hearing or other setting. Environmental Assessment (EA) is critical for achieving environmental management and planning objectives because it provides usable data, clear management objectives, and assessment criteria, as mentioned by Sadler (1996), Heinma & Pöder (2010), and Joseph *et al.* (2015). Decision-makers must interpret data, set conditions, and seek commitments from developers, all while being backed up by the legislation extensively mentioned by Gibson *et al.* (2015) and Morrison-Saunders (2011). Political motivations can also have an impact on the outcome.

Follow-up, monitoring, and compliance in the seventh stage, monitoring, evaluation, management, and communication are the four components of EA follow-up, according to the IAIA [82]. According to Gibson *et al.*, 2015; Hanna, 2016; Joseph *et al.*, 2015; Zhang *et al.*, 2013, monitoring ensures compliance with approval conditions, provides information to reviewers, and establishes a baseline for future assessments.

Finally, the best EIA practice should integrate issues of public participation, overall impact coverage, and scientific mitigation to cover environmental management goals for decision-making, the solicitation of transparent and accountable evidence-based approaches, including monitoring and follow-up, the inclusion of legitimate approaches, and opportunities for future appraisal.

5. Conclusions

EIA is a critical decision-making tool that promotes environmental conservation and sustainable development. It entails identifying potential consequences of activities that have an impact on science and law, and it should be based on environmental data and scientific knowledge. Environmental Impact Assessment

(EIA) is a critical step in addressing environmental concerns in a project or plan. It aids in the early identification of significant impacts, allowing for design and cost-benefit analysis without major delays. Screening, scoping, prediction and mitigation, management and monitoring, and audit are all steps in the EIA process. The process is not rigid, but it does include a number of steps such as screening, scoping, prediction and mitigation, management and monitoring, and audit. The EIA process is critical for identifying the most pressing issues, involving community input, and influencing the outline proposal. An Environmental Impact Statement, which contains a detailed plan for managing and monitoring environmental impacts, is the main output report.

Environmental Impact Assessment (EIA) began in the 1970s in the United States and Australia and concentrated on the effects on air, water and sediments. Public participation and social aspects were introduced, and scoping was developed in the 1980s. EIA was widely accepted in the 1980s and 1990s, particularly in developing countries like Malaysia and the Philippines, with a trend of moving from project to plans and policies.

In the United States, Environmental Impact Assessment (EIA) systems were introduced in 1962, with the National Environmental Policy Act (NEPA) of 1969 requiring EIA for large-scale projects. As a result, many European and Asian countries implemented EIA policies. Following the lead of the United States, countries such as Australia, Thailand, France, the Philippines, Israel, and Pakistan began to provide EIA systems. When EIA is implemented early in the policy or project planning phase, it is generally more efficient and effective. However, the duration, scope, and procedures of implementation differ by country and agency. Asian countries were early adopters of environmental policies, with many having EIA systems in place by the 1980s. Latin American countries began enacting legislation in the late 1980s, whereas African countries have yet to gain traction. In order to address sustainability concepts, address regional and global environmental changes, and encourage international cooperation on environmental research and training, the scientific and institutional framework for environmental assessment (EA) was revised in the 1985-1990s.

The United Nations Conference on Environment and Development adopted Agenda 21, which aimed for sustainable development, in the 1990s. In the wake of the International Convention on Transboundary Environmental Assessment (EA) and the United Nations Convention on Climate Change (UNCED), environmental assessment concepts and processes have grown. To address global environmental issues, Japan enacted the Environment Basic Law in 1993 and the Environmental Impact Assessment Law in 1997.

EIA can be described as a systematic process for identifying, examining, analyzing, evaluating, and predicting the impacts of a proposal involving public consultation and using the results of the analysis and consultations in planning, authorities, and implementation activities. The EIA practice is legally binding or non-binding, and the scope and procedures vary by country and agency, with each system having its own distinct characteristics. General procedures include

project screening, scoping assessment, EIA conduct and review, public involvement, decision-making, and follow-up. Most countries, including those in developing countries, have laws that allow for public participation and expert consultation in environmental impact assessments (EIAs). At all levels of decision-making, these assessments are increasingly regarded as a necessary component of sustainable development. EIAs are required for a wide range of projects, including major ones, based on investment, activity type, and potential environmental impacts. Ad hoc, checklist, matrix, network, overlay, environmental index, cost-benefit analysis, and predictive or simulation methods are essential for assessing the environmental impacts of development activities.

The review of literature highlights that environmental impact assessment (EIA) is a common practice in the South Asian region for assessing and mitigating environmental impacts. While it will not result in significant changes, it will increase public participation and environmental awareness. However, most countries focus on mitigating the negative environmental impacts of investment projects, ignoring the possibility of public scrutiny in decision-making processes. Environmental Impact Assessment (EIA) processes are important in developing Asian countries' development planning because they consider environmental concerns at various scales.

Integrating EIA with planning, using a holistic approach, engaging diverse stakeholders, using credible data, using transparent methods, and ensuring accountability are all best practices for EIA. Improvements in screening criteria, area-specific sensitivity, quality of conducting EIA, effective site-specific management plans and implementation, effective monitoring and assessment of post-impacts, and rehabilitation and rehabilitation activities can make EIA more effective.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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