Application of Strategic Environmental Assessment (SEA) in Watershed Management

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Objectives

- To provide some insight and describe briefly the significance of strategic environmental assessment (SEA) in terms of its concept, methodology and the processes being used globally

Why is Strategic Environmental Assessment (SEA) needed?

In order to bring environmental balance and sustainability, there is a need for developing a new perspective that combines social, economic, and environmental concerns in watershed management where optimal utilisation of natural resources and urban parcels are treated in an integrated manner. Development of such a new perspective in watershed management with appropriate integration of strategic environmental assessment (SEA) is required, in order to ensure a sustainable balance of ecological, economical and sociological parameters.

In most conventional watershed management, the integration of environmental assessment in order to address the causes of unsustainability emanating from the implementation of development proposals is ignored. Watershed management is considered as environmentally benign and conservation-oriented. However, watershed management activities can be complex, ranging from simple rehabilitation measures to the construction of large irrigation channels, feeder roads, bridges and other infrastructure, most of which have significant environmental effects. The application of project-level EIAs on a project-by-project basis is cumbersome, time-consuming, expensive, and ineffective. Therefore, the integration of SEA at the planning stage for evaluating the management plan from an environmental point-of-view could be beneficial and effective. It could minimise most of the anticipated adverse environmental impacts that are likely to emanate from plan implementation.

SEA: general concept, process and method

What are the inefficiencies, inadequacies and limitations of EIA?

Integration of environmental impact assessment (EIA) in development projects was initiated almost 30 years ago with the enactment of the Natural Environment Protection Act in the USA. The primary objective of integrating EIA in development proposals was to make economic development projects environmentally sound and sustainable. EIA proved useful in ensuring a balance between environmental conservation and economic development objectives. Consequently the adoption of this tool spread to most countries of the developed world during the 1970s and 1980s. More recently, developing countries have also adopted this tool as one of their national instruments in order to protect and conserve the environment from the harmful effects of development project implementation. Most have enacted EIA laws and regulations, establishing appropriate institutions and administration procedures and developing human resources. However the implementation of EIA has not yielded the expected output in terms of combining the aims of conservation and development. Experience from developed countries indicates that the implementation of EIA at the project level is constrained by a number of deficiencies such as the following.

- EIA is a self-limiting process (reactive) and is not able to tackle the current scale of the global ecological deterioration.

- It is not an effective tool to analyse and assess the cumulative impact.

- It does not go beyond the process of impact fixation.

- It is often applied to assess the downstream impacts of a decision-making cycle and therefore does not influence upstream decision-making in which the

real cause of environmental unsustainability is believed to be rooted.

- It does not consider project alternatives.

- It is not able to assess the impact of non-project actions.

- EIA is of limited value when it is considered only as a mechanism for obtaining government clearance for the execution of a project—a situation common in most developing countries.

Is SEA a second generation EIA process? Where is it applied? Whom does it address?

Realising the ineffectiveness of project-level EIA, a second generation EIA process called strategic environment assessment (SEA) has been adopted recently. SEA is applied at the upper level of decision-making, particularly at the policy, plan and programme levels. The effectiveness of SEA goes beyond the process of impact fixation and is effective in reducing the causes of unsustainability that usually lie at the upstream level of decision-making. SEA, if applied at the upper level of decision-making, addresses all major environmental issues resulting from activities proposed and contained within a plan.

Definition of SEA, similarity and differences with EIA

SEA is defined as a systematic process for evaluating the environmental consequences of proposed policy plan and programmes initiatives in order to ensure they are fully included and suitably addressed at the earliest appropriate stage of decision-making. In other words, SEA is an EIA of policy, plan and programmes. The procedural aspects of SEA are similar to EIA, but SEA at the strategic level addresses issues at the upper level of decision-making, whereas EIA addresses project-level activities. Therefore, SEA differs from EIA in its scope and the dimension of issues to be covered.

A policy is defined as an inspiration and guidance for actions, a plan represents a set of co-ordinated and timed objectives for the implementation of policy, and a programme is a set of projects to be implemented in particular areas. SEA can be applied to all these actions and in their associated decision-making cycle. Policy, plan and programme (PPP) may be sector-specific such as transport, mineral extraction, forestry, etc. It can also be spatial such as national, local and regional. PPPs are tiered, in the sense that a policy provides the framework for the establishment of a plan, a plan provides a

framework for a programme, and a programme leads to projects. However in practice these tiers are fluid and have no clear-cut divisions. When SEA is applied to different tiers of PPP the major environmental issues are often addressed and those which are apparent in project implementation are resolved by the application of project-level EIA. Therefore, if the major impacts have been addressed at the upper level of decision-making through the application of SEA, then minimum attention needs to be given to environmental issues at the project level.

What are the merits of SEA?

The application of SEA at PPP level has the following merits.

- SEA applied at the upper level of the decision-making cycle influences downstream decision-making and implementation.

- SEA provides an opportunity at the upstream level for considering alternatives that may make the process more sustainable environmentally.

- SEA strengthens project-level EIAs, making them more sequential, and reduces time and effort involved in their preparation.

- SEA is effective in tackling the environmental effects of large-scale programmes (regional, transboundary, watershed and global) and their cumulative effects.

How many types of SEA are there? What are their specialties?

Types of SEA

Several important activities, including project and non-project development actions which can not be addressed easily by project-specific EIAs, are usually subjected to SEA. They include the following.

Sector-specific SEA

Sector-specific SEA is the process of examining environmental and social implications of all or most project proposed in the same sector. Sector-specific SEA can influence project selection more easily than project-level EIA. It provides environmental ranking of all projects proposed before pre-feasibility and helps in project selection (for example, in the power sector, coal vs. hydro vs. thermal; or in the transport sector, road vs. railway vs. airport). Initially SEA sets a development objective

and then evaluates a number of possibilities for achieving the set objective. For example, if there is need for 2,000 MW of power for a certain location, SEA evaluates a number of viable project options: this is not possible through project-specific EIA.

A sector-specific SEA can

- provide an environmentally and economically sound strategy to achieve objectives,

- introduce non-traditional options into the planning process at an early stage,

- help in ranking potential alternatives in sequence of environmental soundness,

- start gathering existing data and identify data gaps,

- make project-specific EIA cheaper, quicker and robust,

- make things transparent so that the project selected is acceptable to taxpayers and people affected, and

- help minimise political pressure in project selection.

Regional SEA

A regional SEA analyses cumulative impacts resulting from the implementation of environmental, social, economic and multi-sectoral developments within a defined geographical area over a certain period of time. If an area, such as a watershed, is likely to be subjected to intense development pressure then there is a need to analyse the effects of the likely impacts and proposed mitigation measures. This can be performed in two ways. The project proponent can undertake individual project-specific EIAs (such as for irrigation, hydropower, road construction, town development, etc). In such cases, impacts from all activities should be summed up through cumulative impact assessment. Alternatively SEA can be applied at the planning stage for all activities in order to reduce the anticipated impacts. The former method is cumbersome, ineffective, expensive, and time-consuming. However the application of SEA is more effective, quicker and cost-effective.

Cumulative SEA

The cumulative SEA focusses on assessing the impact of currently proposed projects added to the impact from existing development projects and the impact of fore-seeable future projects to be implemented in the same area. The distinctions between cumulative and regional SEA are not sharp and, in some cases, they overlap in concepts and application. However, a cumulative SEA deals with the synergy of the impacts of past, present and future development projects whereas a regional SEA deals with the future consequences of implementation of plans and programmes in a defined watershed area. Box 1 illustrates the application of SEA in a forestry sector management plan.

An example of sectoral SEA of Bara District Forest Management Plan

Background

Forty-two percent of Nepal's natural forest is protected by law. However, extraction of timber, fuelwood and fodder, and deforestation for acquiring agricultural land are still common practice. As a result, the forest area of Nepal is degrading at an alarming rate, if this continues the remaining forest area will be degraded within the next 20-25 years. The Forestry Sector Master Plan (1988) realised that current practices of protection-oriented forest management are not enough to maintain and conserve forest resources. Production-oriented forest management planning is necessary for sustainable use of forest resources. With these objectives in mind, the Department of Forests in collaboration with the Forest Management and Utilisation Project (FMUDP) developed a strategy for the production-oriented forest management planning that relies on the natural regenerative potential of sal (Shorea robusta) trees.

Project description

The operational forest management plan (OFMP) proposed covered 26,000 ha of forest in Bara District. Harvesting was to be carried out initially on 14,000 ha for the first five years. However, the implementation of the OFMP included activities geared towards shifting from protection–oriented to production-oriented forest management and encompassed an array of adverse and beneficial impacts associated with biophysical, social and economic conditions. Government-endorsed national and forestry sector guidelines require EIA for such a large project that changes the management regime from one type to another. Therefore, an EIA was carried out for the OFMP, and two alternatives were analysed: the 'do-nothing' alternative that evaluated the impacts if the existing situation continued and implementation of the proposed management plan.

Impact analysis

Based on background reports and scoping exercises, 19 environmental impacts were identified. Each impact was evaluated and its magnitude, extent and duration were predicted. The following critical environmental impacts were identified.

- Fuelwood gathering for domestic use
- Forest clearing
- Grazing
- Wood-cutting
- Wildlife poaching
- Uncontrolled forest fires
- Loss of habitat and biodiversity
- Soil erosion
- Silvicultural practices
- Timber harvesting methods
- People's participation
- Tenure rights
- Economic activities
- Employment
- Awareness and education
- Health
- Legal and institutional arrangements
- Transportation
- Marketing strategies

Conclusion

The production-oriented forest management plan examined during the EIA did not include most of the issues listed above. It contained only timber management. Therefore, the EIA recommended their inclusion and appropriate measures to overcome the adverse impacts identified. Ranking of each impact indicated that most of the adverse impacts identified in the 'do-nothing' alternative would be lessened by implementing the OFMP. Therefore, the EIA study recommended implementing the OFMP and incorporating consideration of the impacts identified. The final version of the OFMP incorporated all the impacts identified and was modified according to the conditions given in the EIA recommendations. The government of Nepal recently approved the OFMP and authorised the proponent to implement the plan which, with the use of SEA, now fulfils the strategy of production-oriented forest management laid out in the Forestry Sector Master Plan.

SEA and sustainable development

It is now well recognised that SEA is a keystone in achieving sustainable economic development. There are two approaches to the application of SEA. They are (a) ex-panding the existing EIA framework incrementally to reach the sustainable objective, and (b) adopting a trickle-down strategy in achieving the sustainability objective. The incremental type of system goes on expanding its policy towards sustainable development, whereas the trickle-down strategy adopts sustainable development as a central aim. For example, the Natural Environment Protection Act of the USA was originally enacted to implement EIA at the project level; however, the same act was expanded to cover the application of SEA. Similarly EC directives on SEA are the expansion of directives on project-specific EIA. The Dutch system of SEA is an example of the trickle-down approach in which policy sets targets for sustainability and efforts are made to achieve the targets.

Relevance of SEA in Watershed Management Plans

Watershed management plans include an array of activities and often have different kinds of projects within a plan. Some of these are environmentally benign and will improve environmental conditions; for example, protection and plantation of forest trees enhance forest cover which ultimately leads to the protection of soil and the provision of habitat for wildlife. However, there can be activities within a plan that are necessary but that may generate significant cumulative environmental impacts. These need to be addressed properly. Such activities include construction of access roads, irrigation channels, farming, and other infrastructural developments. It is usually not possible to assess the environmental impacts of such activities for every project and try to mitigate them individually. However when considered in totality at the planning stage through the application of SEA, the majority of anticipated impacts can be assessed and almost 90 per cent will be resolved at the implementation stage of individual projects if prescriptions made in SEA are implemented.

SEA procedures and methods

Most of the steps in SEA are similar to EIA except that the dimension and scope differ to some extent. The issues addressed at the strategic level tend to be more generic and at the project level more specific. Therefore, there are some variations in methodology. The following are the steps that are generally used for making an SEA.

Screening

Screening triggers the SEA process. The screening procedure usually determines whether the plan in question needs to undergo SEA. In most countries where EIA is

legally mandatory, guidelines indicate the type of project that needs screening or list projects that need to be considered and those that do not (exclusion/inclusion lists). Screening lists are often given as an appendix in the legislation, and the screening process is legally binding. Although in most cases screening lists are prepared for project-level EIA only in some cases, lists also indicate types of plan and policy to be examined for environmental soundness. For example, the Nepalese Forestry Sector EIA guidelines contain a provision for environmental assessment of watershed management plans and any type of forest management plan. Similarly, in other sectors there are provisions for plans and programmes requiring environmental assessment. Such cases are examples of the incremental system for consideration of SEA.

In most cases, strengthening of screening procedures could bring key process benefits. It would allow practitioners to decide on

- whether SEA is necessary for a particular plan,

- at what stage the assessment should take place,

- the extent and type of involvement of people from outside in the light of planning, and

- the requirements.

Scoping

Scoping is an important step in the process of SEA. It determines the coverage or the scope of SEA of a plan or programme. Scoping helps to develop and select alternatives to the proposed action and to identify the issues to be considered. It is also a procedure for designing the terms of reference (TOR). The scoping exercise involves various steps as follow.

Collection of existing information. Information about the plan and the area in which the plan is to be implemented is collected. It is supported by maps, drawings and other aids. The information is presented in a way that is easy for readers and interested groups to understand and should be accessible to all people concerned.

Information distribution. Compiled and processed information is assembled in a package and distributed to individuals and institutions for their review and comments. An open scoping process can be organized to facilitate interaction on issues related to the proposed plan. Alternatively, closed scoping, such as sending let-

ters and conducting interviews or discussions in small groups, can be organized in order to obtain opinions about the plan proposed and its environmental consequences.

Identification of issues of public concern. Opinions expressed by the people are assembled, processed and categorised. Such information is compiled into a comprehensive list and concerns without any significance are usually rejected. Only significant issues directly related to the proposed plan are usually considered for further analysis.

Analysis and comparison of alternatives

Another important step in SEA is the consideration of alternatives and their comparison in terms of environmental soundness. The alternatives should include the case for continuing the existing situation (the no-action option) and the need for modification. If feasible, a series of options should be compared. However, the minimum should be at least two options in order to provide reference for decision-making. Alternatives are developed by using optimisation techniques. However, in some cases, multi-criteria and sensitivity analysis are also used to determine the preference and robustness of policy options.

Identification of environmental impacts

Implementation of any economic development plan will have some environmental implication whether beneficial or adverse. Therefore, it is essential to identify changes that will affect the existing environment. The process of identifying environmental impacts for all viable options identified is one of the key steps in carrying out SEA. The impacts are identified in three key areas as follow.

- **Socioeconomic impact.** Impacts, both adverse and beneficial, generated in socioeconomic areas.

- **Biophysical impacts.** Impacts on biophysical resources such as vegetation, wildlife, crops, and aquatic life, also includes air, water and soil quality.

- **Cultural impact.** Impacts on cultural and heritage sites, religious sites and traditional practices likely to be affected by the plan.

Impacts may be direct, such as deforestation due to project implementation, or indirect such as impacts on river fish due to the siltation affecting the production of plankton.

Methods for impact analysis

Techniques and procedures for SEA vary from plan to plan. Some plans may cause greater impact on the environment than others. Similarly, some impacts are beneficial while others are detrimental. The following methodology may be used for identifying impacts associated with plan implementation.

- **Use of matrices.** Interaction matrices are used for displaying an area of impacts. Activities to be implemented are presented in the horizontal column and resources likely to be affected are presented in the vertical column of an impact sheet. The area likely to be significantly affected by an action is displayed in a square box. There is a variety of matrices used for various situations.

- **Computer modelling.** Computer models are used in analysing impacts. Calyx Expert System contains a set of impact rules that describes the condition under which environmental impact will occur based on general principles.

- **Geographic information systems (GIS).** GIS are especially useful in land-use planning and in assessing the cumulative impacts of several projects in the same area.

- **Cost-benefit analysis (CBA).** This technique is applied in many cases because impacts can be expressed in comparable terms: the cost:benefit ratio is used as a basis for choice between options.

- **Multi-criteria analysis (MCA).** This is an advanced form of CBA. MCA uses mathematical operations leading to weighting and ranking of options. Unlike CBA, MCA allows for joint analysis of environmental and financial costs.

In addition to these, there are many other techniques used to evaluate policy, plans and programmes from an environmental point of view for SEA. Examples include life-cycle analysis, aggravation methods and several consultative tools.

Impact prediction, evaluation and comparison of alternatives

Once impacts have been identified, it is essential to predict their magnitude, extent and duration. The prediction made should be based on the following factors.

- Determine the initial reference or baseline condition

- Estimate the future state with the proposed action

- Estimate the future state without the proposed action

- Impact predictions are made in the following way

- **Magnitude of impact.** An impact is assessed in terms of its severity. It is classified as reversible or irreversible and ranked as high (H) if it cannot be mitigated, medium (M) if it can be mitigated with an appropriate measure and low (Lo), if it does not make a difference whether it is mitigated.

- **Extent of impact.** An impact can be classified on the level of its spatial influence. It can be site-specific (SP), occurring locally (L), regionally (R), nationally (N) and internationally (I).

- **Duration of impact.** An impact can be classified on a temporal basis: short duration (S), medium term (10-20 years) (M) and longer periods of time (L).

There are several methods available for predicting impacts. No prediction method is perfect, and additional methods are being devised. Most methods are extrapolative, and a few of them are normative. For details of such methodologies please see *EIA Training Manual for Professionals and Managers* (Khadka et al. 1996).

There are several methods for comparing alternatives. Some of the methods are listed below, however, for details of the methodology refer to Khadka et al. 1996.

- Quantitative approach
- Qualitative approach
- Ranking, rating and scaling approach
- Weighting approach
- Nominal group process technique
- Delphi methods
- Environmental evaluation system

Should the public be involved in SEA and how?

Public involvement in SEA

Public involvement is an integral part of SEA. It ensures procedural integrity and provides relevant information and input to policy development. Public involvement brings together stakeholders, affected interest groups, NGOs and other relevant organizations. There are several ways to involve the public either by workshops, meetings and seminars (open) or letters, inter-

views and discussions (closed), etc. There are two approaches as follow.

- When policy, plan and programme are to be evaluated, the first public involvement is organized during scoping. People will be asked for comments on the main objectives of the plan, policy or programme and on environmental issues likely to arise due to plan implementation.

- The second public involvement can also be organized after the SEA is completed. The report is opened to the public at the strategic level, and suggestions for improvement are obtained.

Documentation and SEA report

The length of report can be as short as one page to several pages, depending upon the issues addressed. If the report is long then there should be a short executive summary that should include a precise non-technical description of the significant results and recommended actions. The report should also include a clear description of

- the proposed policy/planning concept,

- the environmental consequences of policy option and how these alternatives compare,

- the difficulties encountered in the assessment and the resulting uncertainty in SEA results,

- recommendations in terms of approval and implementation of proposals, and

- arrangements for monitoring and post-decision analysis

The report should also be accompanied by supporting documents, graphs, charts, relevant baseline information, study team personnel, a list of people contacted and reference materials. A glossary of terms should also be provided to make the report understandable to decision-makers and the public at large.

Summary of SEA procedure

- Initiation: screening mechanism, identify whether SEA is needed.

- Scoping: identify the significant issues to be addressed.

- Impact identification: identify the main impacts on the key resources.

- Prediction of impacts: predict and evaluate the impact and identify the significance.

- Mitigation measures: propose mitigation measures for each impact.

- Public participation: involve the public in the SEA process.

- Preparation of the SEA report.

- Decision-making: take the SEA conclusions and recommendations into account.

- Post-decision: identify follow-up measures for overall impact of projects and measures resulting from policy, plan and programme.

Conclusion

SEA has become one of the most direct and effective ways to ensure that human activities are carried out in an environmentally sustainable manner over a period of time. Many countries have now adopted this method of analysing environmental impacts arising from the implementation of development proposals. In future, this strategic method, particularly the trickle-down approach, is likely to become more popular for achieving sustainable development objectives.

References and further reading (not necessarily cited in the text)

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