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Chapter 3

Impact assessment and biodiversity conservation: An application of EIA and SEA

Introduction

One of the objectives underlying the valuation of environmental goods and services (which do not enter the market place) is to highlight their significance in economic and social terms. Moreover, such information is used to estimate the potential loss of these resources if conservation attempts are lacking. It has been discussed in the earlier chapter that putting a number on environmental resources is a stupendous task. For example, evaluation of damages to biodiversity is not only extremely difficult, but it would also lack scientific precision. Environmental impact assessment techniques are employed to directly assess damage to the natural, economic and social environment due to developmental proposals. They are intended as instruments of preventive environmental management. Biodiversity conservation initiatives internationally advocate the extensive use of environmental impact assessments to design effective strategies and plans.

Threats to biodiversity worldwide are attributed mainly to human activities causing habitat damage or loss. The decline in biodiversity at the global level is cause for concern since it affects the supply of ecosystem services, such as water, clean air, food and fertile soil that support people's livelihood and quality of life. The Millennium Ecosystem Assessment (2003) reports that 60 per cent of ecosystems examined have been extensively and unsustainably degraded. In the sections that follow, we provide a brief overview of environmental impact assessment (EIA) and strategic impact assessment (SEA) processes and examine the role of each in promoting biodiversity conservation. The strengths and weaknesses of the two approaches are highlighted based on country practices and experiences.

A brief overview of EIA and SEA

The International Association for Impact Assessment (IAIA) defines environmental impact assessment (EIA) as 'the process of identifying, predicting, evaluating and mitigating the biophysical, social, and other relevant effects of development proposals'. The aim is to help policymakers consider these effects before major decisions are taken and commitments made regarding a proposed project. Strategic impact assessment (SEA), on the other hand, is a procedural tool for examining the impacts of policies, plans and programmes on the environment (see Box 3.1 for a definition of these concepts). The crux of the SEA process is the preparation of a report that includes baseline data, an assessment of significant environmental impacts, identification of alternatives and mitigation measures (Brown and Farmer, 2007).

Box 3.1. Defining policies, plans and programmes

Policy: A general course of action or proposed overall direction that a government or organisation is, or will be, pursuing, and that guides ongoing decision-making. It may take the form of a law, document, statement or precedent. Typically, policy is implemented by plans and programmes.

Plan: A purposeful forward-looking strategy or design, often with co-coordinated priorities, options and measures that elaborates and implements policy.

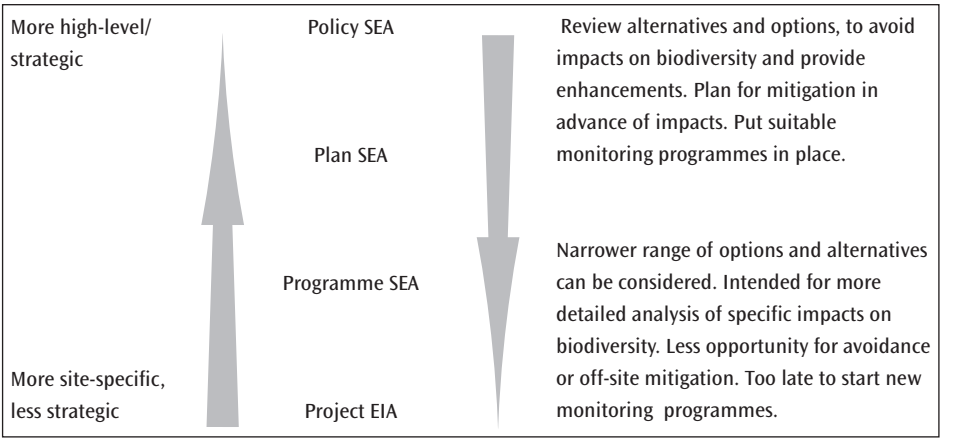
Programme: A coherent, organised agenda or schedule of commitments, proposals, instruments and/or activities that elaborates and implements policy.

Source: Sadler and Verheem (1996); UNEP (2004)

The SEA process extends the aims and principles of EIA upstream to the higher pre-project level of decision-making when major alternatives are still open and there is greater scope than at the project level to integrate environmental considerations into development goals and objectives (UNEP, 2004). The relationship between EIA and SEA is illustrated in Figure 3.1.

Policies shape plans, while programmes and projects put these policies into action. As we move down the hierarchy depicted in Figure 3.1, the nature of decision-making changes, as does the type of environmental assessment required. At the policy level, a wide range of scenarios is considered to avoid harmful impacts to biodiversity or provide enhancements to biodiversity. At the planning stage, mitigation measures can be identified, which would be followed by putting in place suitable monitoring programmes. Project-level assessment, on the other hand, is more specific and provides less opportunity for avoidance or off-site mitigation. The advantage of using SEA over EIA is that threats can be identified at an earlier stage. More specifically, policies, plans and programmes (PPPs) are more strategic since they determine the general direction or approach to be followed towards broad goals.

Figure 3.1. Characteristics of SEA in relation to EIA



Source: Treweek et al. (2005)

EIA v. SEA for biodiversity conservation

Project-based environmental impact assessment (EIA) used to evaluate the impact of specific developments on the environment have not been effective in incorporating biodiversity and ecological considerations (Treweek, 1999). This is because project boundaries rarely match patterns of biodiversity distribution. For instance, to assess the impacts of a project on biodiversity, it may be necessary to understand the biodiversity operating within a whole catchment area, ecosystem or even a country. Moreover, biodiversity is vulnerable to cumulative threats and pressures, and additional disturbances beyond some threshold may have sudden detrimental effects on the natural environment. This aspect of biodiversity is missed out by the EIA process, which essentially looks at the effects of individual projects in isolation. Treweek et al. (2005) identify five important dimensions that are typically lacking or inadequately addressed in project-based EIAs:

i Long-term trends
ii Ecosystem processes and interactions
iii The full range of cumulative threats and pressures acting on biodiversity resources
iv Implications of proposals for current and traditional uses of biodiversity
v Monitoring data needed to understand baseline trends and predict impacts

SEA is recognised by a growing body of literature as an alternative to overcome the limitations of EIA by allowing consideration of biodiversity at higher tiers of decision-making and planning. It thereby provides a process for integrated pursuit of biodiversity and sustainability goals in policy-making and planning. Unlike EIA, SEA adopts a long-term and broad approach by taking into account macro-implications of a proposed project in terms of meeting balanced environmental, economic and social objectives (Table 3.1.). Moreover, SEA also incorporates considerations of cumulative impacts and a broad range of alternative scenarios, making it preferable to EIA (OECD, 2006). The likelihood of success in promoting biodiversity is further enhanced as SEA facilitates greater transparency and more effective public participation by different stakeholder groups at the strategic level. In this way, disputes at the project level can be minimised. EIA decisions, on the other hand, are often subject to controversy and criticism since they are influenced by recommendations in the reports prepared by the project proponents themselves.

The use of SEA as a tool of impact assessment is highlighted in international agreements related to the sustainable use and conservation of biodiversity such as the Convention on Biological Diversity (CBD), the Ramsar Convention on Wetlands, and the Convention on Migratory Species (CMS).

Given numerous advantages and the growing number of proponents of SEA, one question which can emerge at this stage is: Is EIA then totally useless? SEA and EIA can be used as two complementary instruments that can help countries to ensure sustainability of their development plans. For the most part, an SEA is conducted before a corresponding EIA is undertaken. This will mean that information on the environmental impact of a plan will be able to cascade down through the tiers of decision-making and be used in an EIA at a later stage (refer to Figure 3.1).

Table 3.1. SEA and EIA compared

EIA	SEA
Applied to specific and relatively short-term (life-cycle) projects and their specifications.	Applied to policies, plans and programmes with a broad and long-term strategic perspective.
Takes place at early stage of project planning once parameters are set.	Ideally takes pace at an early stage in strategic planning.
Considers limited range of project alternatives.	Considers broad range of alternative scenarios.
Usually prepared and/or funded by project proponents.	Conducted independently of any project proponent.
Focus on obtaining project permission, and rarely with feedback to policy, plan or programme consideration.	Focus on decision on policy, plan and programme implications for future lower level decisions.
Well-defined, linear process with clear beginning and end (e.g. from feasibility to project approval).	Multi-stage, iterative process with feedback loops.
Preparation of an EIA document with prescribed format and contents is usually mandatory. This document provides a baseline reference for monitoring.	May not be formally documented.
Emphasis on mitigating environmental and social impacts of a specific project, but with identification of some project opportunities, off-sets, etc.	Emphasis on meeting balanced environmental, social and economic objectives in policies, plans and programmes. Includes macro-level developmental outcomes.
Limited review of cumulative impacts, often limited to phases of a specific project. Does not cover regional-scale developments or multiple projects.	Inherently incorporates considerations of cumulative impacts.

Source: OECD (2006)

The following sections examine challenges in using SEA in practice to promote biodiversity and identify key principles that need to be taken into account so that biodiversity concerns are adequately addressed at different stages of the SEA process.

Challenges for effective implementation of SEA

Efforts to integrate biodiversity concerns in strategic decision-making and planning face two broad challenges. The first challenge is to ensure that the SEA process remains focused on biodiversity uses and values, and involves the active participation of people (present and

future generations) who depend on these resources for their livelihoods. The second challenge is to ensure that a robust analysis of biodiversity impacts due to planned changes is conducted as part of the SEA process.

Stinchcombe and Gibson (2001) identify ten general barriers to effective implementation of SEA as follows:

- Limited information and unavoidable uncertainties
- Boundary-setting complexities
- Primitive methodologies
- Difficulties in defining the proper role of public participants and ensuring effective involvement
- Coordination and integration of strategic assessment with assessment processes at other levels
- Institutional resistance
- Conflict between integrated assessment and bureaucratic fragmentation
- Jurisdictional overlap
- Limitations of the standard rational planning and policy-making model
- Resistance to integration of strategic assessment in core decision-making.

The effectiveness of SEA, as for EIA, would be compromised by lack of timely and adequate information, and post-decision follow-up and monitoring. This is even more critical in the case of biodiversity, the dynamics of which require on-going monitoring and assessment. The difficulty in predicting impacts is exacerbated in SEA since the scale considered is much larger. Complexity, uncertainty and assessment costs would increase as boundaries expand and with longer time frames. Proponents of SEA, however, argue that the conjunctive use of SEA and EIA might achieve environmental objectives at reduced cost. SEA can speed up EIA procedures and streamline their costs by ensuring that project proposals are set within a policy framework that has been subject to environmental scrutiny (OECD, 2006).

Significant barriers to the practice of SEA relate to policy-makers' aversion to public scrutiny and involvement. Voluntary adoption of SEA and self-assessment is unlikely to be fruitful unless an effective legislative 'stick' exists. The exercise becomes even more complex due to coordination problems across and between institutions, as well as the influence of lobbies and interest groups.

Incorporating biodiversity in SEA

In order to overcome these barriers, it is important to develop comprehensive guidelines so that key biodiversity considerations can be included at various stages of the SEA process with feedback at each stage. The following insertion points for biodiversity can be identified:

- **Screening**: Is SEA required? What are the purposes of the proposed policy/plan/programme and how do these relate to biodiversity?
- **Scoping**: How should SEA be carried out? (See Box 3.2 for an example of a scoping checklist incorporating biodiversity issues).

- **Baseline conditions**: Collect information on the state of the environment in the absence of the plan and identify biodiversity risks. Some additional study might be required to predict how biodiversity might evolve without the plan (for example due to climate change).
- **Identification of options/alternatives**: Is the best biodiversity option being considered?
- **Assessment**: Identification, prediction and evaluation of biodiversity and other environmental impacts of the policy/plan/programme and the alternatives.
- **Mitigation measures**: How can the impacts be avoided, reduced or compensated for?
- **Monitoring**: Follow-up of the plan to compare predicted and actual effects on biodiversity.
- **Consultation and decision-making**: Identification of stakeholders; who are those dependent on biodiversity for their livelihoods? How can they participate effectively in the decision-making process?
- **Preparation of a report**

SEA must ensure that proposed policies and plans are consistent with existing mechanisms for biodiversity conservation, from the international to the local level (Treweek et al., 2005). This might include international obligations under global conventions as well as any national policies for environmental and biodiversity protection. For example, requirements relating to protected areas should be respected when new development is being planned. Opportunities for consideration arise at the screening stage, at the scoping stage (Box 3.2), when considering alternatives or when designing mitigation measures.

To be effective, SEA should be undertaken as an integral part of plan development and findings from the SEA exercise be allowed to feed back into the design of the plan. Supporting institutions should be in place that have the mandate, the capacity and the willingness to follow up on the key results of the actions agreed in the SEA (Verheem et al., 2005). Moreover, stakeholders should be both willing and able to participate without risk.

The importance of political economy factors in policy formulation is an acknowledged fact. Effective SEA depends 'on an adaptive and continuous process focused on strengthening institutions, governance and decision-making processes rather than just a simple, linear, technical approach focused on impacts, as is often found in EIA' (OECD, 2006). The World Bank is testing and validating an 'institutions-centered' approach to SEA as opposed to the traditional 'impact-centered' SEA, which focuses largely on impacts and how to mitigate these impacts (World Bank, 2005). The institutions approach emphasises improved governance, social accountability and social learning on a continuous basis to improve the design of public policies and raise awareness on environmental issues. It involves assessing a country's environmental management capacity to address the effects of policies on identified environmental priorities, which may include biodiversity. If a country's environmental management capacity is inadequate, a set of institutions and governance strengthening requirements to address these effects are warranted.

Box 3.2. Scoping checklist for biodiversity

1 Are there any protected areas or species within the area affected?

2 Consider biodiversity values and uses within the plan area.

3 Consider biodiversity at the following levels. Are there possible impacts at these levels? Which level(s) can be studied most effectively?

Bioregion	Habitat	Population	Landscape	Community
Individual	Ecosystem	Species	Gene	

4 Address the following questions to determine the scope of the SEA in relation to biodiversity composition, structure and function:

Composition

- What are the main components of biodiversity affected by the plan (see above)?
- What is the distribution pattern and richness/abundance of biodiversity?
- How does biodiversity composition in the study area compare with that outside the study area? (For instance, are there components that are unique?)
- Which biodiversity components are particularly vulnerable/sensitive to proposed plan activities?
- How does biodiversity composition in the study area compare with that outside the study area? (For instance, are there components that are unique?)
- Which biodiversity components are particularly vulnerable/sensitive to proposed plan activities?
- What are trends in compositions? (For instance is biodiversity organisation and composition stable or subject to rapid change?)

Structure

- Structural relationships include: connectivity, patchiness, fragmentation, vertical habitat differentiation, distribution of key physical features, availability of niches, water availability.
- How are biodiversity components organised in time and space?
- What are the requirements or 'drivers' for high or characteristic biodiversity to be maintained (e.g. environmental gradients)?

Function

- Consider how current levels and types of biodiversity are being maintained. Take an ecosystem perspective to identify important functional relationships like dependence of wetlands on hydrological processes; relationship between aquatic invertebrates and water quality.
- What processes maintain boundaries and structure (competition, herbivory, predation, dispersal)? What role do biodiversity components play in maintaining these processes and dynamics or supporting other biodiversity components (for instance, the role of vegetative cover in retarding surface water run-off, habitat in providing refuge for certain species)?
- Are there any threatened components present? What is their functional role? What are their requirements?
- What are the demographic processes determining the status of species populations?

Source: Adapted from Treweek et al. (2005)

International experiences of EIA and SEA in achieving biodiversity goals

EIA is practised in more than 100 countries worldwide (Donnelly et al., 1998). Huge differences in EIA systems are found to exist between and within countries both in the developed world and in the developing world. Within Africa, for example, the South African EIA system is found to have the sophisticated attributes of a developed-country EIA (Wood, 2002), while EIA is now becoming important in Ghana but is almost non-existent in Somalia (Wood, 2003). The variation in EIA in developing countries is attributed to the existing political and administrative systems, availability of resources, the social and cultural systems as well as the level and nature of economic development (George, 2000).

Despite large variations between individual countries, a general distinction can be drawn between the practice and performance of EIA in developed countries as opposed to developing countries (LDCs). EIA systems in LDCs are not well-embedded in the development process and usually lack the adequate institutional and legislative frameworks generally found in developed countries to ensure effective EIA. In these low- and middle-income countries, EIAs are generally carried out as a requirement by development assistance agencies on a project-by-project basis. The methodologies used tend to miss out cumulative impacts on the environment (Lohani et al., 1997), which are crucial in the case of biodiversity preservation. Political economy considerations, such as vested interests of powerful stakeholders and politicians having influence on the decision-making process, constitute additional limitations of the EIA process. These factors appear to play a big role in LDCs where there is no tradition of consultation and participation of all the stakeholders, big and small.

While the ineffectiveness of EIA in developing-country contexts is well-documented in the literature (Wood, 2002), there is an ongoing debate about the suitability of SEA in these countries. To date, undertaking SEAs has been largely confined to developed countries, more specifically Australia, Canada, the Netherlands, the USA and the UK (see example in Box 3.3). SEA in developing countries is gradually increasing and, like EIA, is mostly conducted as part of the lending requirements of international donor agencies such as the World Bank and, more recently, the Asian Development Bank (see Boxes 3.4 and 3.5).

Box 3.3. Strategic assessment of Australian fisheries plans

Issue: In order to ensure sustainable development of fisheries, the Australian Commonwealth has made it a requirement to conduct impact assessment of fisheries plans similar to SEAs required by the EU. The impact assessment should include identification and description of environmental characteristics that are likely to be affected by the fishery plan, such as protected areas, components of biodiversity, threatened and protected species, and coral reefs.

Outcome: Early identification of management regimes (mitigation measures) to ensure an ecologically sustainable development of fisheries, namely, licensing systems (to control access to fisheries) and imposing conditions upon operators.

Source: Based on Brown and Farmer (2007)

Box 3.4. Achieving positive revision to forest policies in Ghana

Issue: An examination of the Ghana Poverty Reduction Strategy (GPRS) identified potential conflicts between the forest policy (aimed at broadening the resource base of the wood industry) and environmental protection of river-system bank-side ecosystems. As a result, Ghana's forest policy was modified. In less than six months, the government had set up nurseries to raise bamboo and rattan plants to increase the supply of raw materials for the industry, thereby helping protect river banks from uncontrolled harvesting of wild bamboo and rattan.

Key benefits

- Reduce pressure on primary forests and fragile river ecosystems
- Creation of new timber resources
- Employment

Source: OECD (2006)

A rising number of developing countries are introducing legislation or regulations to undertake SEA – sometimes in EIA laws and sometimes in natural resource or sectors laws and regulations (OECD, 2006). In South Africa, for instance, some sectoral and planning regulations identify SEA as an approach for integrated environmental management. In the Dominican Republic, legislation refers to strategic environmental evaluation or SEA. Elsewhere, the existing EIA legislation requires an SEA-type approach to be applied either to plans (e.g. China), programmes (e.g. Belize) or both policies and programmes (e.g. Ethiopia). Nevertheless, the effectiveness of SEA is still under scrutiny.

Box 3.5. A strategic environmental assessment of Fiji's tourism development plan

Background and issue: Tourism is the fastest growing sector in Fiji, with potentially significant impacts on the natural and social environment. The World Wide Fund for Nature – South Pacific Programme (WWF-SPP) and the Asian Development Bank (ADB) formed a partnership to carry out an SEA of Fiji's tourism development plan (TDP), which aimed at large-scale growth of that industry. The SEA exercise was intended to inform the Ministry of Tourism and its partners about the environmental and social impacts of the TDP. This information would enable sustainable plans and policies to be adopted when the TDP is reviewed.

Method: The SEA was carried out by comparing baseline environmental, economic and social conditions with likely trends under the TDP to determine whether the TDP is sustainable. Moreover, a critical component of the SEA consisted of consultations with groups of people representing a whole range of stakeholder interests.

Major findings of the SEA report on environmental, economic and social impacts:

- Tourism development is causing severe environmental degradation. In fact, many environmental pressures, such as on coral reefs, are close to levels at which irreversible damage would occur.
- Growth in tourism under the TDP is highly demanding on the environment in terms of resource use and pollution generated.

- While the economic benefits of tourism are considerable, an estimated 60 per cent of the money coming in leaks out of the country.
- Rapid growth of tourism is likely to lead to mounting tensions between tourism developers, local communities and landowners.

Some conclusions and recommendations

- Implementation of institutional and regulatory frameworks for environmental assessment and management is a prerequisite for sustainable tourism.
- A fully effective system for enforcing the findings of the impact assessments must be in place.
- Universal standards for minimising environmental impacts should be set which all developers must comply.
- An Environmental Fund must be established from user fees collected from visitors.

Source: Levett and McNally (2003)

Many of the weaknesses pertaining to effective EIA also apply to SEA. The existing legal and institutional frameworks as well as availability of resources (financial and human) emerge as real constraints in many developing countries, in particular, where funds and necessary skills to conduct SEA might be lacking. Moreover, lobby groups including industrialists may try to block changes in the legal system which would enable effective implementation of SEA if they perceive that these rules would increase their private production costs, for instance, by enforcing compliance to mitigate. Despite the various problems relating to the use of SEA in LDCs, the potential advantages are also greater because of the quick pace of development in many areas. SEA could be employed to generate integrated and sustainable development plans and strategies. In this case, international donors and NGOs would act as important pressure groups favouring implementation of SEA in these developing countries.

Concluding remarks

Biodiversity goals should not be addressed in isolation and must be considered as an important component of a sustainable development strategy. SEA is found to have a considerable advantage over EIA in this respect by requiring identification of environmental impacts (including biodiversity) at an early stage of the proposed plan and its alternatives. Moreover, SEA allows for consideration of cumulative impacts on biodiversity when deciding to go ahead with a plan. The literature supports the use of EIA and SEA as complementary instruments to achieve sustainability. Despite its advantages, the practice of SEA is not widespread. Moreover, there is recognition that EIA needs to be strengthened at basic levels in many developing countries. Institutional pre-conditions in LDCs constitute an important hurdle to the introduction of SEA, which is still a relatively new assessment tool. However, lack of political will emerges as the main constraint to effective implementation of both EIA and SEA in developing countries. This would highlight the role of international donors and NGOs in helping these countries choose sustainable development paths, taking into account the environmental, economic and social goals.

References

Brown and Farmer (2007). 'The Use of Fisheries Licensing in Environmental Integration.' *Ocean and Coastal Management* **50**: 35–56.

Donnelly, A., B. Dalal-Clayton, and R. Hughes (1998). *A Directory of Impact Assessment Guidelines*. London: International Institute for Environment and Development, 2nd edition.

George, C. (2000). 'Comparative Review of Environmental Assessment Procedures and Practice'. In N. Lee and C. George (Eds.), *Environmental Assessment in Developing and Transitional Countries*. Chichester: John Wiley and Sons.

Levett, Roger and Richard McNally (2003). *A Strategic Environmental Assessment of Fiji's Tourism Development Plan*. UK: World Wide Fund for Nature.

Lohani, B.N., J.W. Evans, R.R. Everitt, H. Ludwig, R.A. Carpenter and S.L. Tu (1997). *Environmental Impact Assessment for Developing Countries in Asia*. Manila: Asian Development Bank.

Millennium Economic Assessment (2003). *Ecosystems and Well Being: A Framework for Assessment*. Washington, DC: World Resources Institute.

Organisation for Economic Co-operation and Development (OECD) (2006). *Applying Strategic Environmental Assessment – Good Practice Guidance for Development Co-operation*. DAC Guideline and Reference Series. Paris: OECD.

Sadler, B. and R. Verheem (1996). *Strategic Environmental Assessment: Status, Challenges and Future Directions*. Ministry of Housing and Spatial Planning (VROM) Report No. 53. The Netherlands: Zoetermeer.

Stinchcombe, K. and R. Gibson (2001). 'Strategic Environmental Assessment as a Means of Pursuing Sustainability: Ten Advantages and Ten Challenges'. *Journal of Environmental Assessment Policy and Management* **3**(3): 343–372.

Treweek, J., R. Therivel, S. Thompson and M. Slater (2005). 'Principles for the Use of Strategic Environmental Assessment as a Tool for Promoting the Conservation and Sustainable Use of Biodiversity'. *Journal of Environmental Assessment Policy and Management* **7**(2): 173–19.

Treweek, J. (1999). *Ecological Impact Assessment*. Oxford: Blackwell Science.

United Nations Environment Programme (UNEP) (2004). *Environmental Impact Assessment and Strategic Environmental Assessment: Towards An Integrated Approach.* Geneva: UNEP.

Verheem, R., R. Post, J. Switzer and B. Klem (2005). 'Strategic Environmental Assessments: Capacity-Building in Conflict-Affected Countries', Social Development Paper. Washington, DC: World Bank.

Wood, C. (2002). *Environmental Impact Assessment: A Comparative Review*. (2nd Edition). Harlow: Prentice Hall.

Wood, C. (2003). 'Environmental Impact Assessment in Developing Countries: An Overview'. Paper presented at the Conference on New Directions in Impact Assessment for Development: Methods and Practice, 24–25 November, 2003. EIA Centre, School of Planning and Landscape, University of Manchester, Manchester, UK.

World Bank (2005). 'Integrating Environmental Considerations in Policy Formulation.