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# BIODIVERSITY IMPACT ASSESSMENT

by  
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**Overview.** *Impact assessment is a tool for integrating environmental and social concerns into decision making processes. This paper examines the potential of existing impact assessment techniques to implement the Convention on Biological Diversity (CBD). The analysis reveals that impact assessment can be developed in two ways to make it a better tool for implementing the CBD. First existing techniques should be revised to address biodiversity and second a new tool is needed to extend impact assessment to initial planning stages.*

*Biodiversity Impact Assessment (BIA) is a new technique which helps existing techniques achieve the CBD's three objectives. Introducing biodiversity concerns into conceptual stages of planning, BIA achieves the integration needed to spur innovative solutions which place biodiversity conservation, sustainable use, and equitable sharing at the core of planning processes.*

*This paper provides a brief survey of the state of affairs in impact assessment, judges how well existing techniques meet the three objectives of the CBD, establishes BIA as a supporting tool of assessment, and proposes an outline methodology for the new technique. The paper is meant as a catalyst for ideas about BIA and the role of biodiversity in existing impact assessment techniques.*

## 1. INTRODUCTION

Biological diversity, or the variability among living organisms at the genetic, species, and ecosystems levels, is our life support system. The existing endowment of biodiversity is a non-renewable resource that we are unable to duplicate or substitute by technological innovation (Swanson, 1997) and is being eroded at a rate unprecedented since the age of dinosaurs. This alarming loss is widely attributed to the spread of unsustainable human development and specifically to: habitat loss and fragmentation; introduced species; over-exploitation of plant and animal species; pollution of soil, water, and atmosphere; global climate change; and industrial agriculture and forestry (WRI, 1992). The causes of biodiversity loss are "embedded in the way we live" (WRI, 1992) and halting or slowing this loss requires a shift in the path of human development. This in turn depends on fundamentally integrating biodiversity concerns into decisions made in every facet of our lives.

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**Table 1 Action Called for in the Convention on Biological Diversity***Article 6 General Measures for Conservation and Sustainable Use*

- integrate biodiversity considerations into national strategies, plans and programmes
- integrate biodiversity into sectoral or cross-sectoral plans, programmes and policies

*Article 8 In-Situ Conservation*

- establish a system of protected areas and guidelines for the formulation of protected areas
- promote the protection of ecosystems, natural habitats and maintenance of viable populations
- promote environmentally sound & sustainable development in areas next to protected areas
- rehabilitate and restore degraded ecosystems and promoting the recovery of threatened species
- prevent the introduction of...alien species threatening ecosystems, habitats or species

*Article 10 Sustainable Use of Components of Biological Diversity*

- integrate consideration of biodiversity into national decision making
- adopt measures relating to the use of biological resources to avoid or minimise adverse impacts on biological diversity
- protect and encourage customary use of biological resources in accordance with traditional cultural practices that are compatible with conservation or sustainable use requirements
- support local populations to develop and implement remedial action in degraded areas

*Article 11 Incentive Measures*

- adopt economically and socially sound measures that act as incentives for conserving and sustainably using biodiversity

*Article 14 Impact Assessment and Minimising Adverse Impacts*

- ensure that biodiversity is addressed in projects, programmes and policies decisions.

*Article 20 Financial Resources*

- provide financial support and incentives in respect of those activities...intended to achieve the objectives of this Convention, in accordance with national plans, priorities and programmes.
- developed countries should provide new and additional financial resources to enable developing country Parties to meet the agreed full incremental costs to them of implementing measures which fulfil the obligations...

The Convention on Biodiversity (CBD) is a call from nearly 170 nations around the world to:

- *conserve* biological diversity,
- *sustainably use* biological resources, and
- *fairly and equitably* distribute the benefits derived from the use of biodiversity.

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The Parties recognise the severity of the situation and are committed to embarking on fundamental changes in our social, economic, and government structures. Table 1 highlights specific steps called for in the CBD.

Parties acknowledge the imperative to consider biodiversity at all levels of decision making. Impact assessments identify and address environmental and social impacts of projects, programmes, and policies under consideration. The CBD recognises the value of impact assessment as a tool for integrating biodiversity into decision making processes and provides a strong international mandate in Article 14 (see Table 2) for implementing and developing impact assessment techniques. Impact assessment is a potentially powerful tool for implementing the CBD because:

- it ensures the objectives of the CBD are integrated into decision making processes,
- it provides a forum for developing new ways of thinking and decision making,
- it enables adverse environmental impacts to be anticipated, avoided, and mitigated,
- it ensures alternative options, such as incentive measures, are considered,
- it introduces environmental and biological data into decision making processes,
- it provides structured methods of public participation,
- it calls for monitoring and auditing systems which provide data relevant to the further conservation and sustainable use of biological resources, and
- it facilitates the development of environmentally sensitive technology and business management techniques.

<p><b>Table 2 The CBD on Impact Assessment</b></p>
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<p>Article 14.1 Each Contracting Party, as far as possible and as appropriate, shall: (a) Introduce appropriate procedures requiring environmental impact assessment of its proposed projects that are likely to have significant adverse effects on biological diversity with a view to avoiding or minimising such effects and, where appropriate, allow for public participation in such procedures; (b) Introduce appropriate arrangements to ensure that the environmental consequences of its programmes and policies that are likely to have significant adverse impacts on biological diversity are taken into account.</p>
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But do existing impact assessment techniques match this potential? In the words of Michel Dorais, Chairman of The Federal Environmental Assessment Review Office Canada, "*The challenge facing us is one of relevancy - has environmental assessment reached its potential in supporting informed*

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*decision making and if not, what measures must we take to make it so?"* (ISEA, 1994). This paper argues that the impact assessment community should take advantage of the CBD's mandate to strengthen existing techniques in two ways: amending existing techniques and introducing an additional technique to the tool bag.

Many countries and organisations (Canada, the World Bank, and the Asian Development Bank for example) have taken the lead in integrating the objectives of the CBD into their impact assessment legislation and guidelines. Based on a review of these efforts this paper argues that existing techniques, with appropriate amendments, are able to execute two of the CBD's three objectives - the conservation of biodiversity and the fair and equitable sharing of benefits derived from its use - but that, for structural reasons, the third objective - sustainable use - remains illusive. Biodiversity impact assessment (BIA) is proposed as an extension of existing impact assessment techniques to help Contracting Parties meet the sustainable use objective. BIA is a response to the impact assessment community's call for the development of "*...effective ways to link environmental assessment into other planning and decision making processes*" (ISEA, 1994). It is a tool for developing project ideas which improve the state of biodiversity while serving other important social and economic objectives. By using BIA in project, programme, and policy planning processes Contracting Parties move towards meeting the CBD's objectives.

This paper explores the current application of impact assessment in Contracting Parties, presents the need for a new BIA technique, and outlines a path for the development of BIA. Section two outlines the history and methodology of impact assessment techniques and provides a checklist of updates for legislation and guidelines. Section three evaluates impact assessment techniques on procedural and structural levels and determines their ability to meet the three objectives of the CBD. A new tool - BIA - is introduced as a means of fully implementing the CBD. Section four develops the theoretical basis for BIA and outlines the objectives of BIA. Section five proposes a methodology for BIA that evolves EIA and SEA into more holistic planning tools. The conclusion reviews the current position and recommends further action for stakeholders: the COP, the SBSTTA, Contracting Parties, and the impact assessment community.

## **2. IMPACT ASSESSMENT TECHNIQUES**

*Impact assessment is a process to improve decision-making and to ensure that the project/programme options under consideration are environmentally and socially sound and sustainable. It is concerned with identifying, predicting and evaluating the*

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*foreseeable impacts, both beneficial and adverse, of public and private (development) activities, alternatives and mitigating measures, and aims to eliminate or minimise negative impacts and optimise positive impacts.*

(Roe, *et. al.*, 1995)

Impact assessments are standardised processes of analysing proposed projects, programmes, or policies for their possible impacts on existing environmental or social structures and of identifying and proposing measures to mitigate these impacts. An impact assessment is conducted after the core idea for a project, programme, or policy has been developed but before it is given permission to be carried out. Permission depends on a thorough impact assessment and adequate mitigation measures. In this way impact assessments inform decision making processes to ensure a project, programme, or policy has minimal adverse impact on environmental or social structures.

The term impact assessment encompasses a range of techniques used to evaluate projects, programmes, and policies. These include environmental impact assessment (EIA), strategic environmental assessment (SEA), health impact assessment (HIA), risk assessment, and social impact assessment (SIA). Related techniques include integrated environmental management (IEM), environmental assessment (EA), environmental management and audit schemes (EMAS), and others specific to demands of countries and organisations. EIA and SEA are the two techniques relevant to biodiversity because they address environmental impacts. Procedurally EIA and SEA are similar but they differ in scope with EIA acting on a project level and SEA working on a more 'strategic' programme and policy level.

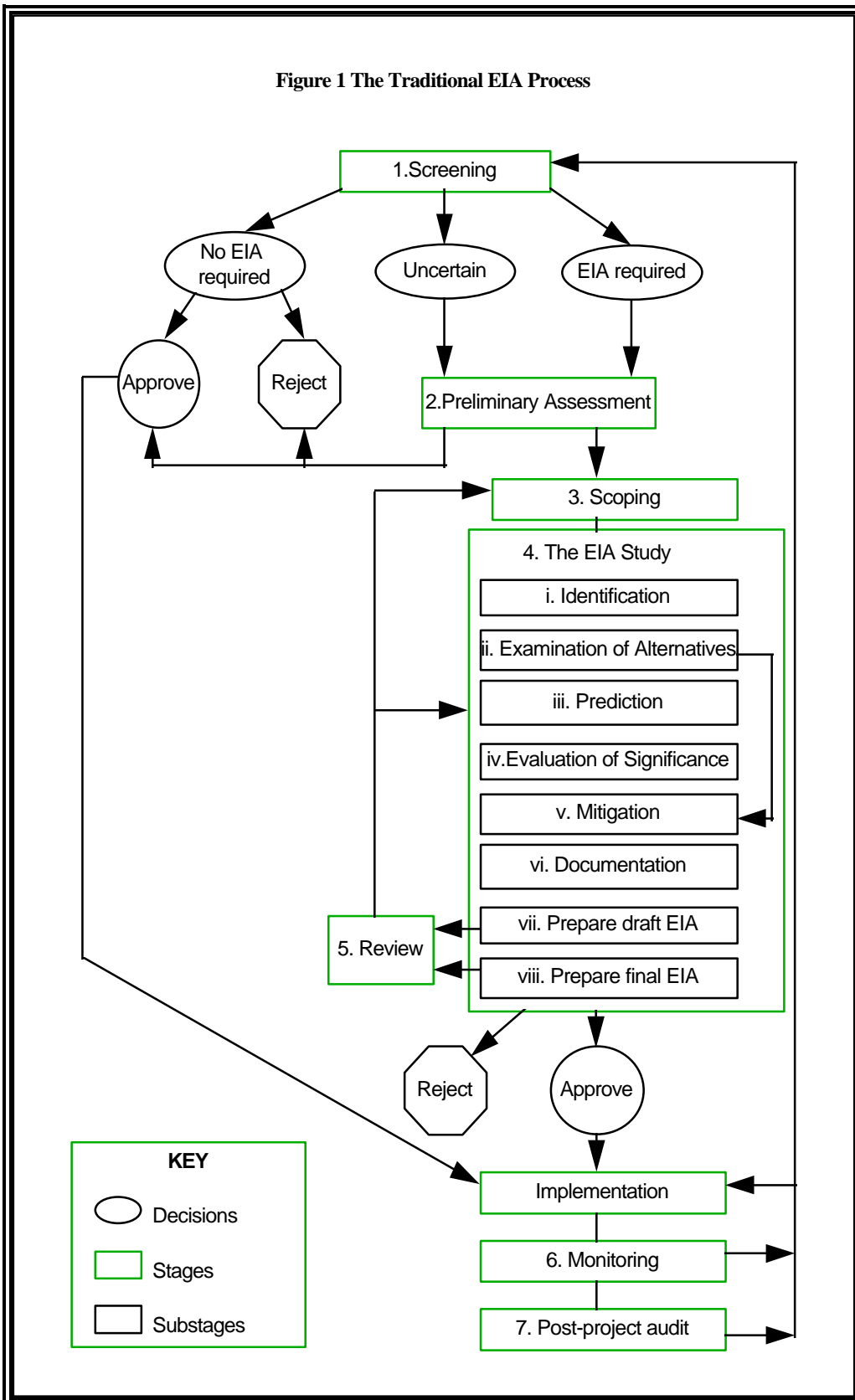
EIA was developed in the US in the late 1960's as procedure for identifying, predicting, and mitigating environmental impacts. The 1970's and 1980's saw the inclusion of social factors in impact assessments and the introduction of sustainability concerns. In the 1990's assessments expanded in scope to programmes and policies with the introduction of SEA (Roe, *et. al.*, 1995). Though relevant as a tool for the CBD (Article 14.1b), SEA is early in its development stage and is not widely adopted or practised. EIA is more established and is used throughout the paper as the standard of measure for other impact assessment techniques.

## **2.1 The Environmental Impact Assessment Process**

Though EIA techniques vary from country to country and organisation to organisation there are stages common to most EIA processes. Figure 1 displays these stages and the feedback loops within the process. There is opportunity to integrate biodiversity concerns throughout EIA and Table 3 lists specific criterion from the CBD to be considered at each stage.



Figure 1 The Traditional EIA Process



**Table 3 Criterion for EIA Stages**

**EIA**

	1	2	3	4i	4ii	4iii	4iv	4v	4vi	5	6	7
<b>DO GUIDELINES AND LEGISLATION:</b>												
<i>Article 7 Identification and Monitoring</i>												
Identify ecosystems and habitats which:												
contain high diversity?		X	X	X								
contain large numbers of endemic or threatened species?		X	X	X								
contain endemic or threatened wilderness?		X	X	X								
are required by migratory species?		X	X	X								
are of social, economic, cultural, or scientific importance?		X	X	X								
are representative of unique biological processes?		X	X	X								
<b>Identify species and Communities which are:</b>												
threatened?		X	X	X								
wild relatives of domesticated or cultivated species?		X	X	X								
of medicinal, agricultural or other economic value?		X	X	X								
of social, scientific, or cultural importance?		X	X	X								
of importance to research into biodiversity?		X	X	X								
Described genomes and genes of social, scientific or economic importance?		X	X	X								
Identifies processes and categories of activities which have or are likely to have significant adverse impacts on the conservation and sustainable use of biological diversity?	X			X								
<b>DO PROJECTS:</b>												
<i>Article 8 In-situ Conservation</i>												
Impact on an established protected area?	X			X			X					



Impact on biological resources important for the conservation of biological diversity?	X			X			X						
Impact on attempts to protect ecosystems or promote the recovery of threatened species?	X			X			X						
Release living modified organisms resulting from biotechnology which are likely to have adverse environmental impacts that could affect conservation and sustainable use of biological resources?	X			X									
Rehabilitate or restore degraded ecosystems or promote the recovery of threatened species?								X					
Take into account risks to human health?	X			X			X						
Introduce alien species which threaten ecosystems, habitats, or species?	X			X									
	1	2	3	4i	4ii	4iii	4iv	4v	4vi	5	6	7	
Impact on the knowledge, innovations, and practices of indigenous and local communities embodying traditional lifestyles?	X			X			X						
Impact on attempts to conserve components of biological diversity in an ex situ context?	X			X			X						
Impact on attempts to adopt measures for the recovery and rehabilitation of threatened species and for their reintroduction into their natural habitats?	X			X			X						
<i>Article 10 Sustainable Use of Components of Biological Diversity</i>													
Adopt measures to avoid or minimise adverse impacts on biological diversity?					X			X					
Impact on local populations' attempts to develop and implement remedial action in degraded areas where biological diversity has been reduced?	X			X			X						
<i>Article 11 Incentive Measures</i>													

Adopt measures that act as incentives for the conservation and sustainable use of biodiversity?					<b>X</b>			<b>X</b>					
<i>Article 12 Research and Training</i>													
Impact on research which contributes to the conservation and sustainable use of biodiversity?	<b>X</b>			<b>X</b>		<b>X</b>						<b>X</b>	
<i>Article 13 Public Education and Awareness</i>													
Promote the understanding of the importance of the conservation of biological diversity?								<b>X</b>	<b>X</b>	<b>X</b>			
<i>Article 15 Access to Genetic Resources</i>													
Impact on the sovereign rights of States over their natural resources and their authority to determine access to genetic resources?	<b>X</b>			<b>X</b>			<b>X</b>						
Impact on endeavours to facilitate access to genetic resources for environmentally sound uses?	<b>X</b>			<b>X</b>			<b>X</b>						
Impose restrictions that run counter to the objectives of the CBD?	<b>X</b>			<b>X</b>			<b>X</b>						
Provide and/or facilitate access for and transfer of technologies that are relevant to the conservation and sustainable use of biodiversity?					<b>X</b>	<b>X</b>		<b>X</b>			<b>X</b>		
<i>Article 17 Exchange of Information</i>													
Facilitate the exchange of information relevant to the conservation and sustainable use of biodiversity?					<b>X</b>			<b>X</b>	<b>X</b>	<b>X</b>			

	1	2	3	4i	4ii	4iii	4iv	4v	4vi	5	6	7
<i>Article 20 Financial Resources</i>												
Lend financial support and incentives to activities intended to achieve the objectives of the CBD?					X			X				
(For a developed country) provide new financial resources enabling developing countries to meet the CBD's objectives?					X			X				

### Stage 1: Screening

Screening determines the need for, and appropriate level of, assessment. The decision to conduct an assessment is based on past experiences summarised in categories which specify the types of projects requiring EIAs. The level of assessment is determined by thresholds based on the size of the project, amount of waste, or other criterion. Adequate screening procedures ensure projects with detrimental effects on biodiversity are subjected to EIAs.

To ensure projects impacting on biodiversity are subjected to EIAs, it is important that screening includes biodiversity criterion. Categories should include projects likely to impact biodiversity at a genetic, species, or ecosystems level and thresholds should include specific biodiversity parameters such as exotics and over-harvest (Asian Development Bank, 1996). A project's spatial context is also important in screening and projects, programmes, or policies proposed to take place in or adjacent to established preserves (Article 8e) should be subjected to full EIAs or SEAs. Biodiversity criterion for screening are included in Table 3.

### Stage 2: Preliminary Assessment

A preliminary assessment is conducted if an EIA is required or if there is uncertainty about potential impacts of the project. This brief assessment applies methods of rapid assessment to determine key impacts, their magnitude and significance, and their importance to decision makers (Section 2.3 provides more detail about brief assessment techniques). From this decision makers determine if a full EIA is required and what impacts will likely be considered in the EIA. Specific to biodiversity the preliminary assessment should take account of impacts at the genetic, species, and ecosystems levels on a local, regional, national, and global basis.

### Stage 3: Scoping

The impacts which are the focus of the rest of the assessment are identified in the scoping stage. There are four important principles to consider at this stage in terms of biodiversity: spatial context, cumulative effects, public

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participation, and biodiversity criterion. Time and spatial parameters of the study are defined in the scoping and these definitions should consider ecological processes and components such as migratory or nesting patterns for birds, to provide a regional context for the impacts.

With the appropriate parameters, the cumulative effects of other activities and the added effect of the project helps identify impacts that to studied. Because impacts defined in the scoping stage are often influenced by the background and experience of the assessment team it is important to infuse a degree of objectivity by engaging community members, regulatory authorities, decision makers, and outside experts in discussions and consultations. Finally, scoping guidelines and legislation must supply specific biodiversity considerations such as areas with high levels of biodiversity, critical habitats, or endangered species. Scoping criterion are listed in Table 3.

#### **Stage 4: The Environmental Impact Assessment Study**

The EIA study examines impacts identified in the scoping stage in further detail, determines their significance, and establishes measures to mitigate adverse impacts and maximise positive impacts. This process is addressed in its six sub-steps.

##### ***i. Identification***

Identification determines the project's direct and indirect impacts through checklists, matrices, overlays, models, questionnaires, and simulations. Information from screening and scoping guides and supplements identification work. To adequately identify impacts on biodiversity criterion such as those in Table 3 must be included in methodologies applied at this stage.

##### ***ii. Examination of Alternatives***

There is always an alternative action for a project, whether it is to take no action, to select a different project site, or to find an alternate means of implementation. These options are analysed for possible impacts, benefits, and costs. Biodiversity issues should be included in the development of alternatives and in their analysis. Stakeholders should be involved in the identification of the alternates' impacts, benefits, and costs.

##### ***iii. Prediction***

The prediction step determines causes and effects of key impacts. Quality data is crucial for accurate prediction and insufficient research can lead to unacceptable levels of uncertainty. Existing information collected in UNEP's *Global Biodiversity Assessment* tome (Heywood & Watson, 1997) can guide predictions of biodiversity impacts. Where further information is required assessment teams should use the clearinghouse mechanism and biodiversity

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conservation information system (BCIS) as sources of data. Information attained from assessments should be integrated into these mechanisms. Also, methods of monitoring the predictions are created in this step and implemented in the monitoring stage.

***iv. Evaluation of significance***

The significance of predicted impacts often depends on qualitative insights gained through examination of existing legislation, social norms, and policy objectives. Public participation is important as stakeholders provide qualitative information about the importance of impacts based on their experiences and preferences. The equitable sharing objective of the CBD should guide decisions about an impact's significance.

***v. Mitigation***

The EIA team next determines appropriate mitigation measures for negative impacts and means of maximising positive impacts. Here too stakeholders provide insight about options. Alternatives are reconsidered with reference to new information from the prediction and significance steps. Incentive measures (Article 11) should be used as mitigation tools whenever possible, as they are powerful methods of moving people towards lifestyles compatible with biodiversity conservation, sustainable use, and equitable sharing because they work with rather than against rational decision making processes. Environmental management plans should be included as mitigation measures for projects with impacts in their operational phases. 'No net loss' of ecosystems, species populations, or genetic diversity should guide the design of mitigation measures and degraded habitats can be restored in place of those altered by the project. Whatever the mitigation measures prescribed, they should be accompanied by implementation and monitoring plans to ensure they perform as planned.

***vi. Documentation***

Information gathered and the procedures used by the impact assessment team is documented in what is commonly referred to as an environmental impact statement (EIS). The EIS should be clear and concise but is often a weighty volume written in technical jargon. This procedure makes the EIA inaccessible and intimidating yet an important purpose of EIA is to inform debates and decisions. Executive summaries address this problem.

**Stage 5: Review**

The review determines if the assessment adequately informs decision makers about environmental consequences of the project and reviews alternatives and mitigating measures. If the EIA is inadequate the review committee requests further information or alternative methodologies. This stage is important to the credibility of the EIA process and the review team should check that

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biodiversity issues specifically have be adequately addressed. The public should be consulted to ensure the process is acceptable.

### **Stage 6: Monitoring**

Often left out of EIA legislation, monitoring is critical because it checks if the effects of impacts were predicted accurately, sees that prescribed mitigation measures are carried out appropriately, and ensures unexpected impacts are addressed. Monitoring methods should be established in prediction and mitigation stages of the study and biodiversity data obtained through monitoring should be included in the clearinghouse mechanism and the BCIS.

### **Stage 7: Post-project audit**

Though rare in existing legislation, audits provide important information for improving the EIA processes. Audits of past EIAs reveal how accurately key impacts were identified and their effects predicted, how effective mitigation measures were, and to what extent the EIA process integrated environmental considerations into the decision making process. An audit could establish how well the objectives of the CBD are met through existing EIA practice which would help determine the relevance of EIA as a tool for implementing the CBD.

## **2.2 Strategic Impact Assessment**

Though EIA is widely adopted, it is commonly critiqued as reactive because it does not address underlying structures that predetermine project decisions. SEA addresses this by integrating environmental concerns into decision making at the programme and policy levels. Procedurally, "*...the vast majority of tasks involved in SEA are identical to those in project-level EIA...it follows that many of the methods employed are directly transferable, though many will differ in degree of detail and level of specificity*" (Wood and Djeddour 1991).

But impact assessment practitioners face problems when in applying EIA techniques to policies and programmes. Policy decisions are "*...based on intangible, political factors...*" (ISEA, 1994) which makes applying EIA's rigorous analytical process difficult. The adaptive nature of BIA (further explained in Section 4.3) would "*...ensure that the environmental considerations of policies are taken into account in an integrated way*" (ISEA, 1994).

## **2.3 Brief or Rapid Impact Assessment Techniques**

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Because the EIA process entails a significant investment of time and resources, not all projects, programmes, or policies are subjected to full assessments. Many countries and organisations, such as the US, the World Bank, and the Asian Development Bank, subject projects with minimal impacts to abbreviated assessments. Rapid impact assessment techniques are important for the conservation and sustainable use of biodiversity because they provide an opportunity to assess small projects or local policies which do not warrant full impact assessments but may effect biodiversity.

The same in principles, aims and characteristics as EIA rapid assessment differs in the:

- time involved in conducting the assessment;
- emphasis placed on significant issues and baseline information required;
- need for estimation and predictive approaches;
- kind of assessment methods involved; and
- range of possible final outcomes.

(Partidario, *et. al*, 1994)

### **3. EVALUATING IMPACT ASSESSMENT**

EIA, SEA and related impact assessment techniques have evolved much in their three decades of existence and numerous surveys show that EIAs have made significant contributions to decision making (Sadler, 1996). But do existing techniques take full advantage of the mandate supplied by the CBD or is further strengthening is necessary? A survey conducted by the International Institute of Impact Assessment (IIIA) suggests that country legislation does not adequately address biodiversity with fifty percent of those surveyed responding that biological diversity was not addressed either procedurally or technically in guidelines (Sadler, 1996).

Exactly what demands does the CBD place on impact assessment? What opportunities does the CBD offer for expanding the use and role of impact assessment? Do existing techniques rise to the occasion? And how can impact assessment develop in response to the CBD's mandates? Impact assessment techniques can be evaluated on procedural and structural levels. Procedural analysis determines how legislation and guidelines of the Contracting Parties can meet the objectives of the CBD. Structural analysis determines how capable EIA and related techniques are at meeting the objectives of the CBD.

#### **3.1 The Procedural Evaluation of Impact Assessment**

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A cross examination of legislation and the CBD's mandates reveals how and where biodiversity is and is not included in EIA procedures. This examination is done by measuring existing legislation and guidelines against criterion such as that in Table 3. The criterion are based on the individual Articles of the CBD. Annex 1 Table 6 presents the criterion along with an analysis of legislation or guidelines from six sample Contracting Parties - Canada, Germany, Indonesia, Nepal, and the UK - and outlines the limitations of the study.

The survey reveals that biodiversity considerations can be integrated into EIA through the use of guidelines to supplement legislation. For example the Canadian guidelines on biodiversity and environmental assessment (CEAA, 1996) outline methods of integrating biodiversity into the impact assessment stages thereby filling gaps left by the legislation. Indonesian (Howe, *et. al*, 1991) guidelines also explicitly identify ecosystems and species types to be considered in the EIA.

Also evident from the survey is that the specific types of ecosystems, species and uses - such as scientific, cultural, or spiritual - which the CBD lists for protection are addressed in the legislation and guidelines (see Table 6 Articles 7, 8, 10, and 12). But the more proactive concepts of the CBD, such as promoting education, providing access to transfer of technologies, and lending financial support and incentives, are not addressed (see Table 6 Articles 13, 15, 17, and 20). The mitigation stage of EIA may provide an opportunity to make projects more proactive by introducing measures to compensate for the use of biodiversity resources. This is consistent with Sadler's (1996) recommendation to require compensation for losses of resources and with the 'no net loss' concept in section 2.1.

### **3.2 Amending EIA**

This analysis of a sample set of legislation and guidelines shows us that there is opportunity to amend existing EIA practice and that guidelines play a critical role in this process. Contracting parties should take advantage of this opportunity by reviewing their own legislation and producing guidelines for the specific purpose of the CBD. The checklist in Table 4 which is derived from the Canadian experience (CEAA, 1996) supplements the criterion of Table 3 and will help Parties ask relevant questions of each stage. The whole process of updating legislation and guidelines will procedurally strengthen EIA.

### **3.3 Structural Evaluation of Impact Assessment**



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But is EIA alone capable of implementing all three of the CBD's objectives? The rigorous analytical process of EIA and other impact assessment techniques necessitates a position mid-stream of the planning process. For instance, screening a project requires some definition of project type and size. To determine which projects require EIAs the UK guidelines (Roe, *et. al*, 1995) list them by types such as crude oil refineries, trading ports, long-distance rail lines, etc. Similarly thresholds depend on specifications of size such as manufacturing plants of 20-30 ha or more or pig rearing installations housing more than 400 sows.

These early decisions are critical to the notion of sustainability. For the path of human development to take a more sustainable course these early decisions must consider biodiversity. In its current position in the planning process EIA spurs developers to address the impacts of their projects but it does not affect a shift in the development path. The impact assessment community itself agrees that existing techniques are not sufficiently holistic for improvements.

One alternative is to amend EIA so that it influences early decisions about the project would require a softening of the traditionally rigorous EIA approach. This in turn may sacrifice some of EIA's effectiveness down-stream. An alternative approach is to develop a supplemental tool that moves assessment into the first stages of planning. This approach is supported by the International Summit on Environmental Assessment (1996) which supports the development of links between environmental assessment and other planning and decision making processes.

### **3.4 A New Technique of Impact Assessment**

BIA builds on EIA and SEA processes giving them a more continuous flow by carrying them upstream. BIA looks at the biophysical reality, detects losses of or threats to biodiversity (the impacts), identifies their causes, and addresses the impacts. BIA has the advantage of ensuring biodiversity specifically is addressed in decision making processes of projects, programmes, and policies by founding ideas and actions on the biophysical reality. Some may question the need for a new assessment process but BIA performs a task not addressed by other techniques - the introduction of biodiversity concerns into initial planning stages. As a link between EIA or SEA and the initial stages of planning BIA serves to broaden the scope and depth of those techniques

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**Table 4 Checklist of Biodiversity Requirements for Legislation and Guidelines**

*Screening*

- Categories include activities likely to impact biological diversity such as projects which effect a protected area or projects which would result in the introduction of alien species.
- Thresholds apply biodiversity measures, especially those relevant to over-exploitation of plant and animal species.

*Preliminary Assessment*

- Impact lists include impacts on ecosystems, habitats, species, and communities important to biodiversity (as listed in Annex 1 Table 3).

*Scoping*

- Temporal and spatial parameters reflect biodiversity considerations.
- Cumulative effects on biodiversity are taken into account.
- Public participation is used to minimise bias in defining impacts.
- Impact lists include impacts on ecosystems, habitats, species, and communities important to biodiversity (as listed in Table 3).

*Identification*

- Methodologies include direct and indirect impacts on biodiversity such as habitat loss and fragmentation, introduced species, pollution of soil, water and atmosphere, and global climate change.
- Indicator species are used as criterion.

*Examination of Alternatives*

- Alternatives are assessed for their potential impacts on biodiversity and for the distribution of their costs and benefits.

*Prediction*

- Baseline biodiversity information is obtained from information in the clearinghouse mechanism and the BCIS.
- Existing baseline data is supplemented by further studies if necessary.
- Data produced through studies and predictions is available to the clearinghouse mechanism and BCIS thereby furthering the exchange of information (Article 17).

*Evaluation of Significance*

- Stakeholders are involved in the process of attaching significance to impacts thereby furthering the equitable sharing objective of the CBD.

*Mitigation*

- Stakeholders are involved in identifying mitigation measures.
- Incentive measures and management plans are used for mitigation measures where possible.
- 'No net loss' is used as a guiding principle in the design of mitigation measures.
- Mitigation ensures the project meets the equitable sharing objective.

*Review*

- Biodiversity concerns listed throughout the stages are adequately addressed .

*Monitoring*

- Biodiversity data are included in the clearinghouse mechanism and BCIS.

*Post-Project Audit*

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| <ul style="list-style-type: none"><li>• EIAs are audited for their ability to meet the objectives of the CBD in practice.</li></ul> |
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## **4. BIA- A TOOL FOR THE PLANNING PROCESS**

Biodiversity impact assessment is a method of integrating biodiversity issues into the early stages of planning processes. It is a tool to help plan a project, programme, or policy. Its purpose is to support the objectives of the CBD by enabling project, programme, or policy proponents to identify and achieve ways of integrating the *conservation*, *sustainable use*, and *fair and equitable sharing* of biological resources.

To achieve this BIA must:

- be integrated into planning processes starting at the earliest phases
- be non-adversarial in approach
- be adaptive in application and resolute in purpose
- provide a dual approach

### **4.1 Integration into the Planning Process**

As demonstrated in the introduction, fundamental patterns of human development cause biodiversity loss. Habitat loss and fragmentation, pollution of soil, water, and atmosphere, over-exploitation of species, and industrial agriculture and forestry are integral parts of the 'development' path promoted throughout the world. This path must change course if we are to spare ourselves and the natural systems we depend on. Sustainable development is a concept defined by the Brundtland Commission as a development path which meets the needs of the present with out compromising the ability of future generations to meet their own needs (WCED, 1987). Planning processes provide a window of opportunity for discovering and embarking on sustainable development paths.

EIA goes some way towards integrating biodiversity concerns into decision making processes but because of its application to the middle of the planning process it is unable to take full advantage of the CBD's mandate for sustainability. BIA is proposed as a supplement for EIA and SEA to help achieve the sustainable use objective of the CBD. BIA's success relies on its ability to affect changes in the early stages of planning. The fundamental changes necessary for the sustainable use of biodiversity require innovative projects, programmes, and policies. To spur this innovation BIA must be applied in the conceptual stage of planning.

### **4.2 A Non-adversarial Technique**

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Establishing a place in the early stages of decision making processes requires a technique palatable to developers, government officials, and local citizens. BIA must achieve a non-adversarial means of supporting biodiversity. It is important to embrace a position which recognises that development *per se* is not destructive and emphasises that BIA is a tool for making development sustainable, not for stopping development.

### **4.3 Adaptive in Application and Resolute in Purpose**

Achieving a position in the early stages of planning also requires a technique is easily adapted to the unique situation posed by every project, programme, and policy. BIA must be adaptive in application with several alternate methodologies and opportunity for independent developments and ideas. This adaptive nature will spur innovation needed to change the course of development. This does not mean that BIA forfeits its purpose of integrating biodiversity concerns. There should be a built-in system of checking that biodiversity conservation, sustainable use, and equitable sharing remain at the core of the BIA process. BIA must remain resolute in its purpose.

### **4.4 A Dual Approach**

An additional factor in developing BIA is that many projects, programmes, and policies are intended for purposes other than biodiversity's conservation, sustainable use, and equitable sharing. Often these are the very projects, programmes, and projects that adversely effect biodiversity. BIA must be a tool not only for developing biodiversity policies but also for integrating biodiversity concerns into other sectoral projects, programmes, and policies. This means BIA methodology must apply to two avenues of planning:

- planning for conserving, sustainably use, and equitably sharing biodiversity resources
- integrating biodiversity concerns into planning for other sectors.

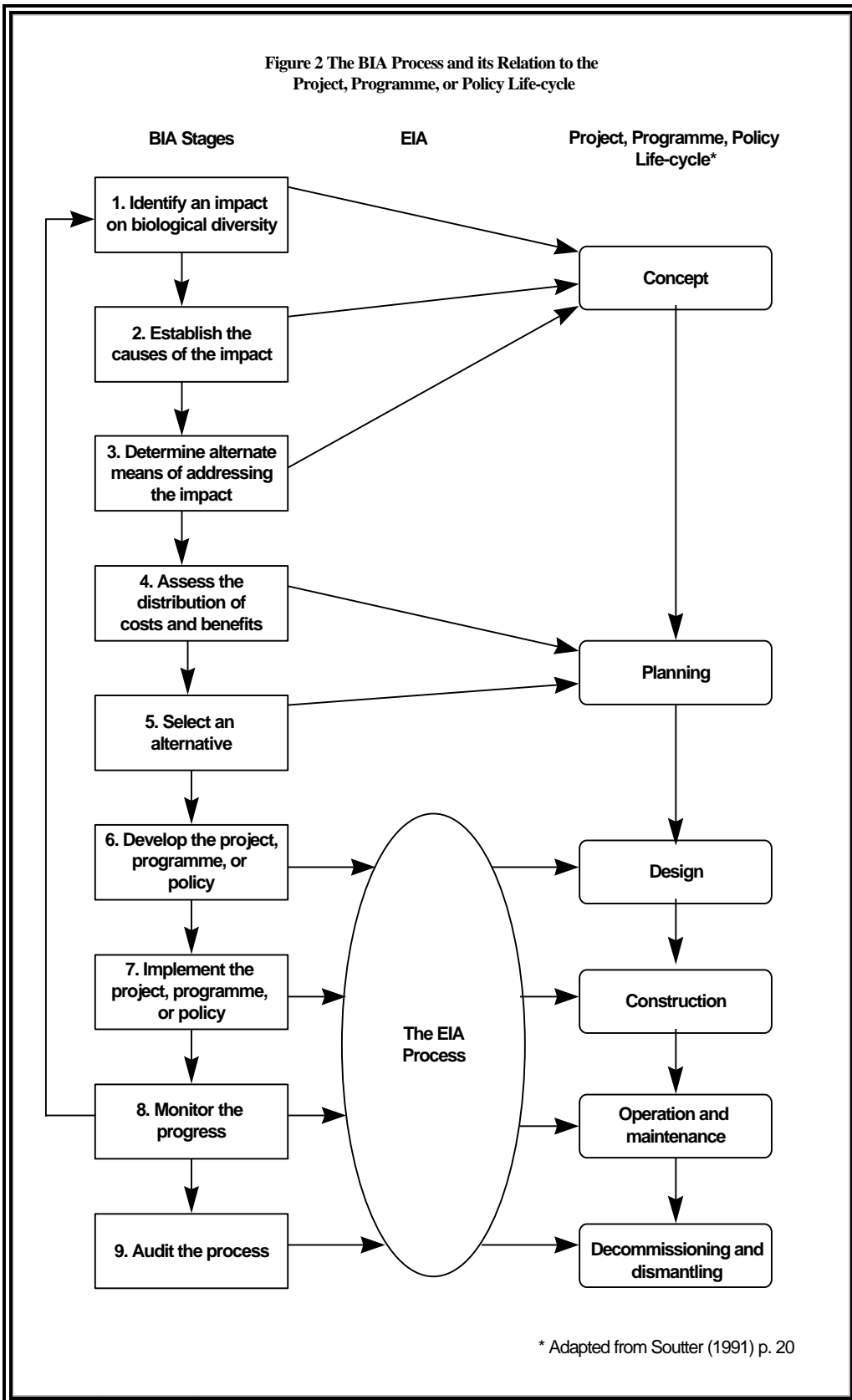
### **4.5 An Outline for Methodology**

These are but a few guiding principles which govern the development of a BIA methodology. Time and discourse will unveil more requirements of the new technique. But let us take these four and see how they interact to create a methodology which builds on EIA and transports biodiversity concerns to the heart of planning.

## **5. BIA METHODOLOGY**

An accessible, easy to use methodology needs clear guidelines but the requirements set out in Section 4 mean developing these guidelines will be a

Figure 2 The BIA Process and its Relation to the Project, Programme, or Policy Life-cycle



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difficult exercise. The challenge is to produce a methodology for BIA which will spur innovative thinking from the premise that biodiversity resources must be conserved, sustainably used, and equitably shared. The methodology proposed in this section and depicted in Figure 2 is adapted from a framework which developed out of discussions by an international expert group of ecologists and economists brought together by IUCN in 1996 to discuss the role of economics in addressing biodiversity issues (IUCN, 1996).

This methodology builds on conventional impact assessment techniques and carries biodiversity concerns to the early stages of planning. The methodology presented is not meant as an end solution but is instead intended to spur ideas about possible approaches.

The methodology is applied to a case study to provide the reader with an example of how BIA is intended to help formulate projects and policies. The example is based on information for a case study conducted by the Centre for Private Conservation (Seasholes, 1997) on Wood ducks.

### **5.1 Identify an Impact on Biological Diversity**

The purpose of BIA is to bring the objectives of the Convention into initial stages of planning, so the first step is to think about a project, programme, or policy from the biophysical perspective. This entails looking at the existing state of biodiversity and asking if there is a loss or threat (an impact) that needs to be addressed. Information about the state of biodiversity can be obtained through existing studies, by using tools such as checklists and matrices, and through interviews and discussions with the public. The first step is to ask the questions:

- What biodiversity is significant in the region?
- What is happening to that biodiversity?
- Are there species, communities, or ecosystems which are threatened in the region?

To give an example, a paper company executive wishing to develop a new product determines from asking these questions that a member of the region's waterfowl, the Wood duck, is declining in population. At a different level, a federal policy maker realises a decline in the Wood duck population across its range.

### **5.2 Establish the Causes of the Impact**

Having identified a loss or threat, the next stage is to establish proximate and underlying causes of this loss or threat. This is not a straightforward task and

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the process is prone to bias if the assessment group is too homogeneous, just as with the scoping stage of EIA. A broader perspective can be obtained by using a team with diverse backgrounds and by opening the process to public participation. A useful guideline is to ask if the loss is caused by proximate factors such as:

- habitat loss and fragmentation;
- introduced species;
- over-exploitation of plant and animal species;
- pollution of soil, water, and atmosphere;
- global climate change; or
- industrial agriculture and forestry.

It is important to ask if the proximate causes are related to underlying causes such as:

- economic incentives or disincentives (subsidies or taxes, for example) or
- social conduct laws (zoning legislation, for example)

The temporal and spatial parameters of the project, programme, or policy is important as these determine which causes the proponent is able to address.

In the case of our Wood ducks the executive and policy maker study available information about the nesting and land-use patterns over the last 200 years and identify loss of habitat as a proximate cause of the decline. The Wood duck's nesting habitat is deciduous forests near water, also known as bottomland hardwood forests. Over 200 years bottomland forests have steadily been converted to cropland.

This in turn has been spurred by a series of federal acts including the Swamp Land Drainage Acts of 1849, 1850, and 1860 and the Flood Control Acts of 1928 and 1944 (Seasholes, 1997). Another cause of the decline in population is the excessive hunting, or over-exploitation, of the species.

### **5.3 Determine Alternate Means of Addressing the Impact**

Knowing the impact and its causes the next step is to determine what can be done about it. The proponent identifies several means of addressing the impact and its causes including a 'do-nothing' alternative. Brainstorming sessions, open dialogues with stakeholders, and surveys of similar impacts and responses can help this process. Innovative solutions should be encouraged and considered at this stage.

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To take our Wood duck example, the executive notes the response of concerned individuals has been to create habitat by building wooden nesting boxes and placing them near water. One option for the executive is to produce wooden boxes ready for assembly. Another option is to donate company funds to a local NGO which studies the Wood duck's nesting habits, determines the optimal location for woodland along the river, and pursues reforestation. Yet another option is to produce a paper nesting box. With open discussion, the list of options can go on and would likely include some innovative alternatives. Similarly numerous options are available to the policy proponent. He can institute a policy which bans or limits Wood duck hunting or he can introduce a new subsidy for the reintroduction of wetlands which creates an incentive for conservation. A third option is to repeal the existing legislation which removes the perverse incentives of the Swampland Drainage and Flood Control Acts.

#### **5.4 Assess the Costs and Benefits of Each Alternative**

Each alternative is subjected to an analysis of the social, economic, and environmental costs and benefits to determine which alternative is a 'best response'. This analysis also determines the distribution of those costs and benefits which will help proponents meet the fair and equitable sharing objective of the CBD.

The analysis should use monetary valuations where possible but can also include qualitative information. Though quantitative data often relies on economic or ecological expertise qualitative data most often comes from community sources. Including and equally considering qualitative data ensures public participation is taken seriously and carried out effectively.

To carry our Wood duck example further, the executive gathers all of the alternatives identified in Section 5.3 and determines the qualitative and quantitative costs and benefits of each alternative. He opens the process to the community as a whole and they help identify the winners and losers of each alternative. The policy proponent subjects his alternatives to a similar process.

To take the policy proponent's situation as an example let us say the first option, a hunting ban, costs the government \$10,000 in enforcement, \$5,000 in lost hunting licences, and much angst from hunters. The benefits are an additional 200 Wood ducks after a year of the ban and positive reactions from the conservation community. The second option, legislating a new subsidy for reintroducing wetlands, costs \$50,000 in subsidies distributed, and \$5,000 in administration. The benefits are blessings from the conservation and hunting communities and an additional 1,000 Wood ducks in five years time. The third option entails \$5,000 in administration costs and angst from farmers losing their subsidies but results in 1,000 Wood ducks in five years time, blessings



from hunters and conservationists, and no additional costs for subsidies. Doing nothing has no monetary costs but results in negative reactions from the hunters and conservationists and 250 fewer Wood ducks. Table 5 displays these costs and benefits and reveals the winners and losers of each option.

**Table 5 Sample Matrix for Assessing the Alternatives**

	Hunting ban or limit	Subsidy for restoring wetlands	Repeal of existing subsidies	Do nothing
Costs in dollars	\$15,000	\$55,000	\$5,000	\$0
Costs in angst	-	no change	-	--
Wood ducks	200 in 1 year	1,000 in 5 years	1,000 in 5 years	-250
blessings	+	++	++	no change
DISTRIBUTION:				
hunters	-	+	+	-
conservationists	+	+	+	-
farmer	=	+	-	=
government	-	-	+	-
Wood ducks	+	+	+	-

++ much better off

+ better off

= at the same level

- worse off

-- much worse off

## 5.5 Select an Alternative

From the above analysis one alternative is selected. Recognising the constraints the country and region's social, cultural, and political values the selection should reflect an equitable sharing of the distribution of benefits derived from the use of biological resources. Making the selection and supporting reasons explicit and public helps to ensure equitable distribution.

Having identified the costs and benefits of each alternative, and the distribution of those costs and benefits, the policy maker decides to repeal the existing subsidies as this is clearly the best option for the stakeholders. However, if the political situation was such that the farmers had a particularly strong lobbying position this option may not be feasible. At this stage the

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policy proponent may go back to the drawing board and discover that a policy of replacing the perverse incentives with more benign subsidies would allay the angst of the farmers and make this option politically feasible.

### **5.6 Develop the Project, Programme, or Policy**

At this stage it is appropriate to formulate the project, programme, or policy. Development steps are unique to the type and size of project, programme, or policy but biodiversity is integrated into decisions throughout the development process. Having chosen to produce a paper nest our executive will have to experiment with materials and design to arrive at an end product. The policy maker will design the legislation and identify means of implementation.

Once the project, programme, or policy has been developed it is then subjected to legislated EIA or SEA processes. A well conducted BIA reduce the cost of an EIA or SEA because it ensures the best alternative has been selected and appropriate mitigatory measures are in place. Though the new product is unlikely to require an EIA, the policy should be subjected to an SEA. Because biodiversity was the motive for the policy and much of the background work has been done, the SEA should be straightforward.

### **5.7 Implement the Project, Programme, or Policy**

Implementing the project, programme, or policy is a lengthy process and a strategy should be developed to ensure it goes smoothly. Strategies also ensure biodiversity considerations and mitigatory measures developed throughout the BIA are properly administered. Continued interest in biodiversity at this stage helps the group identify impacts which eluded them before and address those impacts as appropriately as possible. The new legislation will likely take time to pass through legislative procedures. The policy maker should follow the process throughout, ensuring that the *raison d'être* for the policy remains intact.

### **5.8 Monitor the Progress**

Monitoring the progress of the project, programme, or policy throughout the implementation and operative stages is crucial to ensure it is conducted appropriately. Also monitoring identifies problems as they arise and in time to be corrected. Data collected through the monitoring exercises can add to information available through the clearinghouse mechanism and BCIS and thereby help decision makers in other countries or organisations. In monitoring the subsidy repeal the policy maker may find an unintended consequence of the policy is to clear forests instead of wetlands. He then

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returns to the first stages, determine what is happening to the state of biodiversity, find proximate and underlying causes, etc.

### **5.9 Audit the Process**

Auditing is crucial for improving the BIA process. Audits review the entire process and determine if appropriate impacts were identified, their causes established accurately, the alternatives given appropriate considerations, and costs and benefits analysed correctly. An audit also determines if BIA meets the CBD's objectives and if the process is capable of instituting change in the path of human development.

## **6. CONCLUSIONS AND RECOMMENDATIONS**

The rapid depletion of biodiversity and our dependency on this resource has caused nearly 170 nations around the world to come to agreement on the need to conserve, sustainably use, and equitably share biological resources. The Contracting Parties have agreed on the need to shift the path of human development so these objectives are met. It is time now to develop techniques which deliver this shift.

Impact assessment has potential as a means of integrating biodiversity concerns into decision making processes. Procedurally, existing impact assessment techniques, with a few adaptations, amend projects and policies so that biodiversity concerns are addressed. But the structural constraints of traditional impact assessment techniques render them unable to infuse the early stages of planning with consideration for biodiversity. EIA and SEA alone are unable to affect the shift in the development path called for in the CBD.

BIA is a new technique of impact assessment that holds potential to help EIA and SEA achieve the three mandated objectives of the Convention. By introducing biodiversity concerns into the conceptual stages of the planning process BIA can achieve the full integration needed to spur innovative solutions which place biodiversity conservation, sustainable use, and equitable sharing at the core of planning processes.

This paper provides a brief survey of the state of affairs in impact assessment and proposes an outline for BIA methodology and its application. There is much work yet to be done. Regarding existing EIA legislation and guidelines:

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- A more complete survey of existing EIA legislation is needed to determine the extent to which Contracting Party EIA legislation procedurally meets the CBD's mandates.
  - A standardised method of assessing and updating legislation and guidelines, based on the experiences of Canada and the World Bank, should be developed in keeping with the capacity building objectives of the CBD.

Regarding the development of BIA techniques:

- There is a need for further discussion about the potential uses of BIA and for the development of a methodology.
- Methods of carrying BIA into the operational phase of a project, programme, or policy through a biodiversity management system need to be explored.
- Case studies should be carried out to determine how BIA would alter decisions.
- Guidelines should be written and tested for applying BIA to planning process.

Recommendations can be divided into actions required by the stakeholders: the Conference of the Parties, the Standing Body for Scientific, Technical, and Technological Advice, the Contracting Parties, and the Impact Assessment Community.

### **6.1 The Conference of the Parties (COP)**

The COP should lend their support to research and develop BIA methodologies. COP4 should call for the initiation of an intensive study into existing EIA legislation and guidelines, based on the brief study conducted for this paper but with more attention to the relationship between guidelines and legislation. They should also call for the organisation of a conference to discuss the potential uses of BIA and outline possible methodologies for the new technique.

The COP should also address BIA and EIA in a thematic manner, similar to that used for incentive measures. This would integrate BIA and EIA into relevant sectors of the Convention such as forestry, agriculture, marine and coastal environments, and inland waters.

### **6.2 The Subsidiary Body on Scientific, Technical, and Technological Advice (SBSTTA)**

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SBSTTA should make recommendations that COP4 carry out the decisions called for above. SBSTTA should also include BIA in the agenda of the upcoming meeting and thereafter integrate BIA thematically, as was recommended to COP. SBSTTA would then make their BIA recommendations to COP thematically.

Additionally, SBSTTA should provide a forum for discussing the potential uses of BIA and possible methodologies. They should call for and support further research into existing EIA practices and case studies which determine the extent to which BIA application would change decisions. Subsequently, SBSTTA should lend their support to efforts to establish and test guidelines.

### **6.3 Parties**

Parties should subject their own EIA legislation and guidelines to a test similar to that outlined in Section 3 and conducted by Canada to ensure they are meeting their commitments to the Convention. If they find their legislation and guidelines fall short of their obligations they should make appropriate amendments and consider how the application of BIA could help. The Parties should lend their support to research efforts and should take an active role in discussions surrounding the development of BIA. Once a methodology has been developed, Parties should test the new technique, make recommendations for guidelines, and require the refined process to be applied to projects, programmes, and policies.

### **6.4 The Impact Assessment Community**

The impact assessment community should support efforts to design BIA methodology and should participate in discussions regarding the new technique. The impact assessment community already recognises the potential of impact assessment as a tool for biodiversity through their inclusion of biodiversity as a theme to IAIA's 18th annual conference. This should be supported by workshops on BIA, the development of a methodology, and eventually guidelines for BIA. The impact assessment community should also provide technical support to Contracting Parties updating their legislation and guidelines.

### **6.5 Concluding Remarks**

As stated before, this paper is only an initial survey into Biodiversity Impact Assessment. There is a great need for more information about the state of EIA and SEA practices around the world and the potential role for BIA. The conclusion has suggested several options for furthering the development of BIA and more will come out of subsequent discussions. But there are several

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practical questions that have gone unmentioned, such as who will conduct the research, who will take the lead in organising a forum for discussion, where the funding come from? These must be addressed and answered soon so that BIA can start to integrate biodiversity concerns into planning processes...so that we can move towards changing the path of human development to one that will conserve, sustainably use, and equitably share the benefits from the use of our precious biological diversity.

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## APPENDIX

### Establishing the criterion and the limitations of the study

The method chosen here to examine the existing legislation and guidelines entails establishing a set of criterion based on the CBD and using this as a benchmark. These criterion are based on the three objectives of CBD: the *conservation* of biological diversity; the *sustainable use* of its components; and the *fair and equitable sharing* of benefits arising from its use. They are derived from individual Articles of the CBD, specifically:

- Article 7: Identification and Monitoring,
- Article 8: *In situ* Conservation,
- Article 10: Sustainable Use of Components of Biological Diversity,
- Article 12: Research and Training,
- Article 13: Public Education and Training,
- Article 15: Access to Genetic Resources,
- Article 17: Exchange of Information, and
- Article 20: Financial Resources.

Because the criterion are a guide, it is not necessary that the wording of the legislation and guidelines exactly match that of the criterion. This means a certain amount of subjectivity is involved in determining what is meant by the legislation and guidelines examined. The study is also limited by time and funding constraints which have resulted in a selection of legislation and guidelines based on availability. It would be useful to conduct a full survey of the legislation and guidelines of all Contracting Parties to determine how effectively biodiversity is integrated into EIA legislation around the world and to have a better basis for recommending improvements for EIA procedures.

Using both guidelines and legislation in the study introduces some bias as guidelines, by their non-binding nature, are more detailed than legislation. This produces a division between the legislation (Germany and the UK) and the guidelines (Indonesia and Nepal) made obvious in Table 3 where Indonesia's guidelines make more specific references to biodiversity than either Germany or the UK's legislation. This discrepancy is intensified where, as in the case with Indonesia, the guidelines are sector specific as there is more opportunity to identify specific biodiversity issues relevant to that sector. It would be useful to identify which legislation requires the use of specific guidelines, what those guidelines include, and therefore to what extent legislation indirectly addresses biodiversity issues.

**Table 6 Evaluating EIA**

**Countries**

C – Canada, G – Germany, I – Indonesia, N – Nepal, P – Pakistan, U - United Kingdom

	C	G	I	N	P	U
<b>DO GUIDELINES AND LEGISLATION:</b>						
<i>Article 7 Identification and Monitoring</i>						
Identify ecosystems and habitats:						
containing high diversity?	X	x	X	x	x	x
containing large numbers of endemic or threatened species?	X	x	X	x	x	x
containing endemic or threatened wilderness?	X	x	X	x	x	x
required by migratory species?	X	x	x	x	x	x
of social, economic, cultural, or scientific importance?	X	x	X	X	X	X
are representative of unique evolutionary or other biological processes?	X	x	X	x	x	X
Identify species and Communities which are:						
threatened?	X	X	x	x	X	X
wild relatives of domesticated or cultivated species?	X	x	x	x	x	x
of medicinal, agricultural or other economic value?	X	x	X	x	X	
of social, scientific, or cultural importance?	X	x	X	X	X	X
of importance to research into the conservation and sustainable use of biological diversity?	x	x	X	x	X	x
Described genomes and genes of social, scientific or economic importance?	X	x	X	x	x	
Identifies processes and categories of activities which have or are likely to have significant adverse impacts on the conservation and sustainable use of biological diversity?	X	X	X	x	x	x
<b>DO PROJECTS:</b>						
<i>Article 8 In-situ Conservation</i>						
Impact on an established protected area?	X	X	x	X	x	X
Impact on biological resources important for the conservation of biological diversity	X	X	X	x	x	X
Impact on attempts to protect ecosystems or promote the recovery of threatened species?	X	X	X	x	x	
Release living modified organisms resulting from biotechnology which are likely to have adverse environmental impacts that could affect conservation and sustainable use of biological resources?	x		x	x	x	x
Rehabilitate or restore degraded ecosystems or promote the recovery of threatened species?	x		X			x
Take into account risks to human health?	X	X	X	X	X	X
Introduce alien species which threaten ecosystems, habitats, or species?	X		X			
Impact on the knowledge, innovations, and practices of indigenous and local communities embodying traditional lifestyles?	X		x	X		
Impact on attempts to conserve components of biological diversity in an <i>ex situ</i> context?			x			

Impact on attempts to adopt measures for the recovery and rehabilitation of threatened species and for their reintroduction into their natural habitats?	x		<b>X</b>			
	C	G	I	N	P	U
<i>Article 10 Sustainable Use of Components of Biological Diversity</i>						
Adopt measures to avoid or minimize adverse impacts on biological diversity?	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>
Impact on local populations' attempts to develop and implement remedial action in degraded areas where biological diversity has been reduced?	x		x	x		
<i>Article 11 Incentive Measures</i>						
Adopt measures that act as incentives for the conservation and sustainable use of biodiversity?						
<i>Article 12 Research and Training</i>						
Impact on research which contributes to the conservation and sustainable use of biodiversity?	<b>X</b>		<b>X</b>	x		x
<i>Article 13 Public Education and Awareness</i>						
Promote the understanding of the importance of the conservation of biological diversity						
<i>Article 15 Access to Genetic Resources</i>						
Impact on the sovereign rights of States over their natural resources and their authority to determine access to genetic resources?						
Impact on endeavors to facilitate access to genetic resources for environmentally sound uses?						
Impose restrictions that run counter to the objectives of the CBD?						
Provide and/or facilitate access to and transfer of technologies relevant to the conservation and sustainable use of biodiversity?						
<i>Article 17 Exchange of Information</i>						
Facilitate the exchange of information relevant to the conservation and sustainable use of biodiversity?			<b>X</b>			
<i>Article 20 Financial Resources</i>						
Lend financial support and incentives to activities intended to achieve the objectives of the CBD?			<b>X</b>	x		
(For a developed country) provide new financial resources enabling developing countries to meet the CBD's objectives?						

Sources: Canada: CEAA (1995) and CEAA (1996); Germany: German Federal Ministry for Economic Co-operation and Development (DMZ), (1995); Indonesia: Howe, C.P., *et. al.*, (1991); Nepal: National Conservation Strategy Implementation Project, (1994); Pakistan: Government of Pakistan, (1989); UK: Department of the Environment, (1989), Department of Environment (1995) and Morris, P. and R. Therivel (*eds.*), (1995).