

Implementation of the Convention on Biological Diversity in Mesoamerica: environmental and developmental perspectives

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SUMMARY

Mesoamerica (Southern Mexico, Guatemala, Belize, El Salvador, Honduras, Nicaragua, Costa Rica and Panama) is a culturally diverse region considered a conservation priority due to its biotic richness and high endemism. The Convention on Biological Diversity (CBD) sets out obligations and objectives for national parties to cope with biodiversity reduction, and encourages these national parties to develop measures to conserve and manage biodiversity. This paper presents trends in Mesoamerican countries in the implementation of the CBD, specifically in relation to the general measures for conservation and sustainable use (Article 6), identification and monitoring (Article 7), and *in situ* conservation (Article 8) derived from examination of reports from the CBD National Reports unit, questionnaires to national focal points, and interviews in the field. In general, there was increased effort toward CBD implementation and related issues. The scientific capacity, political stability, and accessibility to resources in each country, however, influenced the rate at which capacity was being built and the relative importance governments afforded to each of the CBD articles. Lack of resources or institutional limitations are identified as major impediments to fulfilling obligations. The CBD is also poorly known among actors in civil society and at several levels of administration. Overall, Costa Rica and Mexico are exceptions in the region with regard to inventory and monitoring, and the efforts to incorporate biodiversity into broader intersectoral policies. However, the measures required to ensure the fair and equitable sharing of benefits arising from biodiversity are poorly developed, or not developed at all, in the region. It is pivotal that, since Mesoamerica is one of the poorest regions in the world, any attempt to conserve biodiversity in the region must include sustainable use and equity.

Keywords: conservation, inventory, monitoring, implementation, biodiversity, Convention on Biological Diversity (CBD)

INTRODUCTION

Mesoamerica (Southern Mexico, Guatemala, Belize, El Salvador, Honduras, Nicaragua, Costa Rica and Panama) is an area with common historical, political and ecological features. In the region many crops of global importance have been domesticated (FAO [Food and Agricultural Organization of the United Nations] 2001). High species richness diversity, and endemism have been widely documented (see Simpson 1964; Duellman 1966; Cook 1969; Wilson 1974; Wake & Lynch 1976). Nine thousand endemic plants and numerous vertebrates belong to the region (Table 1). As a whole, the region is moderately forested (Table 2), has a broad range of vegetation and forest types, including lowland, montane or alpine forests (FAO 1999).

The role that local groups have played in nurturing cultural and wild diversity is considerable in many nations of Mesoamerica. Indigenous peoples represent significant proportions of the population in many Mesoamerican nations (World Bank 1998). The indigenous population is estimated to be between 47% and 55% of the entire population in Guatemala (World Bank 1998). It is lower in other Mesoamerican countries: less than 1% in Costa Rica and El Salvador, 5–7% in Nicaragua, Panama and Honduras, and 10% in Belize. The majority of the indigenous people are based in remote countryside (World Bank 1998). Most of the continuous tracts of forest are located inside territories traditionally inhabited by indigenous people (Nietschmann 1995).

Deforestation is one of the major threats to biodiversity in the region, one steadily increasing form being the conversion of forest into agricultural or pasture lands. This conversion has particularly resulted from government-induced or spontaneous migration, infrastructure development and insecure land tenure systems (De Jong *et al.* 2000). In the northern part of the region, oil prospecting and exploitation are additional major threats to biodiversity because of the associated impacts, for example increasing fragmentation, road construction, impacts on local economies, and increased numbers of new settlements (De Jong *et al.* 2000).

The region has also been the scene of violent confrontations during the last decades; civil wars developed in Guatemala, El Salvador and Nicaragua. At the beginning of the last decade, armed conflict ended in Nicaragua, followed by El Salvador and, finally, Guatemala. (Universidad de San Carlos de Guatemala 1997; World Bank 1998; Oficina de

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Table 1 Higher vertebrate and plant species richness (total known species in parenthesis) and endemism in Mesoamerican countries (modified from Groombridge 1992; Stotz *et al.* 1996; Gillespie *et al.* 2001)

Country	Mammals	Birds	Reptiles	Amphibians	Plants
Mexico	136 (439)	88 (961)	368 (717)	169 (284)	3624 (34000)
Belize	0 (163)	0 (571)	2 (121)	1 (42)	150 (3000)
Guatemala	4 (184)	0 (480)	19 (231)	25 (88)	1171 (9000)
El Salvador	1 (135)	0 (450)	4 (73)	0 (23)	17 (3000)
Honduras	1 (173)	1 (725)	11 (152)	9 (56)	148 (5000)
Costa Rica	8 (205)	6 (848)	17 (214)	34 (162)	1800 (13000)
Nicaragua	2 (193)	0 (695)	6 (161)	2 (59)	57 (7000)
Panama	11 (218)	6 (922)	18 (226)	22 (164)	1222 (9000)

Derechos Humanos del Arzobispado de Guatemala 1998; Luciak 2000). Land tenure systems, and security, and access to resources fed the conflicts in all three cases where nearly 80% of the population live in extreme poverty, while 85% of the land is in the hands of 2% of the population (World Bank 1998). At present, land tenure security and access to land remains as one of the most sensitive issues in the region.

Today the area is considered a high conservation priority with respect to biodiversity (Mittermeier *et al.* 1998). Mesoamerica is thus attractive for many stakeholders, both international and national conservation non-governmental organizations (NGOs), pharmaceutical companies, research groups, local and indigenous people, and tourism investors. Stakeholders' interests can be conflicting in many cases, the definition of rights of access to resources and the distribution of benefits arising from the use of biodiversity resources are often contested.

During the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in June 1992, the Convention on Biological Diversity (CBD) was opened for signature. It entered into force on 29 December 1993 and currently has 183 parties. The main objectives of the CBD are (1) the conservation of biological diversity, (2) the sustainable use of its components, and (3) the fair and equitable sharing of the benefits arising from the use of genetic resources (UNEP [United Nations Environment Programme] 1992). We report on the progress of CBD implementation in Mesoamerica by reviewing national activities in relation to General measures for conservation and sustainable use (Article 6), Identification and monitoring (Article 7), and *In situ* conservation (Article 8). These articles

are obviously interdependent, and inventory and monitoring are crucial for biodiversity-rich countries that usually lack enough resources for such activities. *In situ* conservation initiatives will reflect the level of development related to the previous Articles. To monitor the achievements of contracting parties, the Conference of the Parties (COP) has recommended that national reports should be submitted to the CBD secretariat twelve months before the following COP meeting (UNEP 2000). *In situ* conservation is defined by the CBD as the conservation of ecosystems and natural habitats, and the maintenance and recovery of viable populations of species in their natural surroundings and, in the case of domesticated or cultivated species, in the surroundings where they have developed their distinctive properties. *In situ* conservation is, and will remain, by far the most important form of biodiversity conservation (Groombridge 1992). Managing protected areas comprise the most common form of *in situ* conservation strategy practised. In addition, it is widely accepted and thought to provide opportunities for rural development, generating income and creating jobs, for example through research and tourism. However, effectiveness of protected areas as both conservation tools and development promoters, still needs to be seen.

The costs of implementing the CBD are high, especially for developing countries. International support has helped with the design of national strategies. In other cases, governments have launched programmes to support conservation efforts through some kind of biodiversity use. Biodiversity prospecting is seen as one conduit to finance implementation-related costs. Bioprospecting may be seen to have potential in a region with high biodiversity (Steck 1999; Mateo 2000). Biodiversity prospecting or bioprospecting is defined as a process by which new, useful natural products are discovered, and can draw upon traditional knowledge (Berlin *et al.* 1999, Dhillion *et al.* 2002). Its relation to conservation is based on the assumption that, through bioprospecting, developing countries could generate funds for building capacity for advanced technology and the conservation of biodiversity (Dhillion *et al.* 2002). At present there is not enough evidence supporting bioprospecting as a viable and sustainable activity that could *per se* promote biodiversity conservation (Dhillion & Amundsen 2000; Dhillion *et al.* 2002).

Our intention in this paper is to present and discuss the status and process of CBD implementation, without drawing conclusions as to success or failure of implementation.

Table 2 Land forest cover, and forest cover change in Mesoamerica (modified from Groombridge 1992; FAO 1999).

Country	Total land area (ha)	Forest cover (ha)	Forest cover change 1990–1995 (%)
Mexico	190 869	55 205	–1.08
Belize	2280	1348	–2.32
Guatemala	10 843	2850	–1.71
El Salvador	2072	121	–4.60
Honduras	11 189	5383	–1.03
Costa Rica	5106	1968	–0.77
Nicaragua	12 140	3278	–3.01
Panama	7443	2876	–1.65

Among the activities we describe, not all are initially associated with the CBD. For example, *in situ* activities like designation of protected areas started prior to the CBD. In addition, the potential for conservation may be dependent on different forces, such as economic recession impacting the rates of deforestation. Therefore, we also examine how pre-existing initiatives are now placed within the more recent CBD framework. Prior to presenting our findings on the implementation of the Articles, we examine the actors and costs involved in the process of implementation.

METHODS

We conducted interviews and used questionnaires at focal points (government offices that are designated to coordinate CBD-related work) in Mexico, Costa Rica, Guatemala and Nicaragua, namely individuals at the Ministry of Environment and Energy (MINAE) in Costa Rica, the Ministry of Environment and Natural Resources (MARENA) in Nicaragua, the Biodiversity Institute (INBio) in Costa Rica, the Technical Office for Biodiversity (OTECBIO) in Guatemala, and the Mexican National Commission for the Knowledge and Use of Biodiversity (CONABIO). A questionnaire was sent to all focal points in seven countries in the region; Honduras and Belize did not complete it. The questionnaire was a self-completion questionnaire, with closed questions and, at the end, some space for comments. The questionnaire inquired about the respondent's perception of issues related to Articles 6, 7 and 8 of the CBD. Questions focused on: the priority afforded by governments to implementation of Articles 6, 7 and 8; adequacy of resources for meeting the obligations derived from the CBD; the status of different programmes related to Articles 6, 7 and 8; the status of legislative measures, if there was legislation related to bioprospecting in the country; and actors involved in different programmes associated with the implementation of the CBD.

To monitor the achievements of contracting parties, the CBD has adopted the following mechanisms: the COP reviews the implementation of the Convention, each contracting party presents reports to the COP on measures that have been taken to implement the Convention, and a secretariat arranges meetings of the COP, under Articles 23.4, 26 and 24 (UNEP 1992). The COP has recommended that national reports should be submitted to the CBD secretariat twelve months before the following COP meeting (UNEP 2000); we therefore examined these national reports. National reports that were available at the CBD national report unit up to August 2001 were qualitatively analysed, available reports included those from Mexico, Guatemala, Belize, El Salvador, Nicaragua, Costa Rica and Panama.

We also conducted unstructured interviews with key informants during field visits to Costa Rica, Mexico and Guatemala between 1998 and 2001. Key informants included people working at the administrative unit of protected areas, researchers (ecologists and social scientists), people who work

or had worked with programmes associated with the implementation of the CBD (National Biodiversity Strategy and Action Plan, inventory and monitoring) and with leaders in rural communities (Playon de la Gloria, Galacia and Flor del Marques in Chiapas, Mexico; Santa Cecilia, Brasilia and Birmania in Guanacaste, Costa Rica; and Ixcán, Guatemala). We asked them about their perception of different projects and programmes (bioprospecting and protected areas), how decisions were made, and to what extent they were involved in projects and programmes associated with the CBD.

RESULTS

Actors involved in CBD implementation

The implementation of the CBD depends on a number of actors at the local and regional level. Environment ministries or secretariats exist in all of the countries; two of them, namely Costa Rica's MINAE and Panama's Autoridad Nacional del Ambiente (ANAM), were created prior to adoption of the CBD, but most of them have been created recently (Table 3).

Costa Rica's INBio and Mexico's CONABIO deal with monitoring, inventory and related activities in these two countries. Universities are key actors in civil society that can support CBD implementation since much expertise and knowledge resides there. Other actors were difficult to identify; CBD and related issues do not appear to be a priority issue for civil society in the region. Although it is obvious that indigenous peoples' groups, local peasants and women are important stakeholders for CBD implementation, they were not revealed as significant in our analysis. An important group in the region is the intergovernmental Comision Centro Americana para el Ambiente y el Desarrollo (CCAD; Central American Commission for Development and Environment), created in 1989 by the presidents of the seven Central American countries to address deforestation (CCAD 1989). In 1992, CCAD coordinated the development of a joint position (Agenda 2000) for the region at UNCED. After UNCED, CCAD supported the creation of the Central American Inter-Parliamentary Commission on the Environment (CCAD 2002). Recently, CCAD has supported Central American focal points to structure and deliver national reports for the COP. CCAD now aims to strengthen those national initiatives that seek to address natural resource management and to harmonize policies and national legislation with regard to sustainable development in the region. CCAD is placed at the highest political level in the region and could exert an impact on national decisions, policies and programmes.

Costs associated with CBD implementation

Many countries are experimenting with bioprospecting agreements and, at least in Costa Rica, the agreements appear to be viable (Table 3). INBio's biodiversity prospecting

Table 3 Summary of efforts towards CBD implementation in Mesoamerica. MARN: Ministerio de Ambiente y Recursos Naturales, MARENA: Ministerio del Ambiente y Recursos Naturales, ANAM: Autoridad Nacional del Ambiente, MINAE: Ministerio de Ambiente y Energía, MNR: Ministry of Natural Resources, SERNA: Secretaría de Recursos Naturales, SEMARNAP: Secretaria de Medio Ambiente Recursos Naturales y Pesca.

Activity	Country							
	Mexico	Belize	Guatemala	El Salvador	Honduras	Nicaragua	Costa Rica	Panama
<i>General measures for conservation and sustainable use (Article 6)</i>								
National reporting	On time	First on time, second delayed	Not submitted	First on time, second delayed	Not submitted	Not submitted	First on time, second delayed	First on time, second delayed
National authority in charge of CBD	SEMARNAP	MNR	MARN	MARN	SERNA	MARENA	MINAE	ANAM
National biodiversity strategy	Finished	Ongoing	Finished	Finished	Ongoing	Finished	Finished	Finished
National action plan	Finished	Ongoing	Ongoing	Ongoing	Ongoing	Finished	Ongoing	Ongoing
Legal regulation for bioprospecting	Ongoing, but weak	Weak	Weak	Very weak	Weak	Very weak	Ongoing	Weak
Biodiversity law	None	None	None	None	None	None	Approved	None
<i>Identification and monitoring (Article 7)</i>								
Inventories of biodiversity components	Advanced	To some extent	To some extent	To some extent	To some extent	To some extent	Advanced	To some extent
Monitoring of the status of biodiversity in the country	Ongoing	Unorganized	Unorganized	Unorganized	Unorganized	Unorganized	Ongoing	Unorganized
<i>In situ conservation (Article 8)</i>								
System of protected areas	Implemented	Ongoing	Implemented	Ongoing	Implemented	Implemented	Implemented	Implemented
Measures to encourage fair and equitable sharing	Early stages of development	None	Peace accords have some elements, but not measures implemented	None	None	Early stages of development	Early stages of development	Ongoing
Legislative measures to regulate access to resources through bioprospecting	None	None	None	None	None	None	Ongoing	None
Agreement with companies or others to conduct bioprospecting	No agreement, but some research centres are collecting plants and related information	None	None, even though one national pharmaceutical company is collecting plants and related information	None	None	None	Yes agreement between INBIO and Merck & Co., ICBG, British Technological group, University of Massachusets, EARTH, Eli Lilly and others	Discussions ongoing with Novartis Pharma

programme seeks out potential users of biodiversity and facilitates the flow of Costa Rican biodiversity samples and information for commercial research and development (Table 3). The royalties generated by this activity could contribute to the management of protected areas and eventually to Costa Rica's development economy. INBio negotiates payments to cover all its costs during the research process. In addition, 10% is given to MINAE to support conservation. Future royalties are also negotiated; any royalty will be shared equally with MINAE (Mateo 2000). There are no agreements signed in any other country in the region, however Panama is considering ways of negotiating with a company (Table 3). Even when there are no signed agreements in Mexico and Guatemala, national companies or research centres are collecting plants and related knowledge (Table 3).

Article 6: general measures for conservation and sustainable use

All Mesoamerican countries considered in this review ratified the Convention rather early, between 1993 and 1995 (Table 4). In addition, they made institutional arrangements for the CBD eventually to be incorporated into national policies (Tables 3 and 4). Guatemala, Honduras and Nicaragua did not submit the first national report due in 1996. Mexico, Belize, El Salvador, Costa Rica and Panama submitted their first national reports between 1997 and 1998.

Table 4 Mesoamerica. Parties to the Convention on Biological Diversity and institutions responsible for its implementation.

<i>Country</i>	<i>Signed</i>	<i>Party</i>	<i>Institution responsible for the CBD at the national level</i>
Mexico	13 June 1992	11 March 1993	Secretariat of Environment and Natural Resources
Belize	13 June 1992	30 December 1993	Ministry of Natural Resources and the Environment
Guatemala	13 June 1992	10 July 1995	Ministry of Natural Resources and the Environment
El Salvador	13 June 1992	9 August 1994	Ministry of Natural Resources and the Environment
Honduras	13 June 1992	31 July 1995	Secretariat of Environment and Natural Resources
Costa Rica	13 June 1992	26 August 1994	Ministry of Environment and Energy
Nicaragua	13 June 1992	20 November 1995	Ministry of Natural Resources and the Environment
Panama	13 June 1992	17 January 1995	National Environment Authority

All the countries in the region have engaged in the design of national biodiversity strategies; in most cases they are complete. The strategies are published for Mexico, Guatemala, El Salvador, Nicaragua and Costa Rica (CONABIO 1997; MARN [Ministerio de Ambiente y Recursos Naturales] 1997; CONAMA [Comision Nacional del Medio Ambiente] 1999; MINAE 2001). The strategy has involved diverse groups, ranging from universities to indigenous people. However, in countries where the involvement of broad sectors of civil society is key, the participation of some groups has been limited; for instance, there has been limited participation from indigenous people, despite their significant numbers in the region.

The strategy in Costa Rica and Mexico has guidelines to incorporate biodiversity into broader policy and institutional decisions (CONABIO 1997; MINAE 2001). Mexico and Guatemala have each a general act (Ecological Equilibrium and Environmental Protection), which incorporates some elements of biodiversity use and protected areas. There are no explicit policy or legal/regulatory frameworks specifically for the conservation or sustainable use of biodiversity in Belize, El Salvador, Nicaragua or Panama, and no guidelines for the incorporation of the CBD into national legislation. However, there is legislation that establishes protected areas: the National Park Systems Act, and the Forest Act in Belize; a draft Natural Protected Areas Act in El Salvador and Panama's Act 41 (passed in 1998). Costa Rica's legislative assembly passed the Biodiversity Act (Ley de Biodiversidad) in 1998, making it the first country to develop this category of national legislation in Mesoamerica (Mateo 2000).

Within the different governments, the issue of protected areas has more importance than biodiversity, as reflected in budgets and the numbers of officers appointed to address the respective themes and legislative measures. There is general recognition of the need to incorporate biodiversity issues into policy decision-making, but usually there is a lack of political compliance in the governmental departments with this. One of the serious problems is that the CBD is not well known among politicians or civil society.

Article 7: identification and monitoring

The relative priority afforded to implementing identification and monitoring activities, as prescribed by Article 7, varies between countries. For Mexico, Nicaragua and Costa Rica, the priority is high even though the resources are limited. Selected fauna and flora groups and ecosystems have been inventoried and universities play an important role in the process in Mexico. Inventory activities are minimal in Guatemala, although universities and some international NGOs effect some inventory and monitoring. The Belize Biodiversity Information System summarizes zoological information in Belize; government agencies and NGOs are also collecting data on animal and plant species. Universities and NGOs have conducted inventories in El Salvador, and the information has been published, but there seems to be no

real coordination and no clear priorities. However, some work is being done to develop a more comprehensive system for inventory and monitoring. In Nicaragua, inventory has been prioritized according to the availability of resources; for instance, at the species level, activities are restricted to some key groups and, at the ecosystem level, only major ecosystems are being identified. There are programmes to identify and develop means to monitor biodiversity components in Costa Rica, through INBio.

For most countries, the amount of work required is much greater than the financial and technical resources that the countries can allocate or rely on externally. Universities, museums and other research institutions can play a role in this process, but these institutions usually lack basic resources. The clear exceptions are Mexico's CONABIO and Costa Rica's INBio.

Article 8: in situ conservation

All countries in the region have a system of protected areas (Table 5) and, to some extent all countries are in the process of reviewing or expanding guidelines for the selection, establishment and management of protected areas. Criteria like species richness, endemism, species distribution, extinction risk, and ecosystem diversity are used as guidelines for the establishment of protected areas in Mexico. Protected areas are established in sites with high species richness, sites where endemic species, threatened species or species with limited distribution occur, or areas with high ecosystem diversity. Costa Rica on the other hand proposes a novel model for protected areas, integrating civil society into the management of the protected areas through the participation of NGOs in the financial mechanisms and fund raising. Most protected areas in Guatemala, Belize, Honduras, Nicaragua and Panama are managed centrally through governmental offices, but some efforts have been made to incorporate the private sector through co-management agreements or areas managed completely by NGOs.

The measures to ensure respect, maintain knowledge and practices of indigenous and local communities, and encourage the equitable sharing of the benefits arising from the use of such knowledge and practices, as prescribed by

Article 8, are still very poorly developed or not developed at all in Mesoamerica. Panama is advancing national legislation and regulations in regard to benefit sharing and property rights. Mexico, Belize, Guatemala, Costa Rica and Nicaragua recognize the importance of developing legislation and regulation in regard to indigenous knowledge and encourage the equitable sharing of the benefits arising from the use of such knowledge, but no clear initiatives were identified.

DISCUSSION

Mesoamerican countries differ in their implementation of the CBD. Not all have developed along the same paths at the same time but, in general, there is a regional trend towards implementation of the CBD.

National reporting to the CBD is a key measure, which enables the COP to assess the overall status of the Convention's implementation. At the national level, the process will help governments to identify gaps, achievements and constraints to implementation. As shown by this study, national reporting is delayed in some cases or not fulfilled in other cases, which could be due to the relative importance governments afford to accomplishing the commitments of the CBD. National reporting, however, is not by itself a measure of the status and trends of diversity conservation in the country concerned.

It is important to note that all countries considered in this review have a governmental institution (ministry in most of the cases) that is responsible for the implementation of the CBD. The capacity of a government to formulate, enforce and evaluate policies will depend on institutional, financial and human resources (Rosendal 2000). Government employees interviewed and reports constantly point out the lack of resources or institutional limitations as impediments to fulfil obligations in the cases considered in this review (MARN 1997; CONAMA 1999; CONABIO 2000; MINAE 2001). Government officers and the levels of participation and involvement in the CBD's national strategy and action plans, show that the CBD is little known among key groups in society and at local levels of administration. This represents a problem when implementation achievements are evaluated, because it might be possible that the target groups are not really reached by institutions and policies.

With the exception of Costa Rica and Panama, all other ministries were created after 1992, which points to the CBD's role in triggering the formation of biodiversity institutions. Costa Rica has proved highly compliant towards CBD implementation, and has been pioneering in many aspects; the most remarkable are the biodiversity act and bioprospecting agreements that aim to fund conservation efforts. The response to the CBD through the creation of specific environmental ministries and their specific functions requires additional study across the region.

Inventory and monitoring activities are essential as information sources that could be used, among others, to provide a basis for further research, define management, guide policy

Table 5 Protected areas in Mesoamerica.

Country	Total area of protected land (km ²)	Proportion of national territory as protected areas (%)	Protected areas integrated into a national system
Mexico	159 759	8.10	Since 1996
Belize	9130	39.76	Process ongoing
Guatemala	21 666	19.90	Since 1996
El Salvador	52	0.24	Process ongoing
Honduras	11 309	10.09	Process ongoing
Costa Rica	12 044	23.66	Since 1989 (prior to the CBD)
Nicaragua	16 375	11.06	Since 1999
Panama	15 473	19.71	Since 1998

and decision-making, and provide information necessary for the sustainable use of natural resources (Reyers *et al.* 1998; Dhillion *et al.* 2002, 2003). Mesoamerican countries have developed very different trends with respect to inventory and monitoring. While Costa Rica and Mexico have strong structured programmes, the rest of the countries are rather weak in addressing these needs, limited mainly by funds and scientific capacity.

Mesoamerican parties have identified *in situ* conservation as being important. The emphasis is mostly on protected areas and other aspects of Article 8 are poorly accomplished, particularly those regarding traditional knowledge and equitable sharing of the benefits arising from the use of such knowledge. This is particularly critical in the region since indigenous people groups are numerous and diverse, and have faced conflicts concerning their traditional territories and contested their legal rights for a long time (Nietschmann 1995). For hundreds of years, these groups have been struggling to achieve recognition and respect for their rights and traditional ways of living and organization (Nietschmann 1995). Since there is a strong positive relationship between the occurrence of indigenous territories and priority conservation areas, governments and the international community can no longer disregard the participation and involvement of indigenous people in conservation efforts (World Bank 2000). Local groups' participation in protected areas is believed to improve conservation and biodiversity management (Brandon & Wells 1992; Wells & Brandon 1993; Kremen *et al.* 1998, 1999; Perrings & Lovett 1999). Conflicts that need to be resolved, however, centre on indigenous groups and land areas that have been traditionally occupied, or rural inhabitants seeking land areas large enough to provide for biodiversity conservation, use and management. It has been argued by many that indigenous peoples' positive and active participation in forest ecosystem management can only occur if (1) they acquire legal rights over territories that are sufficiently large for sustainable resource management, with governments providing adequate legal and police protection to such territories, (2) the indigenous peoples are empowered to make decisions concerning the sustainable use and management of biodiversity in these territories, and (3) government provides adequate assistance to adapt to changing land-use technologies and needs (Nepal & Weber 1995; Venter & Breen 1998; Becker 1999; Brechin *et al.* 2002).

Protected areas in the region take priority over any other *in situ* conservation strategy; it appears that protected area projects and policies are likely to remain detached from local and indigenous people's participation. Decisions as to locations and boundaries of protected areas, their goals and uses, are taken by central government offices with the advice or pressure from national and international NGOs, often without much local involvement.

It is important to point out that CBD effectiveness to reduce biodiversity loss and threats to it should be evaluated at many levels, i.e. local, provincial, national, regional and international, since all have responsibilities towards biodiver-

sity conservation. In addition, different perspectives have to be considered, for example political, economical, legislative and biological (Brechin *et al.* 2002). Given Mesoamerica's high global conservation priority, it is important to promote efforts that do not only preserve natural resources, but also integrate all the complexity that characterizes the region (Aguilar Støen & Dhillion 2002). Since it is one of the poorest regions in the world and the levels of marginalization for gross segments of the population are rather alarming, any attempt to conserve biodiversity in the region must and should include sustainable use and equity. The success of biodiversity conservation and management depend on the strength, involvement and commitment of social actors, as well as on the effectiveness of communicating policies and programmes. Effective communication requires the strong and active involvement of different stakeholders, such as NGOs, community-based groups, private investors, indigenous peoples, the scientific community and governmental agencies (Brechin *et al.* 2002; Chipanshi 2002; Dhillion *et al.* 2002).

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References

- Aguilar Støen, M. & Dhillion, S.S. (2002) The Convention on Biological Diversity (CBD) in Mesoamerica: implementing activities related to Articles 6, 7 and 8. Working Paper 2002/01, Centre for Development and the Environment, University of Oslo, Norway.
- Becker, C.D. (1999) Protecting a garua forest in Ecuador: the role of institutions and ecosystem valuation. *Ambio* 28 (2): 156–161.
- Berlin, B.E., Berlin A., Fernández Ugalde, J.C., García Barrios, L., Puett, D., Nash, R. & González-Espinoza, M. (1999) The Maya ICBG: drug discovery, medical ethnobiology, and alternative forms of economic development in the Highland Maya Region of Chiapas, Mexico. *Pharmaceutical Biology* 37: 127–144.
- Brandon, K.E. & Wells, M.P. (1992) Planning for people and parks—design dilemmas. *World Development* 20 (4): 557–570.
- Brechin, S.R. Wilshusen, P.R. Fortwangler, C.L. & West, P.C. (2002) Beyond the square wheel: toward a more comprehensive understanding of biodiversity conservation as social and political process. *Society and Natural Resources* 15 (1): 41–64.
- CCAD (1989) Convenio constitutivo de la Comisión Centroamericana de ambiente y desarrollo. Antecedentes historicos [www document]. URL <http://ccad.sgsica.org/antecedentes/antecedenteshistoricos.htm>
- CCAD (2002) Agenda Centroamericana sobre ambiente y desarrollo [www document]. URL <http://www.marn.gob.sv/legisla/regional/agendaaca.htm>

- Chipanshi, A. (2002) Constraints to implementing international agreements: the case of the Montreal Protocol in Botswana. *Ambio* 31 (1): 30–34.
- CONABIO (1997) Situación actual sobre la gestión, manejo y conservación de la diversidad biológica de México. Primer reporte nacional a la Conferencia de las Partes del Convenio sobre Diversidad Biológica [www document]. URL <http://www.conabio.gov>
- CONABIO (2000) Informe anual de actividades [www document]. URL http://www.conabio.gob.mx/institucion/conabio_espagnol/doctos/inf2000.pdf
- CONAMA (1999) Estrategia Nacional para la Conservación y Uso Sostenible de la Biodiversidad–Guatemala–Informe de proyecto [www document]. URL <http://www.biodiv.org/doc/world/gt/gt-nbsap-01-es.pdf>
- Cook R.E. (1969) Variation in species density of North American birds. *Systematic Zoology* 18: 63–84.
- De Jong, B., Ochoa-Gaona, S., Castillo, M., Ramirez-Marcial, N. & Cairns, M. (2000) Carbon flux and patterns of land-use/land cover change in the Selva Lacandona, Mexico. *Ambio* 29 (8): 504–511.
- Dhillion, S.S. & Amundsen, C. (2000) Bioprospecting and the maintenance of biodiversity. In: *Responding to Bioprospecting. From Biodiversity in the South to Medicines in the North*, ed. H. Svarstad & S.S. Dhillion, pp. 103–130. Oslo, Norway: Spartacus Forlag AS.
- Dhillion, S.S., Donavanik, J. & Ampornpan, L. (2003) The development of biodiversity institutions and regulations in Thailand. Working Paper 2003/xx, Centre for Development and the Environment, University of Oslo, Norway (in press).
- Dhillion, S.S., Svarstad, H., Amundsen, C. & Bugge, H.C. (2002) Bioprospecting: effects on environment and development. *Ambio* 31 (6): 491–493.
- Duellman, W.E. (1966) The Central American herpetofauna: an ecological perspective. *Copeia* 4: 700–719.
- FAO (1999) *State of the World's Forest*. Rome, Italy: FAO.
- FAO (2001) Food security (www document). URL <http://www.fao.org/biodiversity/>
- Gillespie, T.W., Nicholson, K. & McCray, J. (2001) Patterns of vertebrate species richness and conservation in Nicaragua. *Natural Areas Journal* 21: 159–167.
- Groombridge B. (1992) *Global Biodiversity, Status of the Earth's Living Resources*. London, UK: Chapman & Hall.
- Kremen, C., Raymond, I. & Lance, K. (1998) An interdisciplinary tool for monitoring conservation impacts in Madagascar. *Conservation Biology* 12 (3): 549–563.
- Kremen, C., Razafimahatratra, V., Guillery, R.P., Rakotomalala, J., Weiss, A. & Ratsisompatrarivo, J.S. (1999) Designing the Masoala National Park in Madagascar based on biological and socioeconomic data. *Conservation Biology* 13 (5): 1055–1068.
- Luciak I. (2000) Democracy and its discontents: Life in post-conflict Central America. *Development* 43 (3): 43–49.
- MARN (1997) Primer informe del País–El Salvador– a la Conferencia de las Partes del Convenio sobre Diversidad Biológica [www document]. URL <http://www.biodiv.org/doc/world/sv/sv-nr-01-es.pdf>
- Mateo, N. (2000) Bioprospecting and conservation in Costa Rica. In: *Responding to Bioprospecting. From Biodiversity in the South to Medicines in the North*, ed. H. Svarstad & S.S. Dhillion, pp. 45–55. Oslo, Norway: Spartacus Forlag AS.
- MINAE (2001) First National Report from Costa Rica [www document]. URL <http://www.ns.minae.go.cr>
- Mittermeier, R., Myers, N. & Thomsen, J.B. (1998) Biodiversity hotspots and major tropical wilderness areas: approaches to setting conservation priorities. *Conservation Biology* 12 (3): 516–520.
- Nepal, S.K. & Weber, K.E. (1995) Managing resources and resolving conflicts–National parks and local people. *International Journal of Sustainable Development and World Ecology* 2 (1): 11–25.
- Nietschmann (1995) Conservación, autodeterminación y el Área Protegida Costa Miskita, Nicaragua. *Mesoamerica* 16 (29): 1–55.
- Oficina de Derechos Humanos del Arzobispado de Guatemala (1998) Guatemala Nunca Más. Informe Proyecto interdiocesano de recuperación de la memoria histórica. Guatemala: Editorial Piedra Santa.
- Perrings, C. & Lovett, J. (1999) Policies for biodiversity conservation: the case of sub-Saharan Africa. *International Affairs* 75 (2): 281–282.
- Reyers, B., Van Jaarsveld, A.S., McGeoch, M.A. & James, A.N. (1998) National biodiversity risk assessment: a composite multivariate and index approach. *Biodiversity and Conservation* 7 (7): 945–965.
- Rosendal, K. (2000) *The Convention on Biological Diversity and Developing Countries*. Dordrecht, the Netherlands: Kluwer Academic Publishers.
- Simpson, G.G. (1964) Species density of North American recent mammals. *Systematic Zoology* 13: 57–73.
- Steck, B. (1999) Sustainable tourism as a development option. Practical guide for local planners, developers and decision makers. Federal Ministry of Economic Cooperation and Development, Germany.
- Stotz, D.F., Fitzpatrick, J.W., Parker, T.A., III & Moskovits, D.K. (1996) *Neotropical Birds: Ecology and Conservation*. Chicago, USA: University of Chicago Press.
- UNEP (1992) Text of the Convention on Biological Diversity [www document]. URL <http://www.biodiv.org>
- UNEP (2000) Conference of the Parties to the CBD V, Decision V/19 [www document]. URL <http://www.biodiv.org>
- Universidad de San Carlos de Guatemala (1997) *Acuerdos de Paz*. San Carlos, Guatemala: Universidad de San Carlos de Guatemala, Editorial Universitaria.
- Venter, A.K. & Breen, C.M. (1998) Partnership forum framework: Participative framework for protected areas outreach. *Environmental Management* 22 (6): 803–815.
- Wake, D.B. & Lynch, J.F. (1976) The distribution, ecology, and evolutionary history of plethodontid salamanders in tropical America. *Los Angeles Natural History Museum, Scientific Bulletin* 25: 1–65.
- Wells, M.P. & Brandon, K.E. (1993) The principles and practice of buffer zones and local participation in biodiversity conservation. *Ambio* 22 (2–3): 157–162.
- Wilson, J.W., III (1974) Analytical zoogeography of North American mammals. *Evolution* 28: 124–140.
- World Bank (1998) Guatemala: an assessment of poverty. Unpublished report 12313-GU, pp. 1–4, Human Resources Operations Division, Latin America and the Caribbean Regional Office, World Bank Group, Washington DC, USA.
- World Bank (2000) Mexico Mesoamerican biological corridor project: environmental assessment. Unpublished report E-405, pp. 1–6, Natural Resources Management Sub-sector, Latin America and the Caribbean Regional Office, World Bank Group, Washington DC, USA.