Chapter Two

Policy Responses

Policy background

Sustainable development issues present a difficult challenge to conventional government structures. They are typically complex problems with political, social, economic, environmental, intergenerational and international implications, and it is difficult for any one government department or agency to address such complex issues as some dimensions will inevitably fall outside the department's normal remit. The solution lies in better planning, co-operation and co-ordination, and thereby improving integration – both horizontally (between departments at the same level) and vertically (between departments at different levels).

There are a number of reasons why some Caribbean governments are not yet fully able to address sustainable development issues. The main reasons are – inadequate funding, or lack of resources; insufficient human resources, coupled with inadequate training; and technical considerations relating, for example, to the absence of an integrated approach to the issues at national level (ECLAC 1999). Often, these impediments are compounded by the existence of weak government infrastructure and non-compliance with the law – even when laws are in existence.

These institutional issues, in conjunction with a lack of agreement on the long-term goal of the national development strategy, and with the very real technical and political difficulties of operationalizing elusive concepts such as sustainability, make it difficult for Caribbean governments to deliver a long-term strategy for sustainable development without extensive and fundamental changes in the system of government, existing institutional arrangements and the prevailing political culture.

MEAs and non-binding agreements

Global MEAs

A review of multilateral environmental agreements (MEAs) has shown that more than 100 conventions hold some relevance to the Caribbean, of which 13 are of particular importance (Caribbean Law Institute 1998a; Box 2.1). However, determining the extent to which many of these global MEAs have impacted Caribbean regional or national environmental programming and the environment in the region is difficult to assess, for two reasons. First, environmental initiatives at the national level are largely driven by Country Environmental Profiles (CEPs) and/or National Environmental Action Plans (NEAPs) prepared by Caribbean governments, often with the encouragement of bilateral and multilateral funding institutions. Second, there is no accepted methodology or agreed set of indicators, and few data, for determining the impacts of international MEAs on the environment at the national level.

Global conventions, much as regional ones, place obligations on the signatories and many have implications even for states that have not ratified the particular convention. Table 2.1 shows the level of ratification of

Box 2.1: Global MEAs of particular importance to the Caribbean

Basel: Convention on the Transboundary Movements of Hazardous Wastes and their Disposal. Basel, 22 March 1989.

CBD: Convention on Biological Diversity. Nairobi, 22 May 1992.

CITES: Convention on International Trade in Endangered Species of Wild Fauna and Flora. Washington, 3 March 1973.

CLOPD: International Convention on Civil Liability for Oil Pollution Damage. Brussels, 29 November 1969 (as amended in 1976 and 1984).

Heritage: UNESCO Convention Concerning the Protection of the World Cultural and Natural Heritage. 23 November 1927.

OILPOL: International Convention for the Prevention of Pollution of the Sea by Oil. London, 12 May 1954 (as amended in 1962 and 1969).

London Dumping Convention: Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter. London, Mexico City, Moscow, Washington D.C., 29 December 1972 (and its 1996 Protocol).

MARPO: International Convention for the Prevention of Pollution from Ships. London, 2 November 1973 (as amended by the Protocol of 1978).

Ozone: Convention for the Protection of the Ozone Layer. Vienna, 22 March 1985; and Protocol on Substances that Deplete the Ozone Layer. Montreal, 16 September 1987.

Ramsar: Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention). Ramsar, 2 February 1971.

SOLAS: International Convention for the Safety of Life at Sea. 1 November 1974.

UNCLOS: Convention on the Law of the Sea. Montego Bay, 10 December 1982.

UNFCCC: Framework Convention on Climate Change. New York, 9 May 1992.

Other global MEAs of lower priority to the region include:

CMS: Convention on the Conservation of Migratory Species of Wild Animals. Bonn, 23 June 1979.

CCD: Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa. Paris, 17 June 1994.

Note: dates are dates of adoption, not entry into force.

global MEAs by Caribbean states. The table indicates that of the 13 conventions identified as particularly important, eight (UNCLOS, Ozone Layer, UNFCCC, SOLAS, Biodiversity, CITES, Basel and Heritage) have been ratified by more than 50 per cent of the states.

One anomalous feature of note is the low level of ratification of pollution-related conventions. The existence of a regional oil spill response mechanism (supported by the Cartagena Convention) indicates governmental interest, and the public outcry against shipments of waste (especially hazardous wastes) through the region suggests that there is public support. Yet this is not reflected in the ratification of related global MEAs, such as the International Convention on Civil Liability for Oil Pollution Damage.

Significant levels of involvement in international MEAs may be related to the perception of immediate benefit versus potential problem in Caribbean states (UNFCCC, Ozone Layer, Biodiversity) and the level of involvement of the convention's secretariat in working with individual states (UNCLOS, CITES).

Governments of the region are usually aware of the measures necessary to ensure compliance with global MEAs. However, that awareness is often restricted to one or two agencies, and in many cases widespread support is absent. Additionally, the general public is well informed about only a few MEAs, such as the Ozone Layer, Biodiversity and CITES, which have implemented awareness-raising campaigns through both public and non-governmental organizations.

Few new national institutions have been created specifically for the implementation of global MEAs, either at the national level or at regional level. Inter-agency co-ordinating mechanisms have been established in a few countries, based on the regulatory and scientific focus/requirements of CITES. More than ten Caribbean Community (CARICOM) countries that are parties to the UNFCCC are currently collaborating to implement the Caribbean Planning for Adaptation to Global Climate Change project. This project involves a combination of national pilot/demonstration activities, regional training and technology transfer.

Given that the environmental programmes in Caribbean countries are driven more by bilateral and multilateral funding arrangements than by MEA obligations, it is difficult to determine the impact or effectiveness of global MEAs in promoting national legislation to protect the environment. In general, there is very limited enactment of national laws to facilitate compliance with the obligations of global MEAs. For the international treaties adopted by Caribbean Countries, most have not been supported by legislation at the national level. In the few cases where such laws exist, such as those dealing with protected species, the laws were often enacted prior to ratification of the related MEA. Regulatory measures and mechanisms were developed primarily to address national environmental

Table 2.1: Caribbean signatories to relevant international environmental conventions

(actual numbers in brackets)	CBD 174 parties	CITES 145 parties	CMS 56 parties	Basel 121 parties	Ozone 168 parties	UNFCCC 176 parties	CCD 144 parties	Ramsar 144 parties	Heritage 156 parties	UNCLOS 130 parties
Latin America & Caribbean (33)	100 (33)	94 (31)	18 (6)	82 (27)	97 (32)	97 (32)	88 (29)	67 (22)	88 (29)	82 (27)
Caribbean (13)	100 (13)	85 (11)	0 (0)	69 (9)	92 (12)	92 (12)	85 (11)	23 (3)	69 (9)	100 (13)
Antigua and Barmuda	●	●		●	●	●	●		●	●
Bahamas	●	●		●	●	●		●		●
Barbados	●	●		●	●	●	●			●
Cuba	●	●		●	●	●	●		●	●
Dominica	●	●		●	●	●	●		●	●
Dominican Rep	●	●			●		●		●	●
Grenada	●				●	●	●		●	●
Haiti	●					●	●		●	●
Jamaica	●	●			●	●	●	●	●	●
St Kitts and Nevis	●	●		●	●	●	●		●	●
St Lucia	●	●		●	●	●	●		●	●
St Vincent and the Grenadines	●	●		●	●	●	●			●
Trinidad and Tobago	●	●		●	●	●		●		●

● = parties to environmentally related conventions

Source: Compiled from the websites of the various conventions.

Box 2.2: Biodiversity policy

Initiatives in biodiversity conservation occur at both the national and regional levels, and involve many and varied actors. Unfortunately, these activities appear to be sporadic and project-driven, rather than resulting from any systematic planning process. At the national level, ten countries are now embarked on the preparation of national biodiversity strategies and action plans (NBSAP) funded with GEF resources (ECLAC 1997). An increasing number of countries are also undertaking activities (involving both government agencies and NGOs) under related international conventions such as Ramsar and CITES.

Data on investments in biodiversity conservation are sparse, but those available for funding from government sources and NGOs based in the United States show that the Caribbean received a very small percentage of total US funding: 2 per cent in 1987 (US$ 918 465) and 4 per cent (US$ 2 826 613) in 1989. Areas of focus included research, site/species management, policy planning/analysis, education, and institutional strengthening. Nevertheless, a number of actions have been initiated at the regional level, including:

- the establishment of the Inter-American Biodiversity Information Network (IABIN);
- maintenance of an Internet mailing list on biodiversity by the Island Resources Foundation;
- preparation of a Caribbean Action Plan as supporting activity under the International Coral Reef Initiative, and
- increasing the capacity of communities to manage biodiversity, facilitated by the Caribbean Natural Resources Institute (CANARI).

Given the existing levels of resources, information and popular support, no immediate change is expected in the status of, and pressures on, biological resources in the Caribbean. Future directions for biodiversity action in the Caribbean should include:

- implementation of biodiversity strategies at the national level;
- development of protected areas to protect valuable ecosystems, especially those of regional importance;
- greater use of information networks, such as IABIN, BIONET and BCIS;
- incorporation of biodiversity impact assessment in policy analysis, sustainable development/physical planning, and development control activity;
- incorporation of biodiversity conservation measures in sectoral projects (tourism, watersheds, etc.);
- incorporation of biodiversity impact assessment as part of the project assessment procedures of donor institutions;
- increased attention to the issues of bioengineering, biosafety and agricultural production;
- improved research, monitoring and evaluation, including harmonization of methods and guidelines;
- restoration of degraded areas, and
- improvement in the collection, manipulation, storage, retrieval and dissemination of information.

problems, and not as a response to the obligations assumed by ratification of the global MEAs.

However, some areas of potential progress exist. It is anticipated that with nine countries now preparing national biodiversity strategies, national implementation of the Biodiversity Convention will be supported by legislation, clear institutional mechanisms and adequate resources (Box 2.2).

Issues relating to the United Nations Framework Convention on Climate Change (UNFCCC) and Ozone Layer conventions are also being addressed in varying degrees throughout the region. Although only Aruba and Cuba have developed or upgraded national legislation to address these issues, almost all of the other states have ratified or acceded to relevant international conventions, including the UNFCCC, and are participating in the Caribbean Plan for Adaptation to Climate Change project. A few countries have undertaken enabling activities and measures to address greenhouse sinks and resources. Some, including Barbados, Cuba, Dominica, Jamaica and St. Lucia, promote the use of alternative and renewable sources of energy, including solar, hydroelectric, biomass and biogas. Jamaica has attempted the use of wind energy, and biomass has been utilized in the sugar cane industry in Cuba. Barbados, Guyana and Jamaica have attempted to promote efficient renewable energy technologies through the application of economic incentives and policies. Most governments have been actively promoting the efficient use of non-renewable energy sources. However, with few exceptions consumers have not been offered sufficient inducements to make the switch. Lack of progress in adopting alternative energy sources is attributed in part to costs – which are currently higher than traditional sources – and in part to the lack of public information about energy-efficient technologies and renewable energy options, although this is being addressed in some instances through public awareness programmes.

There are other notable exceptions: Barbados has placed an environmental levy on non-recyclable goods entering the country, and Jamaica has revised its import policy and guidelines to prevent the entry of motor vehicles and other goods containing products that contribute to the greenhouse effect.

Regional MEAs

The limitations on assessing the impact and effectiveness of global MEAs also hold true for regional MEAs. However, the effects of regional MEAs are more tangible at the level of regional programming.

The only environmental convention covering the whole of the Caribbean region is the Cartagena Convention (Table 2.2) and its protocols on oil spills, specially protected areas and wildlife, and pollution from land-based activities (under development). However, most Caribbean countries have also signed a number of other conventions and protocols that are relevant to regional and national environmental initiatives.

Table 2.2: Status of the Cartagena Convention

	Cartagena[1] Convention	Oil Spills[2] Protocol	SPAW[3] Protocol
Anguilla			
Antigua and Barbuda	●	●	●
Bahamas			
Barbados	● ●	● ●	
British Virgin Islands	● ●	● ●	●
Cuba	● ●	● ●	● ●
Dominica	●	●	
Dominican Republic			
Grenada	● ●	● ●	
Haiti			
Jamaica	● ●	● ●	●
Montserrat			
St. Kitts & Nevis			
St. Lucia	● ●	● ●	●
St. Vincent and the Grenadines	●	●	● ●
Trinidad and Tobago	●	●	●
Turks and Caicos	● ●	● ●	●

Source: Modified from UNEP CEP Website: http:www.cep.unep.org/

● = Signed ● = Ratified or acceded

1 Entered into force on 11 October 1986

2 Entered into force simultaneously with the Convention on 11 October 1986

3 Awaits ratification by five more signatories before its entry into force.

Over the next decade, the Caribbean countries would be expected to use these agreements and associated programmes to move their countries and the region towards a position of strength with respect to environmental management and long-term development of the region's resources. To this end governments, supported by regional efforts, will continue to promote and implement policies and programmes in support of integrated coastal area management, require more science and data-based decision-making in national planning and development efforts, and demand more cost-effective use of technical human resource pools in the region.

In support of the national and regional efforts to make the Caribbean Sea an environmentally sustainable zone, the governments of the region continue to seek

Box 2.3: Barriers to implementation of global and regional MEAs

A number of barriers hinder treaty adoption and national implementation of treaty commitments. Case studies from four Caribbean countries have identified the following constraints:

- limited financial, technical and human resources;
- lack of political priority for environmental protection and sustainable development;
- lack of information and understanding of treaty benefits and costs, and
- lack of national focal points responsible for treaty acceptance.

Constraints on national implementation of treaty commitments were identified as:

- lack of expertise and inadequate financial/human resources in relevant departments to 'champion' legislative follow-up and enforcement;
- a tendency on the part of international financial institutions to support projects rather than long-term institutional capacity-building;
- other political priorities, and
- the lack of comprehensive framework environmental legislation.

Source: Caribbean Law Institute (1998b)

Note: dates are dates of adoption, not entry into force.

international recognition of the Caribbean Sea as a 'Special Area'. A formal proposal to this effect will be presented to the United Nations General Assembly Special Session on SIDS in September 1999. The preparation of this proposal would entail defining the concept of 'Special Area' in detail, seeking political support for its acceptance and implementation, and making an analysis of the international and regional conventions within the context of which the 'Special Area' status could be established.

Recognizing the weaknesses that exist in the implementation of MEAs in the region, Caribbean governments have begun to identify possible remedies, including the need for a much stronger regional approach to treaty negotiation and implementation. Interviews with selected countries of the Organization of Eastern Caribbean States (OECS) sub-region (Caribbean Law Institute 1998b) provided a number of suggestions, including the following:

- that a regional treaty guide be prepared to assist countries in understanding treaty obligations and benefits, and
- that a regional workshop be held to explore ways of overcoming national treaty implementation constraints.

In addition, representatives of Caribbean governments attending the Caribbean Sea Forum (Port of Spain, 3–6 June 1998) agreed that the trends and required actions mentioned above were relevant to all Caribbean states. Based on this, the Forum proposed the following actions:

- development of a strategy to encourage Caribbean countries to ratify relevant treaties (and the identification and implementation of treaties that can be adequately implemented);
- support and encouragement for the ratification of treaties and the inclusion of treaty provisions in national legislation. Model legislation on integrated coastal zone management could be included in the recommended strategy for governments to consider;
- establishment of a permanent regional mechanism to consider, review and provide guidance to governments on the provisions of international treaties. This will assist in effective and harmonized treaty implementation and enforcement;
- identification of resources for the training of negotiators at international fora, and the establishment of post-graduate programmes in law, and multidisciplinary programmes in environmental sciences, at the University of the West Indies.

Action plans and non-binding instruments

In addition to the major conventions and protocols, a number of regional, hemispheric and global non-binding agreements and programmes help to guide regional environmental programming. These include:

- *Agenda 21* (Rio), 1992
- The Summit of the Americas Plan of Action, 1994/1998
- The Programme of Action for the Sustainable Development of Small Island Developing States (SIDS), 1994
- The Plan of Action for the Sustainable Development of the Americas (Bolivia), 1996

- The Caribbean/United States Summit (Bridgetown, Barbados), 1997

Of these, both *Agenda 21* and the SIDS-POA have had a profound impact on the promotion of sustainable development in the region. Both have helped to set the framework for a number of National Environmental Action Plans (NEAPs) (Table 2.3) which measure progress, establish priorities, and identify actions to guide national policies, programme planning, investment decisions and budget preparation towards sustainable development.

Agenda 21 has also led to the setting up of numerous Sustainable Development Councils. For example, the Government of Jamaica has established a Sustainable Development Council to officially link all stakeholders in national development through a multi-stakeholder approach to sustainable development. Its mandate is to:

- sensitize key players and decision-makers at all levels of society by facilitating dialogue on the importance of sustainable development, the responsibility it imposes on government and all other sectors and interests, and the need for all to work in an integrated and co-ordinated manner;
- monitor national progress towards sustainable development measured against the dictates of both *Agenda 21* and the SIDS POA;
- identify policy gaps, influence policy-makers and promote research, policy reform, programmes and legislation for sustainable development;
- advise the government on international co-operation issues regarding the promotion of sustainable development;
- promote and facilitate capacity-building and awareness programmes on sustainable development, and
- co-ordinate and harmonize sustainable development activities nationally.

For the Caribbean, the formulation of the Programme of Action for Small Island Developing States (SIDS POA) in 1994 is beginning to influence regional and national environmental action. The greatest concerns with respect to the implementation of the SIDS POA revolve around priority areas such as 'Coastal and Marine Resources', 'Natural and Environmental Disasters' and 'Tourism', among the substantive elements of that Programme, and 'National Institutions and Administrative Capacity' among the cross-sectoral areas. However, in this region, all the Priority Areas embodied in the SIDS POA are deemed to be of direct importance and relevance to its sustainable development, and significant progress has been made by many regional SIDS in their implementation.

According to a recent report by the Economic Commission for Latin America and the Caribbean (ECLAC 1999), what is needed to maintain and enhance the contribution of activities in these areas to national and regional development is a focused and sustained effort, once certain constraints are overcome. This would involve, *inter alia*, more rigorous adoption of sustainable development approaches, the explicit integration of the SIDS POA into the national planning and decision-making process and the provision of much-needed financial resources.

Among the lasting achievements in the implementation of the SIDS POA in the Caribbean is an enhanced understanding of sustainable issues to which this process has given rise. This is already evidenced by, *inter alia*, the improved identification of environmental as well as socio-economic concerns and projects throughout the region. Further, governments and society have reacted to the needs of the SIDS POA by forging innovative partnerships for collaboration at unprecedented levels, in terms of both intensity and scope. The role of society, including the private sector, in identifying and achieving the objectives of the SIDS POA has been recognized and encouraged in a novel and intense system of co-management of natural resources, in setting standards and in preparing environmental policies and action plans. Another significant area in which lasting gains have been recorded relates to the appreciation of the critical importance of institutional strengthening, through capacity-building, enactment of environmental legislation, the application of management tools such as environmental impact assessments, and the adoption and implementation of environment action plans. These, plus environmental authorities and ministries, are among the mechanisms through which Caribbean SIDS have given explicit recognition to the need for an adequate institutional framework for the promotion and advancement of their sustainable development endeavours (ECLAC 1999).

However, it should be noted that many activities relevant to the SIDS POA were neither conceived nor implemented in direct response to the adoption of the SIDS POA. Rather, the commencement of many such activities pre-dated the adoption of the SIDS POA and these activities continue to be pursued in the context of the respective national sustainable development plans.

Table 2.3: National environmental strategies and plans

	National Report for UNCED	State of the Environment Report	National Environmental Profile	National Biodiversity Strategy	National Conservation Strategy	Environmental Action Plan	Forestry Action Plan
Anguilla	n.a.		1993				
Antigua and Barbuda	1992		1991	i.p			1993
Bahamas	1992						
Barbados	1992						1993
Belize	n.a.			i.p		1996	n.a.
British Virgin Islands	n.a.	n.a.	n.a.	n.a.			n.a.
Dominica	n.a.		1991	i.p		1994	1993
Dominican Republic	1992		1981			n.a.	1990
Grenada	n.a.		1991	1988		1994	1993
Guyana	n.a.	n.a.	n.a.	i.p		1994	n.a.
Haiti	1992		1985			i.p	
Jamaica	1992	1995/96/97	1987	i.p		1994/95	1990
Montserrat	n.a.		1993	1993		1994	1993
St. Kitts and Nevis	1992		1991	i.p		1994	1992
St. Lucia	n.a.		1991	i.p		1994	1993
St. Vincent and the Grenadines	n.a.		1991	1986		1994	1993
Suriname	n.a.	n.a.	n.a.	i.p		n.a.	n.a.
Trinidad and Tobago	1992			i.p	i.p	n.a.	1993
Turks and Caicos	n.a.	n.a.	n.a.	n.a.			n.a.

n.a. = Information not available i.p. = in preparation

Source: Updated from UNEP (1997).

Box 2.4:Forestry policy

Regional and national policy decisions and past donor strategies in the region have sent conflicting signals to landowners and natural resource users. Incentives for competing land uses, mainly in agriculture and ranching, have promoted deforestation in the region. In many instances also, land titling and timber concession policies have been skewed in favour of those that have removed forest cover and intensified deforestation. For many governments in the region, the main thrust of policy action has been to enhance timber production, although forestry units of these governments have also generally been charged with responsibilities ranging from the conservation and management of natural resources to the sustainable management of national parks and other protected areas.

However, in the past few years, with the changing perspectives being adopted by international organizations on the link between public timber pricing policies and the sustainable management of forests, a number of regional governments have taken steps to rehabilitate public policy and institutional frameworks. Policy initiatives such as the FAO's 1985 Tropical Forestry Action Plan (TFAP) represented recent attempts to incorporate 'sustainable' timber production with natural forest management on a much wider scale than previously existed. Belize, Jamaica and Guyana took steps to adopt TFAP, but with moderate success as constraints – including difficulties with donor funding and TFAP's failure to address the root causes of deforestation – have diminished its effectiveness on the ground. Other policy initiatives arising from UNCED/*Agenda 21*, and commercial and economic instruments (such as bans on the importation of forest products not carrying an environmental label), are now being developed and implemented by some countries in the region. Another encouraging phenomenon is the paradigm shift from donor dependency to the adoption of local initiatives in sustainable forest management as is evident in Saint Lucia and Dominica.

On the other hand, while official attention has increasingly concentrated on the establishment and maintenance of forest reserves to prevent exploitation, not much is being done to manage the marginal forests on the peripheries of these reserves. Consequently, these outlying forest areas suffer encroachment by an informal sector which extracts charcoal, firewood, fodder for goats and sheep, traditional medicines, and wild food and other resources to fuel economic activities. In addition, forestry and conservation policies in the region concentrate almost exclusively on tropical moist forests, not accounting for other zones with high deterioration and forest loss levels. As for reforestation, the policy challenge is tremendous since for each hectare cultivated, 8.5 hectares of natural growth are deforested (Windgrad n.d.).

In many cases the solution to these problems does not relate directly to forestry, but rather to public policies towards alternative energy, appropriate soil conservation and agro-forestry practices. Although no comprehensive internationally binding policy exists, it is the general consensus that the region would benefit from a cross-sectoral policy framework for sustainable forestry management.

Box 2.5: Marine and coastal areas policies

During the last ten years, Caribbean coastal zone management issues have moved into the mainstream of policy and planning, albeit at a comparatively low level of priority. Steps have been taken to amend the traditional reactive, *ad hoc* approach to coastal zone management. However, despite the growing awareness of the pivotal role of coastal resources in national development, sustainable management practices and sound environmental stewardship are not common.
A number of international and regional organizations have co-ordinated programmes, which include:

- strengthening institutional capacity;
- monitoring coral reefs, beaches, sea-level and coastal water quality;
- economic valuation of coastal resources;
- improving natural resource data bases through stock assessments and resource inventories;
- producing coastal zone management plans;
- upgrading marine protected area management capability;
- assessing land-based pollution of the marine environment;
- sharing technical information;
- formulating coastal set-back guidelines, and
- developing and harmonizing regulations and legislation.

While the SIDS POA has resulted in improved understanding of sustainable development, including the need to prioritize marine and coastal areas, with few exceptions these gains must be viewed in the context of national political mechanisms in which the lack of an integrated planning framework has resulted in the creation of isolated and often conflicting policy and regulatory measures.
In the last ten years there has been a significant improvement in the management approach. A variety of management frameworks have been employed, ranging from stand-alone coastal zone legislation, and umbrella legislation regulating coastal resources, to fragmented legislative systems employed in the reactive, case-by-case management of sectors within the coastal zone (see Box 2.6).
However, several key issues continue to challenge governments within the region:

- inadequate enforcement of coastal resource protection legislation;
- uncontrolled development in key watersheds, wetlands and active beach zones;
- unsustainable near-shore fishing practice by trawlers;
- illegal fishing in territorial waters;
- degradation of coral reefs and sea grass beds from insensitive recreational and commercial activity;
- inadequate management of coastal resources, and
- inadequate co-ordination of activities at the regional level among key agencies.

Box 2.6: Marine protected areas

The concept of protected areas is not new to the Caribbean. The very first protected areas in the region were established over 200 years ago out of concern for watershed protection. This was the reason behind the establishment of the Main Ridge Reserve of Tobago in 1976, as 'woods for protection of the rain' (Cross 1991), and the Kings Hill Reserve in St Vincent in 1791, for the purpose of 'attracting the clouds and the rain for the benefit and advantage of the owners and possessors of lands in the neighbourhood thereof' (Birdsey, Weaver and Nichols 1986). Two examples of successful marine protected areas in the Caribbean are the Bonaire Marine Park on the Dutch Antilles island of Bonaire and the Soufriere Marine Management Area in St. Lucia.

The Bonaire Marine Park, which was established in 1979, is one of the few actively managed protected marine areas in the world. The marine park includes the waters around Bonaire from the high-water mark to the 60m depth contour.

Bonaire's abundant coral reefs and clear waters have long made it one of the most popular diving destinations in the world.

The marine park was established with grant funding from the World Wide Fund for Nature, together with funds from the Island and Dutch Governments. Comprehensive legislation is in place, and the park has 37 public moorings, research and monitoring programmes and interpretative information centres. The park is completely self-financing, obtaining its funds from admission fees charged to divers (De Meyer 1997).

The coastal and marine areas of St. Lucia have recently been under increasing pressure from human activities, and have witnessed the advent of conflicts between resource users.

The Soufriere Marine Management Area (SMMA) in St Lucia was created in 1994 to resolve conflicts of use and to ensure that all economic activities would be able to prosper without damage to the people and their environment.

The SMMA extends for 11km from Anse Jambon in the north to Anse l'Ivrogne in the south, and is divided into five zones. One of the primary reasons for the establishment of the SMMA was to rehabilitate Soufriere's fishing industry, which was at an all-time low. Since the creation of the SMMA there has been a marked increase in fish stocks, which in the future will translate into greater catches.

The SIDS POA has nevertheless been able to impact these activities, imparting greater focus and renewed emphasis, and thereby contributing to a more holistic approach to their management and to the development of new projects and programmes (ECLAC 1999).

Laws and institutions

Caribbean islands are now giving increased attention to addressing the issue of sustainable development by updating their legal and institutional frameworks. Since the 1990s, governments of the region, having embraced the concept of 'environmentally sustainable development', have increased their commitment to improving environmental management, and are cognizant of the importance of including environmental content in development plans and public investment programmes. To a large extent, the need to establish programmes, initiatives and strategies for sustainable development has been a response to the UN Conference on Environment and Development (UNCED) in 1992, and the UN Conference on Sustainable Development of Small Island Developing States (Barbados, May 1994).

To this end there have been moves to establish institutions charged with environmental responsibilities and to enact legislation with modern resources management and environmental protection authorities. These authorities include the Environment Management Agency in Trinidad and Tobago, the Natural Resources Conservation Authority of Jamaica and, at the regional level, the Natural Resources Management Unit of the Organization of Eastern Caribbean States (OECS-NRMU). These institutions have on the whole been given the power to provide for the effective management of the physical environment in order to ensure the conservation, protection and proper use of natural resources. For example, the NRCA in Jamaica has powers to develop, implement and monitor programmes relating to the management of the environment and to formulate standards and codes of practice to be observed by different sectors or interest groups for the improvement and maintenance of the environment. The Authority has emerged as a credible and effective national lead agency on the environment and sustainable development.

While concrete action in the implementation of environmental law is limited, political will does seem to be present. As a demonstration of this, at the Caribbean Ministerial meeting on the Implementation of the Programme of Action for the Sustainable Development of Small Island Developing States (November 1997), the following recommendations were made for legislation, rationalization and institutional reform for the Caribbean:

- that countries incorporate the principle of sustainable development into their legal statutes and enhance the awareness and technical skills of the judiciary with regard to sustainable development issues;
- that the Caribbean Region be viewed as an entire eco-system;
- that the Island System Management Approach being promoted by OECS-NRMU be given further study as a primary vehicle for integrating the legislative framework for the sustainable development of Caribbean SIDS.

A number of consultations have been held in the region to discuss issues related to legislation and sustainable development. The consultation held in Barbados in September 1997 on Policy and Legal Considerations for Sustainable Development agreed that law and the translation of law was critical when looking at sustainable development and the distribution of benefits. The issue of good governance was also discussed, and it was noted that in the Caribbean there is a large gap between the law as it exists and the actual practice of law or its implementation.

The crucial issues for the Caribbean are the development and harmonization of standards of legal regulations; the importance of being involved in the process of international treaty-making, and the building of awareness, which should include not only the judiciary but also enforcement officers and the NGO community. There is also need for institutional capacity-building especially in terms of learning from the experiences of the NRCA, EMA and OECS-NRMU and forging co-operation between institutions in the region.

In Jamaica, the NRCA has formulated a range of regulations, policies, standards and guidelines, and has also developed a system of National Protected Areas that will ensure that 25 per cent of the national land area is protected by the end of the century. Two national parks have been established and seven other protected areas are under study. An environmental permit and licence system has also been established to monitor, and minimize, the negative effects of development on the environment through a process of environmental audits and impact assessments. Society's capacity to address environmental problems through a process of full

Box 2.7: Regional institutions

Large institutions have the potential to implement a wide range of projects, but this potential is dependent mainly on the institutional arrangements used by the institutions. By working through their member organizations, participating states, national focal points, and/or large core groups of associates, they are able to draw on a pool of resources much larger than that contained within the institution itself.
Such regional bodies existent in the Caribbean include:

- Caribbean Natural Resources Institute (CANARI)
- Caribbean Centre for Development Administration (CARICAD)
- Caribbean Conservation Association (CCA)
- Caribbean Disaster Emergency Response Agency (CDERA)
- Island Resources Foundation (IRF)
- Organization of Eastern Caribbean States/Natural Resources Management Unit (OECS/NRMU)
- CARICOM
- Caribbean Fisheries Management Programme (CFRAMP)
- Caribbean Coral Reef Monitoring Programme (CARICOMP)
- Caribbean Environmental Health Institute (CEHI)

Based on their experience in project management, institutional mandates, and access to large groups of associates, members, and/or participating agencies, a number of the above institutions have been targeted for institution-strengthening support. Assistance ranges from improvement of management systems to provision of furniture and physical space.

disclosure using environmental impact assessments and public pollution registers has also been established. New legislation and policies have also been developed in the fields of water resource management, pesticide regulation, forestry management, fisheries management, energy conservation and use, industrial development and land management and use.

Economic instruments

Most Caribbean governments over the last five years have recognized the need to use environmental economic instruments. This is due in part to concern about the implications of these instruments for the achievement of sustainable development and in part to the need to mobilize additional funding sources. However, these instruments have been used rather sparingly in Caribbean countries, and in most cases where they have been used, cost recovery has been the principal objective.

Even though deposit refund schemes and resources charges have been the most popular route chosen for applying economic instruments in the region, these schemes have enjoyed only limited success in terms of their environmental effectiveness due to the continued existence of policy and market distortions. The same is true for resource user fees and user fees for tourism-related activities. Future policy must therefore ensure that there is completeness in the development and application of appropriate instruments and the elimination of market distortions.

Faced with increasing threats to the environment, some Caribbean governments have begun to use economic policy measures to encourage environmentally sustainable and responsible decision-making by investors, consumers and other actors, and to guide their economies towards sustainable development. In particular, many governments are now using these instruments to mobilize additional revenue/funding for environmental protection, monitoring, enforcement and investment. As a result, many Caribbean governments are now seeking to incorporate environmental economic instruments into their overall environmental policy.

At the regional level, the Commonwealth Secretariat has sponsored a programme on the Application of Environmental Economic Policy Instruments in the Caribbean Region. The Planning Institute of Jamaica, the national planning agency of the Government of Jamaica, initiated comprehensive research, training and analysis in environmental policy with assistance from the Commonwealth Secretariat. This is the first Commonwealth Secretariat sponsored programme on environmental economic policy in the region, and one of its main objectives is to integrate environmental economic policy into macro-economic and sectoral policies. The programme also seeks to achieve capacity-building in the application of environmental economic policy (including training and research in Jamaica and the region as a whole).

Deposit refund systems (DRSs) – notably for the return and re-use of glass bottles – have been a major feature of the application of environmental economic instruments in the Caribbean, and have met with some degree of success. In Jamaica the manufacturers of sodas and beer now charge a deposit on glass beverage containers which is refunded to the consumer upon return of the bottle at designated collection points. The current charge levied by the island's largest producer, Desnoes and Geddes, is JA$5 per bottle. The success of the DRS scheme has been moderately good, with 50 per cent and 80 per cent recovery rates for beer and soda bottles respectively.

However, with the increased influx of polyethylene terephthalate (PET) bottles into the local market, DRSs

for drinks containers are becoming less successful due to the lack of incentives for packaging and recycling PET bottles. A further constraint is that in most countries the informal collection of recyclable materials represents an important occupation for poor, unskilled labourers. However, there is scope for the expansion of DRSs to include such products as batteries, tyres and lubricating oil.

Resource user charges, especially for water, exist in virtually all countries in the region. Their effectiveness, however, has been minimal due to the large number of households that are not metered. Water is still provided free of charge through public standpipes, and this has served to discourage water use efficiency among domestic consumers. In Jamaica, for example, a volume-based pricing structure is used, which allows for a fairly full recovery of operational costs. However, capital costs are not captured in the pricing structure. In Barbados, water charges are subsidized, with domestic charges substantially lower than the total supply cost. Cuba has a similar price differentiation between domestic and industrial users, but prices are lower.

The application of the 'user pays' principle for tourism-related activities and the management of national parks is widespread throughout the region, with success in some cases. The establishment of visitor fee system for the Bonaire Marine Park has raised enough money to cover operating costs and capital depreciation (see also Box 2.6). The Park also receives income from the sale of souvenirs. In St. Kitts, the introduction of user fees for the Brimstone Hill Fortress (a major heritage attraction) has increased revenues to the extent that the cost of managing the attraction is no longer the sole responsibility of the government.

The use of incentives and subsidies is not widespread although it has been proposed in some countries. Barbados appears to have gone farthest in applying this technique, with one particularly successful case being the use of incentives to promote solar technology. The Barbados experience with incentives for the use of solar water heaters has demonstrated that the widespread use of proven and reliable technologies could go a long way towards reducing petroleum consumption. In 1974, the Barbados Government introduced tax benefits for home-owners who invested in solar energy. Since then the results have proved to be beneficial. Between 1974 and 1997, an estimated U$66 million has been saved as a direct result of the installation of more than 30 000 solar water systems. In addition, the tax breaks have facilitated economic growth in the country by stimulating the development of the solar industry in Barbados.

Despite these efforts at applying economic instruments, a structured approach to the matter does not exist, and issues such as the feasibility, appropriateness and applicability of economic instruments to environmental management have not been addressed. In this regard the Economic Commission for Latin America and the Caribbean (ECLAC) has proposed a programme for the two–year period 1997–1999 that includes the establishment of a regional focal point for economic instruments; regional and national training programmes; country reviews of existing environmental actions designed to establish clarity in policy objectives; exchange of relevant information, and regional project development for implementation at national level.

The ECLAC proposal could be complemented by a more consistent collective effort by the region's governments, with future environmental economic policy considerations including the following:

- Continued efforts to remove subsidies that encourage unsustainable use of natural resources. This policy action is needed to discourage the wasteful use of scarce resources on the one hand, and to reduce environmental problems on the other. Particular attention needs to be paid to water, timber and energy resources, all of which currently attract significant subsidies from governments.
- Development of adequate legislative measures to allow for the easy introduction of environmental economic policy instruments.
- Continued and comprehensive training to instil skills formation and awareness creation in environmental economic policy development among decision-makers at various levels. This will provide local personnel with the working knowledge of relevant economic instruments and the steps needed to effectively implement and administer such instruments.
- Measures to enhance the awareness and knowledge of policy-makers in the use of economic instruments

Industry and new technologies

While there has been a marked increase in the development of clean technologies in the industrial world, the Caribbean countries still do not possess the advanced technologies required for effective use of their resources, nor can they access them easily. A number of obstacles hinder the transfer of clean

technologies from industrialized countries to developing ones, including – in many Caribbean states – lack of adaptation to local conditions; inadequate scientific and technological background; the reluctance of industrial firms in the North to release state-of-the-art technologies for fear of competition, and lack of funds in the South.

In addition, policy inadequacies and the slow pace of economic growth and investment in the region have further hindered the adoption of cleaner solutions. Nevertheless, emerging clean technologies in the Caribbean came about in the early 1990s, primarily as a result of the formation of a number of government environmental agencies, rising environmental standards and regulations, ISO standards, and public scrutiny. As a result, several islands, including Cuba, Jamaica, and Trinidad and Tobago, have undertaken some clean technology initiatives.

It is predicted that over the next two decades there will be an almost two-fold increase in world-wide energy consumption by developing countries, which will require significant increases in investment to expand existing energy systems and technologies (UNEP 1999). A number of regional initiatives have taken place in the agriculture, mining and tourism industries, utilizing several types and sources of cleaner technologies (some already commercialized) primarily in the areas of renewable energy and waste management.

Wind Energy Conversion Systems (WECS) have been successfully advanced in Curacao, Jamaica and Barbados, despite the variability of the wind and continuing high turbine costs. Curacao has been operating a wind farm since 1993, and Jamaica plans to install one by 2000. The first Ocean Thermal Energy Conversion (OTEC) plant, which used heat energy from the warm surface areas of the ocean to generate power, was constructed in Cuba, followed by the development of a demonstration OTEC plant in Jamaica. Other renewable energy technologies include hydropower, low energy architecture, wave energy, geothermal, solar technologies such as photovoltaics, solar thermal, solar drying and biomass.

In the case of waste management, there are common problems throughout the region, but the most critical is the need for hazardous waste management as most islands lack such technology or are unprepared to manage hazardous waste in the event of a disaster. The lack of legislation for waste management is also a region-wide issue.

Jamaica has also made strides in the management of waste from its bauxite operations. JAMALCO, a fifty-fifty joint venture between the Government of Jamaica and Alcoa Minerals of Jamaica Ltd., has pioneered two types of bauxite residue disposal technology. JAMALCO is a 'zero-discharge' facility, and all water collected from the plant site or the residue system is impounded within the disposal area for re-use in the process. Other environmentally sound technologies being used in the mining sector include reclamation activities, and use of filters and sprinklers in order to control dust in mining operations.

It has been estimated that the daily per capita generation of waste in the Caribbean is between 500 and 1 000 grams per person (PAHO/WHO 1996). The quality and composition of the waste matter has altered significantly over the past 20 years, with solid waste changing from the dense and almost completely organic waste associated with agricultural economies to the less biodegradable waste produced in industrialized economies. Industrial waste from sugar factories and rum distilleries, which has a significantly higher pollution load than sewage, is a common problem for sugar and rum producing islands attempting to find suitable treatment systems for wastes such as dunder. A number of studies on treatment of wastes have been undertaken in Jamaica, Trinidad and other countries in the region, on disposal methods and treatments for food processing industries: however, none have been implemented, due to costs and reluctance on the part of the public and private sectors. Environmentally desirable methods such as sanitary landfilling and composting are not practised on any significant scale, and incineration is limited to the British Virgin Islands, to port waste in Barbados, and to hospital waste in a number of jurisdictions.

Technical development alone might not be sufficient to promote the adoption of cleaner technologies (Clayton *et al.* 1995). Some measures that could be adopted to promote wider development include greater regional collaboration; institution of incentives, regulatory mechanisms and standards; public debate and information dissemination; and aid from technologically advanced countries. The challenge for the Caribbean is to find ways of achieving greater use of cleaner technologies that would lead to sustainable development in the region.

Financing environmental action

External financing has historically been the principal plank for the allocation of resources in the Caribbean countries. Trends and patterns in external financing have changed since the early sixties and late seventies, with greater emphasis being placed on sustainable development in recent years. Two principal constraints which have affected the effectiveness of external financing are the lack of adequate and appropriate institutional capacity and the inability on the part of both donors and recipient countries to effectively co-ordinate and focus on the implementation of policies and projects that are sustainable.

There have been dramatic changes in the sources of external finance available to Caribbean countries over the past decade. Net capital flows from bilateral and multilateral sources have declined significantly, from an average of US$611.8 million and US$482.4 million respectively in the period 1980–84, to US$131.2 million and US$79.9 million in the period 1985–90, and to US$98.4 million and US$91.4 million in the period 1991–96 (Table 2.4). These declines are due in part to high debt service obligations, world-wide decreases in aid flows, and the reorientation of many organizations in the donor community to address fundamental changes in the global economy. It is anticipated that these downward trends in bilateral and multilateral assistance to the region will continue.

Nonetheless, in the 1990s there have been increasing private capital flows to the region, from an average US$317.9 million in 1985–90 to US$3 987.7 in 1991–96 (Table 2.4). For many Caribbean countries, the keys to accessing scarce official resources are the achievement and maintenance of viable macro-economic frameworks, improvement of incentive frameworks for private sector development, and the ability to collectively and/or individually liberalize their economies and implement policies that alleviate poverty and enhance the environment. Should Caribbean countries consolidate their economic policies, there is the increased likelihood of the international financial markets playing a larger role in the provision of significant portions of the region's external financing requirements. To what extent the subsequent development will be sustainable remains to be seen.

Table 2.4: Net external capital flows to Caribbean countries 1980–1996 (US$ millions)

	1980-84	1985-90[1]	1991-96[2]
Total Net Resources Flows	1 336.0	1 015.0	1 719.0
Total Net Long-term Resources Flows	786.2	968[2]	1595[2]
Official Development Finance	1,590.7	650.2	774.7
Grants	724.2	439.2	781.7
Loans	866.5	211.0	(7.0)
Bilateral	611.8	131.2	(98.4)
Non-concessional	n.a.	(23.7)	(125.3)
Concessional	n.a.	154.8	26.9
Multilateral	482.4	79.9	91.4
Non-concessional	n.a.	(15.1)	26.9
Concessional	n.a.	95.0	83.3
Total Private Flows	356.7	317.9	3 987.7
Debt Flows	n.a.	40.7	(139.0)
Commercial bank loans	n.a.	(48.6)	(108.3)
Bonds	n.a.	30.4	50.7
Other	n.a.	59.0	(81.4)
Foreign Direct Investment	266.4	277.2	958.9
Short-term Debt Net Flows	-	47.1	158.3
Memorandum items:			
Total Net Transfers	-	(57.2)	568.2
Workers' remittances, received	-	539.6	1 040.7

Notes: 1 Excluding Antigua and Barbuda, Bahamas and Suriname. 2 Includes IMF transactions
Source: World Bank; IMF International Financial Statistics (various publications).

Public participation

The trend towards decentralization of government functions to provinces and municipalities identified by UNEP (1997) continues. The growth in recent years in the number of environmentally active NGOs, community-based organizations (CBOs), financial and technical support from international aid agencies, and enabling legislation, have allowed some Caribbean governments to divest or share environmental management responsibilities with groups at the 'grass roots' level.

The contribution of NGOs is crucial in the creation and management of protected areas as evident in the Kingshill Forest Reserve in St. Vincent and the Grenadines, the Montego Bay Marine Park in Jamaica, and in Trinidad and Tobago where concerned individuals and NGOs, with government support, introduced an 'eco-management' arrangement that vested responsibility for the management of the turtle nesting beaches in local villagers. The St. Lucia National Trust, along with the Caribbean Natural Resources Institute (CANARI),

spearheaded a nation-wide participation in protected area management (PANOS/CANARI 1994). Public participation is also being institutionalized through legislative requirements as in the case of St. Lucia, which included special provisions for public participation in amendments to its National Trust Act. Projects funded by international aid agencies continue to support initiatives that seek to incorporate public participation. The UNDP/CDB/CARICAD Capacity 21 Project, for example, gave financial and technical support for the establishment of Sustainable Development Councils (SDCs) to facilitate government and civil society partnerships in Barbados, Dominica, Grenada, Jamaica, and St. Lucia.

Local participation for some countries in the Caribbean is facilitated by public education and awareness rather than by active programme planning and implementation. NGOs and CBOs in small island states including those in St. Lucia, Barbados and Dominica have implemented capacity-building programmes to prepare them for effective management of protected areas. However, a number of constraints have affected public participation, including weaknesses in the institutional capacity of NGOs and CBOs (finance, human resources, infrastructure); loopholes in legislation which result in uncertainty regarding roles and responsibilities in a partnership arrangement; absence of relevant policies; limited flow of information between governments, NGOs, CBOs and individuals at the grassroots level; little integration of sustainable development concerns in economic and policy planning; and the inability of Caribbean countries to implement international agreements due to lack of finances, lack of capacity or lack of will.

Despite some success in the regional adoption of public participation approaches in protected area management (Table 2.5), there is still need for further action by government and society in general to encourage and promote public participation. More education programmes; greater national budget allocations to education and human resources; and acceleration, strengthening or initiation of existing government

Table 2.5: Territories that have adopted public participation strategies in sectors identified by SIDS/POA and SOE

	Land	Water	Atmosphere (climatic change)	Bio-diversity	Marine and coastal environment	National and environmental disasters	Management of waste	Tourism resources	National institutional and administrative capacity	Human resources development	Transportation and communication	Energy resources
Anguilla					●		●					
Antigua and Barbuda	●	●		●		●	●	●		●		
Aruba				●	●		●			●		
Bahamas												
Barbados		●		●	●	●	●	●				
Belize												.
British Virgin Islands												
Cuba	●	●	●	●	●	●	●	●	●	●	●	●
Dominica		●				●	●		●			
Dominican Republic		●				●	●	●	●	●	●	●
Grenada												
Guyana												.
Haiti												
Jamaica				●	●	●	●	●	●	●		
Montserrat												
St. Kitts and Nevis				●			●	●	●			
St. Lucia				●		●			●	●	●	
St. Vincent and the Grenadines			●		●	●	●	●	●	●	●	
Suriname												
Trinidad and Tobago				●	●	●	●	●	●			
Turks and Caicos												

Sources: ECLAC/ENEP/IDRC/UNDP (1997); data on Cuba from Cuba, Government of (1998a).

collaboration and co-management efforts to manage critical natural resources are some recommendations offered to facilitate increased public participation in the region.

Environmental information and education

A growing number of Caribbean states have encouraged, promoted or implemented environmental information and education programmes in the management of land resources, bio-diversity and the marine and coastal environments. Many governments have also supported environmental information and education programmes in waste management and sustainable tourism. Nevertheless, there is a need for greater collaboration among SIDS and between SIDS regions, especially in the exchange of experiences and information and in the development of common approaches to solving problems. Governments need to allocate more resources for the development of public awareness activities related to UNCED *Agenda 21* and the SIDS/POA to catalyse discussion among various target groups including policy-makers, technocrats and the wider public.

Environmental information

Some government policy initiatives in the region now make allowances for the establishment of environmental management institutions with responsibility for information management. For example, three regional governments – Jamaica, Trinidad and Tobago, and Guyana – have established institutions that will also be responsible for the development of National Environmental Information Systems (NEIS). In addition, nearly half the projects undertaken by SIDS up to November 1996 had an information component (ECLAC-CDCC/IDRC/UNEP 1997) and the trend has continued since then.

The establishment of institutions with information responsibility demonstrates the growing awareness among governments of the value of information in environmental management. Awareness is most acute at the technical level in the public and private sectors and NGOs. A positive development in the region is the growing involvement of NGOs in data collection, public education and capacity-building. The Caribbean Conservation Association (CCA) in Barbados is focused on implementing an information management programme, information dissemination, and public education. The Guyana Environmental Management Conservation Organization (GEMCO) conducts ecological research, and in St. Lucia, the National Trust is working on progressing from the collection of scientific data to the incorporation of these data into a management system for its national parks.

Except for the activities of a few entrepreneurs, the private sector is not a major player in environmental information collection and dissemination. There appears to be a mixed reaction from the public sector to private sector initiatives in data management. A wide variety of regional networks are also involved, with some networks exchanging information via newsletters, for example, CARICOM's *Fisheries Newsnet* or the *Sea Grant* in the Caribbean newsletter. Others focus on creation and maintenance of regional databases on socio-economic and environmental data and information, for example AMBIONET, CARISPLAN, CEIS, INFONET and UNEPNet.

Geographic Information Systems (GIS) and Satellite Remote Sensing (SRS) technologies are used mainly by government agencies, although universities and the private sector also use them. There is, however, a tendency for entities funded by different donors to establish independent GIS systems. The result is a lack of co-ordination among owners/users of GIS, duplication of data collection effort and coverage, a lack of consistency in map scaling, and a lack of standards for spatial data quality. The Caribbean is increasingly using Internet technology but the level of use differs across regions, within countries and within organizations. Access to the Internet by Caribbean countries is a recent phenomenon (not many had access prior to 1997). Consequently, a World Wide Web presence is not fully capitalized by the environmental NGO community although there is some indication that a few have started to maintain a presence.

Although the potential for the use of information technology exists, the few Caribbean states that use GIS and SRS technologies continue to experience low financial resources and a shortage of relevant skills which militate against the successful adoption of these technologies. Other constraints on effective data management include the poor success of national focus point systems, lack of response from the focal points, and the difficulties experienced in obtaining country information. However, a Caribbean environmental information strategy was approved at the Caribbean Ministerial Meeting on the Implementation of the POA for the Sustainable Development of SIDS. As yet, however, little concrete action has resulted from this. In addition, the Caribbean CEPNET project has attempted

Box 2.8: The CEPNET/IDB project: facilitating decision-making in coastal zone management

With its growing popularity, the Internet has become a powerful tool for information dissemination and management. In an effort to use this tool to help countries in the Wider Caribbean region to better manage their coastal and marine environmental resources, UNEP together with the Inter-American Development Bank (IDB) conceived the CEPNET/IDB project. The project sought to build and strengthen the capacity of the governments of the region, and the UNEP Caribbean Environment Programme, for documenting and disseminating their data holdings, thereby promoting the sharing of information and expertise in the subjects of coastal and marine resource management. This capacity was strengthened by the provision of training and the initial investment in the necessary equipment to establish and maintain Internet-based clearinghouses of coastal and marine data and information. The project was developed in six IDB member countries: Barbados, Dominican Republic, Jamaica, Nicaragua, Trinidad and Tobago and Venezuela. It is currently under development in the Bahamas.

While making use of the Internet as the medium of communication, the project was designed around the concept of disseminating metadata, or data about data. The participating agencies created Web sites with environmental information, as well as metadata for their key marine and coastal datasets. Metadata form the backbone of the clearinghouse system, where searches for metadata on coastal and marine data and information from the Wider Caribbean region can be executed on the Internet.

The participants also produced Internet-based 'State of the Coasts' reports for their countries. These reports use the Internet as a means of publishing information about the country's coastal zones, and Web-GIS to demonstrate coastal zone management case studies of relevance to the country itself and to the Wider Caribbean Region. The information content varies depending on the amount of existing data and information available in the country, as the collection of new data was not a part of the project. The main criterion for choosing an environmental problem or management application for display in the 'State of the Coasts' report was that it be of interest not only to the country producing the report, but also provide an opportunity for other Wider Caribbean Region countries to benefit from the shared experience.

to further environmental information for decision-making in the region (Box 2.8).

The Caribbean is increasingly making use of environmental information in decision-making for sustainable development and a number of technological opportunities are available to facilitate improved efficiency and effectiveness in data management and dissemination. A number of needs have been identified as critical to the development of successful information management systems in the region:

- the need for baseline data;
- the need to locate existing data/information;
- the need for quality data;
- the need for linkages between environmental and socio-economic data;
- the need for human resource development, and
- the need for inter-agency collaboration.

Environmental education

It has been observed that 'traditional approaches to formal education in the Caribbean have not achieved a sufficiently high level of sensitivity towards the environment' (Howell 1994). Caribbean governments have been slow to integrate environmental education into the formal education system because political support has been lacking. A growing number of NGOs, however, have spearheaded a new emphasis on environmental education, and although for the most part their approach has been non-traditional they have managed to achieve positive results.

Environmental education in Caribbean countries is also becoming more widespread and is slowly finding a place in the formal education system at the secondary and tertiary levels. Since 1993, Guyana has embarked on a programme of teaching and research in Environmental Studies at the University of Guyana, and Jamaica's UWI Centre for Environment and Development (UWICED) has plans to establish a teaching programme.

Voluntary NGOs, CBOs, and the print and electronic media have implemented non-formal and creative environmental education programmes in the Caribbean. Indeed, programmes carried out by the CCA for over ten years have assisted in the establishment of Environmental Awareness Committees and programmes in Anguilla, Antigua and Barbuda, Nevis and other countries in the region. International and regional bodies have continued to initiate regional workshops and training seminars on environmental education. A number of Caribbean countries have participated in regional training activities developed by the UNESCO/UNEP International Environmental Education Programme (IEEP), as well as other initiatives sponsored by regional tertiary institutions and NGOs (Howell 1994).

Whereas it is encouraging to see the growing number of NGOs and other bodies actively involved in environmental education, the barriers faced in integrating environmental education into the formal education system appear formidable. Decision-makers, as a first step, should put a higher priority on environmental education and devote more resources accordingly.

In spite of the many environmental education initiatives that have been undertaken across the region, the effectiveness of environmental education is being compromised by a number of constraints:

- a lack of appropriate curricula;
- inadequate materials and methodologies;
- inadequate funding for programmes;
- insufficient emphasis on specialized teacher-training in environmental issues;
- negative impacts of structural adjustment programmes (Howell 1994).

Table 2.6: Territories that have used environmental information and education in sectors identified by SIDS/POA and SOE

	Land	Atmosphere (climatic change)	Biodiversity	Marine and coastal environment	Management of waste	Tourism resources	National institutional and administrative capacity	Human resources development	Science and technology	Energy resources
Anguilla	●			●	●					
Antigua and Barbuda	●	●	●	●	●	●			●	
Aruba			●		●	●				●
Bahamas										
Barbados	●		●	●	●	●				
Belize										.
British Virgin Islands										
Cuba	●	●	●	●	●	●	●	●	●	●
Dominica	●	●		●	●	●		●		●
Dominican Republic		●	●		●	●				●
Grenada										
Guyana										
Haiti										
Jamaica			●	●	●	●	●		●	●
Montserrat										
St. Kitts and Nevis	●		●		●	●	●			
St. Lucia	●		●	●	●	●				●
St. Vincent and the Grenadines	●			●	●	●	●			
Suriname										
Trinidad and Tobago	●		●	●	●	●	●	●	●	
Turks and Caicos										

Sources: ECLAC/ENEP/IDRC/UNDP (1997); data from Cuba from Cuba, Government of (1998a).

Few Caribbean governments have managed to implement a comprehensive environmental education programme owing to the reduced funding created by structural adjustment, and the tendency for policy-makers in most sectors to categorize environmental education as a low priority item.

Social Policies

Social policies have had a significant impact on the environment in many countries. Programmes devised to fight poverty have often been unrelated to environmental policies. Projects that damage the environment have nevertheless been considered valuable because of the employment they have generated (UNEP 1999).

Population growth continues to put pressure on the limited resources of the islands. Although fertility rates in the region have generally fallen in recent years, they remained high in Haiti and the Dominican Republic. The Caribbean population is still very young, but life expectancy in the region has improved significantly. For example, more than 50 per cent of the population is under the age of 25, although the age cohort 0–14 has declined. Simultaneously the age cohort 65 and over has grown from 4 to 10 per cent between 1950–1990 and is expected to reach 14 per cent (UN ECLAC/CDCC 1994).

Improving health, education and living conditions remains the top policy imperative for many countries, many of which see the eradication of poverty, or at least its reduction, as a prerequisite to environmentally sustainable development. Indeed, during the 1980s, recession, high interest rates, poor terms of trade and fluctuating currency exchange rates all contributed to the downward plunge of the economies of many countries in the region. The World Bank estimated that in 1990 about ten million people in five countries in the Caribbean lived below the poverty line, although the scarcity of relevant data and lack of uniformity in data measurement

techniques make the extent of poverty in the region difficult to determine. Haiti and the Dominican Republic account for approximately two-thirds of this number although Jamaica, Guyana and Trinidad and Tobago also had significant numbers of impoverished people, including the unemployed, women, young people, the aged, and rural dwellers. Unemployment rates in the region are generally high, with female unemployment significantly higher than male (World Bank 1996).

Economic conditions and the adjustment policies pursued by many Caribbean governments over the past decade have reduced the number of workers in the public and private sectors, resulting in a larger number of workers who, unless retrained for employment elsewhere, could remain unemployed and therefore vulnerable to poverty. The consequence of any rise in poverty levels would be an increase in the pressure on natural resources as people would be forced to exploit vulnerable and fragile environments in order to subsist.

Migration from countries with relatively stagnant economies or political instability (Guyana and Haiti) to those with vibrant economies and labour shortages (Bahamas, British Virgin Islands and St. Maarten), and migration of skilled workers to North America, are long-standing characteristics of population movement in the region. Migration to urban areas is also on the rise as rural agricultural land is exhausted.

Although many macro-economic indicators show a

Box 2.9: Small Island Developing States (SIDS) and the Lomé Convention

Lomé Convention

The Lomé Convention, which for the past 25 years has been the framework for the European Community and its African, Caribbean and Pacific (ACP) development co-operation partners, has from the very beginning taken into consideration the obstacles particularly hampering SIDS (Article 335, Lomé IV Convention). Out of the 71 ACP countries, 26 are independent island states[1] and 17 of them[2] fall into the category of least-developed ACP states, which entitles them to special treatment under Article 329 of the Convention (Lomé IV bis). When compared with other ACP regions, the island states have derived considerable benefits per capita from European Development Fund (EDF) allocations. (Total funds provided by the EC to island developing states for the period 1976–1995 were €4 447 million. For the period 1996–2000 (Lomé IV bis) the package foreseen for the National and Regional Programmes amounted to €1 024 million.) In addition, for several island ACP countries the trade protocols of the Lomé Convention on sugar, bananas, rum and rice have provided privileged access to the European market, and also indirect price support for these products. In order to assist some SIDS to diversify their mono-producer economies, the EC is supporting some banana and mineral producers with EDF and budget line assistance. Good examples of this are Jamaica and the Windward Islands.

Lomé and the environment

Lomé IV embodied for the first time in 1991 environmental agreements between the EU and ACP states stating that 'development shall be based on a sustainable balance between its economic objectives, the rational management of the environment and the enhancement of natural and human resources' (Art. 4), and a new Title I on Environment spelled out the principles, priorities and procedures for integrating an 'environmental reflex' into all other Lomé operations. It did not, however, set any quantitative targets, and as EDF 7 was programmed just prior to the Rio Conference, it is unreasonable to expect the Rio commitments to be fully reflected in the EDF national indicative programmes for 1992–96. The integration of the environment dimension into EC development co-operation takes place at three different levels: direct financing of projects and programmes with specific environmental objectives; environmental concerns in the overall dialogue with the partner countries; and through efforts to ensure that overall development and economic co-operation activities integrate environmental issues, in particular through further development of the Environmental Impact Assessment (EIA) tool.

In 1996, the EC initiated a comprehensive independent evaluation of the environmental performance of its programmes in the developing countries. It was concluded that the overall environmental performance was relatively low in the period 1990–1995, in view of the extensive policy objectives which existed. Only a few of the National and Regional Indicative Programmes included sustainable development as a cross-sectoral issue at the strategic level, although almost all rural development programmes incorporated environmental factors. However, it was also indicated that improvements have been set in motion since 1990 through the design of specific strategies and through a more systematic use of Environmental Impact Assessment and the integrated Project Cycle Management. In the early 1990s the Commission introduced formal procedures for assessing the environmental implications of project proposals and for integrating environmental factors during the project cycle. Nevertheless, over the period 1990–1995, Environment Impact Assessment (EIA) procedures were rarely applied, although those actually undertaken were of a high quality. In 1998, a project was set in motion to update and harmonize the EIA procedures and guidance of the various departments of the Commission involved in development co-operation. This work will place attention on a more strategic use of the EIA instrument, as well as greater involvement of the developing country counterparts in the EIA process. However, since the Lomé Convention is a partnership agreement, the success of environmental policies depends only in part on incorporation of priority objectives into the design of EC programmes. More importantly, it depends on the commitment of ACP governments to these objectives in their respective national and regional indicative programmes.

Post-Lomé

The current Lomé IV Convention expires on 29 February 2000, and negotiations with a view to concluding a new development partnership agreement were started in September 1998. In 1996 the European Commission published its Green Paper on the future of ACP-EU relations, launching a debate on a thorough review of the present Convention. The paper observes that the relationship between the EU and the ACP countries will enter a new phase, that this renewed relationship will have to be based in the new global reality and that the

rebound from the crisis of the 1980s in recent years, other indicators related to quality of life and the condition of natural resources do not. For example, in some countries, malnutrition is a leading cause of death among children of poor households, and there are a growing number of street children and juvenile delinquents especially in Haiti, the Dominican Republic, Jamaica, and Trinidad and Tobago. While in recent years several Caribbean countries have significantly improved their level of access to safe drinking water, sanitation and quality housing, pipe-borne water is still not readily available in many households.

The Caribbean region has made some progress towards the goal of sustainable development but this has been against the background of growing poverty, social tension, and environmental degradation. Many Caribbean countries have achieved a better understanding of the issues of sustainable development which has resulted in a better identification of environmental and poverty concerns throughout the region. In many countries the changed perception of the role of society in social development has resulted in the adoption of the principles of co-management and in a closer collaboration between governments, NGOs, community organizations and the private sector in setting standards, and in the preparation of environmental policies or action plans. In some countries this collaboration is formalized in the initial

innovations introduced will have to increase the efficiency of the co-operation programme. It also identifies some special aspects of importance to the SIDS: the challenges of further regional integration and transition to a competitive economic environment; problems such as political transitions, heterogeneous economies within the region, lack of human resources, migration and drugs (Green Paper, page 21); and stresses the attention to be given to problems relating to transport, communications, environment and preservation of natural resources.

On the surface the EU and ACP agree on the principles and objectives of future co-operation: strengthened partnership through deeper political dialogue – a partnership geared towards poverty reduction, sustainable development and further integration of the ACP into the international economy. Both mandates recognize the need for 'differentiation' between ACP countries (e.g. by providing special treatment to least-developed countries and vulnerable land-locked and island countries).

However, the aspirations of designing a simpler, leaner and user-friendly agreement are not necessarily focused on the same priorities. The Commission's mandate translates the commitment of radical review of the existing Convention into four main priorities. First, to rationalize and simplify existing instruments by grouping all resources for long-term development into a single facility (including structural adjustment, Stabex, Sysmin, decentralized co-operation etc.). Second, to restore the centrality of programming while linking resource allocation to performance. Third, to move away from projects towards support for sectoral reforms and, if conditions allow, direct budget aid. Fourth, to introduce the concept of differentiation in resource management. The ACP reform agenda looks quite different. There is much insistence on reducing delays; improving transparency; simplifying aid instruments; clarifying the division of roles, and reducing the adverse effects of aid on local institutions and capacities. The focus is on improving day-to-day management; less on changing the rules of the game. The three main proposals of the ACP group differing from the EU mandate are: to allow more time before making changes; to retain as much as possible of the current agreement; and to create a fairer deal. The ACP call for existing access for agricultural goods to be improved, whereas the EU makes no firm proposal, is not prepared to settle the case before negotiations on the future of trade arrangements (REPAs), and will maintain the current access provisions until the new agreement is concluded.

Generally, the ACP seem more 'conservative' than the EU. The principles that the ACP promote are: local ownership of reforms; predictability and security of resources; partnership with more explicit allocation of responsibilities; simplification and rationalization of instruments, and flexibility in programming. As for the actors in partnership, in its negotiating mandate the ACP Group is rather vague about the nature and modalities of private sector involvement whereas for the EU extending partnership to a wide range of actors seems to be a political priority.

References

ACP Secretariat, 1998. 'ACP Group Negotiating Mandate'. On the Internet: http://www.oneworld.org/acpsec/gb/lome/future/negman_e.htm.

Cox, Aidan and Koning, Antonique, 1997. Understanding European Community Aid. Overseas Development Institute, London.

ECDPM 1998. Comparing the ACP and EU Negotiating mandates. (Lomé Negotiating Brief No. 3). Maastricht:

ECDPM 1998. What future for ACP-EU Trade Relations? (Lomé Negotiating Brief No. 1), Maastricht.

Environmental Resources Management, 1997. Evaluation of the Environmental Performance of EC Programmes in Developing countries. London, December 1997.

European Commission, 1998. Draft Negotiating Directives for a Development Partnership Agreement with the ACP Countries. Brussels, June 1998.

Tuononen, Heli (compiled by), 1999. The European Union's Co-operation with Small Island Developing States in the Framework of the Barbados Programme of Action. European Commission, Brussels, April 1999.

Montes, Carlos and Migliorisi Stefano, 1998. Evaluation of European Union Aid (Managed by the Commission) to ACP Countries. Investment Development Consultancy, Paris, November 1998.

Sutton, Paul, 1998. Small States and a Successor Lomé Convention. Background paper for a seminar on Small (Island) Developing States, organized by the European Centre for Development Policy Management in Brussels, September 1998. ECDPM, Maastricht, September 1998.

'The Lomé Convention as revised by the agreement signed in Mauritius on 4 November 1995', in: The Courier, No. 155, January–February 1996.

1 Western Coast of Africa: Cape Verde and Sao Tomé & Principe; the Caribbean: Antigua and Barbuda, Bahamas, Barbados, Dominica, Dominican Republic, Grenada, Haiti, Jamaica, St.Christopher & Nevis, St. Vincent & the Grenadines, St. Lucia and Trinidad & Tobago; Indian Ocean: Comoros, Madagascar, Mauritius and Seychelles; South Pacific: Fiji, Kiribati, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu.

2 Antigua and Barbuda, Cape Verde, Comoros, Dominica, Grenada, Haiti, Kiribati, St. Kitts and Nevis, St. Lucia, St. Vincent and the Greandines, Sao Tome and Principe, Seychelles, Solomon Islands, Tonga, Tuvalu, Vanuatu and Samoa.

movements for decentralization of governance to the community level. In most instances the region has also followed up on global conferences (Poverty, Women and Development and Population) by adopting and implementing Caribbean specific action plans.

Studies have determined that vigorous and sustained economic growth is an essential precondition for poverty reduction. Economic stagnation and problems of adjustment during the 1980s and early 1990s appear to have contributed to poverty in a number of countries. A related policy concern is the need to expand productive employment which calls for policies and measures to bring about vibrant economic growth as well as more direct approaches to employment generation. Social integration to incorporate marginalized and disadvantaged groups as equals in society is also a concern for some countries in the region.

Social policy responses in the region have been manifested mainly in the form of poverty reduction and alleviation initiatives, employment generation, social services and social integration measures. In Jamaica, for example, legislation to provide old age, death and invalidity benefits have been enacted since 1965. Other countries in the region – Barbados (1966), Guyana (1969), and Trinidad and Tobago (1971) – have enacted similar legislation.

Various forms of food subsidy have been implemented in a number of countries, especially in

Box 2.10: Lomé and the Caribbean Region

Regional co-operation

Regional co-operation under the Lomé Conventions will promote long-term collective, self-reliant, self-sustained and integrated social, cultural and economic development and greater regional self-sufficiency. In recognition of regional co-operation as a special feature of the four Lomé Conventions, over 10 per cent of the Lomé funds have been set aside for projects dealing with issues of interest to groups of ACP states on a regional basis. This funding is in addition to national allocations. In the Caribbean, regional co-operation involves Antigua and Barbuda, the Bahamas, Barbados, Belize, Dominica, the Dominican Republic, Grenada, Guyana, Haiti, Jamaica, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname and Trinidad and Tobago. These countries have in 1991 established CARIFORUM and nominated a Regional Authorising Officer (RAO). He is assisted by a Programming Unit which co-ordinates Caribbean regional co-operation with the European Union and assists in the preparation of project proposals. The implementation of this co-operation is decentralized, and each project is managed by a Deputy Regional Authorising Officer (DRAO), supported by the corresponding delegation of the European Commission in the CARIFORUM region.

In the Caribbean, regional co-operation covers the region's fifteen ACP countries and has benefited from more than €340 million in the form of allocations since 1976. The Regional Indicative Programme covering the first financial protocol of Lomé IV (7th European Development Fund) signed in 1992, involves €105 million. Its main objective was *the promotion and support of regional co-operation and integration*. This process is based on liberalizing the intra-regional movement of production factors, a closer co-ordination of strategies and sectoral policies at regional level, and the reinforcement of functional co-operation in the region. Programmes under these themes cover trade, tourism, agriculture, telecommunications and transport, human resources development and environmental protection.

The Regional Indicative Programme covering the second financial protocol of Lomé IV (8th EDF), which was signed in 1997, allocated €90 million for the promotion and support of *regional economic integration and co-operation* (including private sector development in trade and tourism) and *human development and capacity building* as the two focal sectors of Community support. Outside the focal points, priority programmes are planned in the areas of decentralized co-operation with non-state actors and within the framework of the Caribbean action plan for drug control.

Co-operation at national level

The main sectors to receive support in the Caribbean, however, have been *transport and communications*. In 1990 an exceptionally high commitment was made for tourism which accounted for more than 26 per cent of all aid to the Caribbean in that year because of commitments made to the Netherlands Antilles. In 1993 commitments to the Dominican Republic and Guyana increased the share of *industry* projects to an exceptional €54 million, which was 20 per cent of all aid in that year. The Dominican Republic also received significant aid flows in the *energy* sector in 1994 and 1995.

The high proportion of aid to the *social sectors* (12%) is mainly accounted for by big water and sanitation projects in Jamaica and Guyana in 1993 and 1995 respectively. *Health* issues have become more prominent in commitments to the Caribbean since 1992 and accounted for an exceptional high 6 per cent in 1994, mainly thanks to €9 million commitments to the Dominican Republic. *Rural development* appears as 5 per cent of all aid to the Caribbean between 1986 and 1995, but this is mainly due to two years, 1988 and 1992, in which €21 million and €38 million were allocated to this sector. Only Jamaica and Guyana received substantial commitments in support of rural development. The agricultural sector, which received €40 million between 1986 and 1995, was prominent only in Surinam and Grenada. In 1992 and 1995 some commitments were made for good governance and civil society: in 1995 all of this was allocated to Haiti.

Environment

The approach of the EC in the CARIFORUM Caribbean with respect to *environmental policy* has been linked mainly to policy reform and capacity development. Environment has not been a focal area but an integral part of National and Regional Indicative Programmes. Projects have been implemented in the areas of biodiversity and coastal zone management (Jamaica, Belize, Guyana), eco-tourism and environmental management (Dominica), sustainable agriculture (Dominican Republic), sustainable forestry (regional, Belize, Jamaica, Suriname).

Under preparation at the regional level is a four-year *Caribbean Regional Environment Programme* which aims to strengthen regional co-operation and build capacity in conservation management and sustainable development of amenity areas. The main activities include development and strengthening of an effective regional environmental information network, promotion of education and awareness on

Guyana and Jamaica. Public employment schemes – mainly in the form of short-term jobs for unskilled and manual workers – have also been adopted in many countries while many governments have introduced income enhancement policies to help the poor through credit, training and technical support. Guyana's Social Impact Amelioration Programme (SIMAP) to finance small, short-term technically feasible projects is an example of this type of programme. Programmes targeting youth, women, the disabled, and other marginalized and disadvantaged groups have been developed and implemented by some Caribbean states. An example of this is Trinidad and Tobago's SERVOL programme which sought to re-integrate disadvantaged youth into society.

The success of poverty reduction and other social policies in the Caribbean has been severely affected by a number of constraints and shortcomings, some being the direct result of economic recession in the region. In most Caribbean countries there is also an absence of a system-wide monitoring mechanism to evaluate the effectiveness of social programmes. It is also apparent that some social problems have not been adequately addressed by relevant agencies. Reports found that sufficient resources are not being invested in education and human resource development as most countries in the region still show high levels of illiteracy.

environment issues, improvement of the skills and capacity o the regional institutions and development and enhanced management of amenity areas (marine, terrestrial, and watershed). The project will cover all CARIFORUM member states except Haiti and the Dominican Republic. These two countries will benefit from a specific programme financed from the resources of the 8th EDF.

Specific instruments (Stabex, Structural Adjustment, Humanitarian Assistance...)

Stabex transfers during the past few years have been relatively low but peaked in 1991, 1994 and 1995 when they accounted for 14 per cent, 12 per cent and 24 per cent of Caribbean aid respectively. St. Lucia and St. Vincent received particularly high payouts in the last two years – as compensation for the *banana crisis* – whereas most of the 1991 transfer went to Haiti. The main recipients of support for structural adjustment were Haiti, the Dominican Republic and Jamaica, which account for 70 per cent of the total support to the Caribbean through this instrument. Haiti received €58 million in food aid and €38 million in humanitarian assistance, which accounted for most of that aid to the Caribbean.

Post-Lomé and trade

In November 1998, the European Commission released studies on the impact on ACP countries of its proposed Regional Economic Partnership Agreements (REPAs). General conclusions of the studies were:

1. In most cases, LDCs have little to gain from REPAs. They can keep non-reciprocal trade preferences in any case.
2. The loss of non-reciprocal preferences would hardly affect the export performance of many ACP countries.
3. By contrast, the direct or indirect effects of not renewing the protocols could dramatically affect the exports of some ACP countries. However, the studies did not estimate these effects as this would have required separate studies.
4. The negative impact on customs revenues varies considerably, but could be substantial for some.

In the Caribbean, the study included CARICOM[1] (the Caribbean Community) and the Dominican Republic. CARICOM is the most integrated of the ACP sub-regions, and has institutional mechanisms capable of negotiating with the EU. It is currently at an advanced stage of negotiating an FTA with the Dominican Republic. This could soon be an entity with which the EU could sign a REPA. If CARICOM granted preferential treatment to the EU, it would have to extend it also to the US and Canada, with whom it has trade agreements. CARICOM has also entered, or has plans to enter, trade negotiations with Mexico and several Latin American countries, and would take part in the wider Free Trade Agreement of the Americas (FTAA). The main recommendation of the study was therefore that any negotiation of a REPA should be co-ordinated with those activities, and thus should not necessarily fit the 2005–2015 timetable proposed by the EU.

As for the impact of a REPA, results indicate that trade creation would substantially exceed trade diversion, although the former was estimated at only 10 per cent of CARICOM/DR imports. The analysis indicated that there would be significant losses in terms of revenue form import taxes, on which CARICOM/DR countries, especially the smaller Caribbean states, are heavily reliant. Since a REPA would probably be introduced along with hemispheric trade liberalization, the induced adjustment cost will be very high, and thus require special attention by aid donors, including the EU. It was also recommended that sensitive, mainly agricultural, sub-sectors be excluded from the agreement on the grounds of maintaining employment in socially desirable areas.

1. Antigua and Barbuda, Barbados, Belize, Dominica, Grenada, Guyana, Haiti, Jamaica, St Kitts & Nevis, St Vincent and the Grenadines, Suriname, Trinidad and Tobago. (The Bahamas are members of the Community, but not the common market.)

References:

ECDPM (1999). The EC's Impact Studies on Regional Economic Partnership Agreements (Lomé Negotiating Brief No. 5), on the Internet at: http://nt.oneworld.nl/ecdpm3/lome/lnb5_gb.htm ECDPM, Maastricht.

European Commission (1998). *Annual Report for 1997 (as required by Article 318 of the Fourth Lomé Convention) on Regional Co-operation in the Caribbean*. Brussels.

European Commission (1995). *The Caribbean and the European Union*. Luxembourg, June 1995.

Institute of Development Studies (1998). *Study on the Economic Impact of Introducing Reciprocity into the Trade Relations between the EU and CARICOM/Dominican Republic*. Sussex, September 1998.

Tuononen, Heli (compiled by) (1999) *The European Union's Co-operation with Small Island Developing States in the Framework of the Barbados Programme of Action*. European Commission, Brussels, April 1999.

Chapter Three

Future Perspectives

Introduction

For most of history, the capacity of human beings to affect the environment was limited and local. Today, human activities have grown to the point where they not only affect many of the large-scale physical systems of the planet, but also have consequences that reach far into the future. The impact of present policies, for example on energy and infrastructure, will extend well beyond the lifetimes of those who initiated and implemented these projects. The future impacts of today's decisions are becoming more and more prominent in current policy-making (UNEP 1999).

This chapter deals with some of the environmental issues in the Caribbean that will require priority attention in the coming years. Many are old problems that are rapidly becoming worse or for which solutions are becoming more and more difficult, while others are issues that are at present not high on the policy agendas of the region's governments. In addition, the chapter identifies one key issue for the future, namely energy, through an alternative policy study.

According to *GEO-2000* (UNEP 1999), the environmental issues that may become priorities in the twenty-first century fall into the following categories:

- unforeseen events and scientific discoveries;
- sudden, unexpected transformations of old issues;
- well-known issues that currently do not receive enough policy attention – although their long-term environmental consequences are well known.

The huge increase in environmental research over the past two decades has made the possibility of sudden and unexpected scientific discoveries about the environment less probable. Scientific discoveries such as stratospheric ozone depletion and acid rain, or rather the bringing to light of their consequences in a sudden and unexpected way, is less likely.

Unexpected transformations of old issues are more likely. Many of the issues that will require priority attention in the next century will be aggravated forms of today's issues – many of which continue to evolve and broaden in response to changing socio-economic, cultural and environmental conditions. An example is the current surge in number and severity of natural disasters. A further example with heavy impacts on the Caribbean is coral bleaching. In the mid-1980s, this phenomenon was more severe than ever before and occurred in at least 60 countries around the world (ISRS 1999; ITMEMS 1998). Although the links between global climate change, the El Niño phenomenon and extensive coral bleaching are still subject to debate (ISRS), it has been suggested that only global warming could have induced such extensive bleaching simultaneously throughout the disparate reef regions of the world (Pomerance 1999, from UNEP 1999).

Most issues that will require policy attention in the next century are ones that are well known. As time goes on they will become more severe and pose major local

and global challenges. If these challenges are not addressed, they will give rise to major environmental crises in the twenty-first century (UNEP 1999). They are emerging primarily due to lack of action. There are numerous examples from the past which affect the Caribbean region. Increased and accelerated emissions of carbon dioxide have led to climate change issues; the increased intensification of fishing activities has led to the collapse of fisheries in many seas, and the relentless pace of urbanization, especially in coastal areas, has created problems for governments (UNEP 1999). Many of the emerging issues for the Caribbean region fall within this category of 'neglected issues'.

Issues for the Caribbean in the twenty-first century

Addressing the policy nexus between emerging environmental concerns and future economic development trends is an urgent task for ensuring the sustainable development of the Caribbean. Currently, the small states of the Caribbean are hard pressed to respond effectively to global environmental problems such as climate change because of their ecological fragility and their economic vulnerability within the context of a globalized world economy.

From a regional perspective, the key issues that will need to be addressed in the coming millennium include the following (see also Box 3.1):

- global climate change and the impacts of climate variability;
- linkages between globalization and environmental management;
- coastal, marine and fresh water resources;
- waste management and pollution practices, particularly in the tourism industry;
- capacity development, and
- energy.

The interlocking nature of economic factors and ecological conditions is very evident in the Caribbean region where economies are heavily dependent on tourism, mono-crop export-led agricultural practices, mineral hydrocarbon exploration and escalated use of marine resources. These economic activities all involve direct exploitation of natural resources, such as coastal environments, marine ecosystems, agricultural land and mineral resources. Rapid and irreversible degradation of these resources greatly reduces these countries' prospects for socio-economic growth and development. While development pressures on coastal and marine resources are common to all countries, they are more acute in the small island states. In these countries, careful attention needs to be paid to the problems of urbanization and tourism development with a view to formulating policies and instituting capacity that will prevent coastal and marine environment degradation and reduce problems of waste disposal.

To ensure the effective implementation of sustainable development within the region, priority will have to be given to the development of economically sound and environmentally beneficial technologies and practices, particularly in the areas of transportation (less polluting, higher efficiency vehicles), waste and pollution management, toxic chemical disposal, and land and natural resource management. Clearly one of

Box 3.1: Emerging problems in the Caribbean – an alternative perspective

A number of emerging problems were identified (either explicitly or by inference) by the responses to a questionnaire prepared by the ECLAC Sub-regional Office for the Caribbean. These emerging problems, for the most part, occur unevenly across the region, and relate to the following:

- continuing degradation of the Caribbean marine environment;
- problems relating to fresh water resources, regarding both the quantity required to meet increasing demand and the quality of the water supplied;
- frequent absence of measures to ensure ownership and protection of intellectual property rights in the area of bio-diversity;
- the low priority attached to the commercial development of energy based on renewable sources;
- sparse arrangements for the reintroduction of bio-genetic resources following disasters;
- limited capability in, and attention to, the generation and use of such modalities as economic instruments and indices of sustainable development in policy development and planning;
- sparse efforts at the compilation of biodiversity resources;
- concerns related to land resources involving intensified land-use conflicts;
- inadequate attempts at the co-management of major economic sectors such as tourism, and wider conservation and sustainable development activities involving all economic and social sectors, as well as local communities;
- unavailability of resources for GIS and mapping;
- the apparent de-emphasizing of sustainable development criteria in some cases, and the emphasis on economic goals in a context of a tightening financial situation, and
- difficulties encountered in managing the implementation of projects where the collaboration of a number of agencies is required.

Source: ECLAC (1999).

the most critical issues in the region's ability to respond to these issues is the development of effective technical and institutional capacity. It is also important to note that many of the emerging issues identified by the region are influenced by factors and concerns that are externally induced or global in nature.

Global climate change and the impacts of climate variability

Combating the adverse effects of global climate change is a particularly serious concern for the Caribbean. Comprising predominantly small island and low-lying states, the region is gravely affected by global changes such as sea-level rise, coastal zone inundation, and the increasing frequency and intensity of hurricanes and typhoons.

Although these small Caribbean states are not significant emitters of greenhouse gases, their very existence is threatened by the adverse impacts caused by increases in anthropogenic emissions of greenhouse gases in other regions of the world. The principal challenge for the region is to develop adequate adaptation strategies that will allow states to respond to and cope with the adverse impacts of global climate change.

The Caribbean region is prone to extremely damaging natural disasters, primarily in the form of cyclones, volcanic eruptions and earthquakes, and are subject to effects of climate variability. The 1997–1998, El Niño phenomenon had its strongest impact on record on the region, and the 1998 hurricane season was especially devastating: the impacts of hurricanes Georges and Mitch will be felt for a long time. The region will have to work to improve scientific understanding of severe weather events, such as those associated with the El Niño Southern Oscillation, and develop long-term capabilities for natural disaster mitigation and early warning systems.

Globalization and environmental management

Given the small size of their economies, Caribbean states are extremely vulnerable to impacts of global trade and global financial flows. For small countries, the increased flow of information and the growth of information technology as a consequence of globalization also produces new challenges in the management of information. Constraints to the sustainable development of the Caribbean region include:

- fragile and small natural resource bases which do not allow states to benefit from economies of scale;
- small domestic markets and a heavy dependence on a few external markets;
- costly energy imports;
- frequent exposure and vulnerability to climate-related natural disasters;
- rising populations;
- high volatility of economic growth;
- limited opportunities for the private sector, and
- dependence on public sector investments.

The pace of globalization and liberalization has heightened the economic problems faced by small island developing states and presented new challenges and opportunities for them. As a result of globalization, national policy frameworks and external factors, including trade impacts, have become crucial in determining the success or failure of national policy efforts. At the regional and national level, Caribbean states will need to focus attention on policy practices that integrate economic, social and environmental approaches in order to maximize opportunities available to them and to minimize the constraints they face.

Ecological fragility, close interdependence of economy and environment, and vulnerability to natural hazards mean that the Caribbean countries must be vigilant in maintaining their natural resource base. Over-exploitation of near-shore fisheries, conversion of wetlands and forests for other less productive uses, and pollution, are common problems which must be avoided in pursuing sustainable economic growth. Natural resource accounting must be factored into the planning of economic and social activities so that the true costs of development options can lead to selection of activities that minimize negative impacts on vulnerable and productive ecosystems.

Coastal, marine and fresh water resources:

Heavily dependent on the revenues from tourism, many small island nations have sought to rapidly develop their fragile coastal areas. But this aggressive coastal development, along with overfishing, pollution and the introduction of exotic species, are factors that play a major role in the destruction of valuable coastal and marine ecosystems.

The health, protection and preservation of coastal and marine resources are fundamental to the sustainable development of the Caribbean region. Improved coastal and ocean management, sustainable use of coastal and marine resources and the reduction of land- and sea-based pollution are critical issues in the

maintenance of the oceans as a source of food and equally critical in the development of tourism. Coastal zone management is assuming increasing importance in the Caribbean. Management systems are being developed to deal with the growing problems of coastal deterioration caused by rapidly expanding levels of beach tourism, growing urbanization of coastal lands, and coastal sand-mining to support the construction industry in coastal areas and elsewhere.

The development of sound policies and practices that facilitate the integrated management and sustainable development of coastal zone ecosystems and marine resources, including wetlands and coral reefs, is an urgent task. To ensure marine and coastal food supplies for the region, increased attention will need to be paid to the promotion of sustainable fisheries and environmentally sound aqua-culture practices. Building on the work of the International Coral Reefs Initiative (see, for example, Bryant *et al.* 1998), action will also be needed to sustain healthy reefs. Such actions could include the development of integrated national and regional community-based reef conservation and management programmes and the promotion of sustainable tourism practices.

In much of the Caribbean, small watershed and aquifer-recharge areas limit surface water and groundwater resources, and urbanization has placed additional stresses on the availability and quality of water resources. The geophysical characteristics of many small islands leave them vulnerable to periods of drought, and to slow recharge rates. Adverse environmental impacts, including pollution, saline intrusion and soil erosion, reduce the quality of fresh water resources. Consequently, careful attention will need to be paid to integrated water resources management, and to practices and systems that take into consideration land-use patterns, soil erosion, watershed management and waste disposal.

Management and disposal of wastes

Significant increases in the production of waste have resulted from the rapid development of tourism and industry, as well as from urbanization, demographic changes and altered patterns of consumption. The quality and composition of the waste generated within the Caribbean has also altered significantly over the past two decades. Solid waste composition has changed from the dense and almost completely organic waste associated with agricultural economies to the less biodegradable wastes of consumer societies, including toxic materials. Ineffective waste disposal systems have had significant adverse impacts on the terrestrial, coastal and marine environment. Inadequate institutional arrangements, ineffective legislation, lack of monitoring of effluents and emissions, and failure of enforcement mechanisms relating to the management of waste are prevalent in almost all countries in the region.

Pollution of land and water by sewage is a major public health hazard in several Caribbean islands, where low absorbability sub-soil conditions and high groundwater conditions prevail. In densely developed coastal areas, the height of the groundwater table limits the absorptive capacity of the soil and heighten the risk of sewage pollution of coastal waters during large-volume discharges. In a number of islands, out-fall pipes have been damaged or destroyed by hurricanes and rough seas and as a consequence pipes discharge raw sewage onto beaches and into inshore marine areas. The problem of faecal contamination from land-based sources is compounded when yachts discharge raw sewage into the water. The increasing popularity of the Caribbean as a destination for cruise ships has led to an increase in the volume of waste discharged at ports, where reception facilities for ship-generated solid waste are generally inadequate. This is a particular concern where coral reef systems are involved. In some locations the degradation of protective reef systems by sewage-induced eutrophication is contributing to coastal erosion and the destruction of beaches.

The problems associated with toxic wastes are not confined to industrialization. In agricultural areas farm run-off, containing chemicals, is adversely impacting the aquatic environment. There has also been an increase in the trans-boundary movement of toxic and hazardous waste, including chemicals and radioactive materials, through the Caribbean Sea. Attempts have also been made to establish disposal/incineration facilities for foreign waste. Although a number of states have ratified the Basel Convention, there is no united response to this problem – Cuba and Dominica being among the few countries to have formulated laws banning the importation of hazardous wastes.

Very high priority has been accorded to the sustainable management of waste by most countries, and efforts are being made to improve management structures. In this regard, most have ratified relevant international conventions, and legislative deficiencies are being addressed in those countries that have functioning environmental management agencies. Environmental monitoring and management systems as well as emission and effluent standards are being developed and will need

to be continually strengthened. Nevertheless, these activities will need to be implemented more completely and more quickly if the issue of waste management is not to become a major problem in the coming years.

Capacity development

Despite the convening of numerous global environmental conferences, very little attention has been paid to understanding and supporting the technical and institutional processes by which Caribbean island nations respond to the problems of environmental degradation. Consequently, the difficult issue of building economic and institutional capacity within such nations still remains to be addressed. The UN Secretary General's Report on progress on the implementation of the Barbados Programme of Action for SIDS indicates that the two key constraints related to institutional capacity-building are the limited availability of human resources and a lack of financial resources for developing and strengthening institutions and mechanisms (UN ECOSOC 1999a, 1999b). The constraints imposed by the inadequacy of technical capacity at the national level as well as at the level of regional institutions impairs the ability of small island Caribbean nations to meet the challenges of sustainable development because many of these nations depend on regional mechanisms and institutions for responding to environmental problems.

The central challenge is therefore to build regional capacity that will not only develop data and monitoring networks for weather, climate and sea-level rise, and strengthen the legal and institutional protection of valuable natural resources, but also engender more effective systems to manage wastes and reduce sewage contamination, promote tourism practices geared to biodiversity conservation and protection, minimize dependence on destructive agricultural and land-use patterns and promote the use of sustainable energy.

Energy

Use of renewable energy sources and increased energy efficiency offer scope for tapping what are considered to be sizeable domestic resources in the Caribbean and thus of reducing exposure to risk. In some Caribbean countries where the national electricity grid does not extend to remote rural areas, renewable energy technologies such as photo-voltaics are seen as a cost-effective option. While there are many ways to approach renewable energy issues, they should be reviewed in the context of competitive energy markets, and fiscal, legislative and regulatory barriers.

Scenarios for the future

The priorities identified in the first two chapters of this report, and discussions at the regional consultation, indicate that a number of issues warrant further scenario study. These issues include land use (land-based activities and their impacts), fresh water and energy. For this first *Caribbean Environment Outlook*, energy has been chosen as the policy study. The reason for this choice is that energy was identified as a priority not only by the SIDS POA, but also by the CEO process. In addition, energy use has profound impacts on the Caribbean, both in terms of environmental pollution and in terms of its impact on the economies of the region. An underlying commonality among Caribbean nations is the reliance on crude oil as the main fuel for energy production. This consumption of petroleum results in high foreign exchange bills, and increasing exports to maintain purchases of the commodity. This study draws extensively on information available in two ongoing studies being undertaken by the University of the West Indies Centre for Environment and Development (UWI-CED): 'Barriers to Renewable Energy Use' and 'Social and Environmental Costs of Petroleum'.

The adoption of alternative energy policies is something that can be undertaken fairly easily by the governments of the region. Indeed, there have already been examples of such shifts, albeit on a small scale, with Jamaica and Barbados providing case studies for wind and solar power respectively. A project established at the Munro College in St. Elizabeth, Jamaica, generates one million kilowatt-hours of electricity each year using wind-driven turbines. This electricity is currently being sold to the national utility company, the Jamaica Public Service Company (JPSCo.), and is incorporated into its grid (CEIS). Barbados has also embarked on a massive exercise to introduce solar power to meet its energy demands for water heating in domestic and commercial enterprises. Both exercises are exploiting natural weather patterns of the respective countries. It would therefore not be unreasonable to adopt similar strategies throughout the region as comparable conditions exist right across the Caribbean.

Distinct from the provision of energy from the 'formal' energy sector, a vibrant 'informal' energy sector is in existence around the Caribbean, in the form of unregulated production of charcoal or wood fuel. This practice is mainly carried out by people from the lower socio-economic stratum of society who either have had little or no education, or who regard this enterprise as a

viable source of income in the face of poor employment prospects. One of the main consequences of this 'industry' is the removal of vegetation from ecologically sensitive areas. Trees are removed from designated watershed zones, and no effort is made to replenish the stock. The implications of this become more apparent in the more water-stressed scenario which affects a number of the islands in the Caribbean.

Scope of the study

The questions that this section attempts to address are: 'What policy changes can be implemented to enhance cleaner energy technologies while delivering reliable power supplies at manageable costs?' and 'How will this impact on the priority issues of climate change and those associated with the coastal and marine environment?'

REFERENCE SCENARIO ('BUSINESS AS USUAL')

This scenario assumes continued oil dependence in each of three countries – Jamaica, Barbados and St. Lucia. It also assumes that there will be no new investments in renewable energy or energy efficiency and that the policies in place, such as current laws, will remain unchanged. The projections of forecasting studies of the Latin American Energy Organization (OLADE) indicate that the overall electric power demand of Caribbean countries will grow by 3.2 per cent to 6.7 per cent per year during the period 1998–2010. In order to meet this growth without implementing any alternative policies, additional capacity of 400 MW will have to be provided, at a cost of US$25 million per year over the same period of time.

Table 3.1 summarizes assumptions regarding future electricity production in three island states. This scenario represents developments in the electricity sector that can be expected given the continuation of trends in electricity use and fuel prices. In this 'business as usual' scenario for Barbados, current high growth rates of roughly 5 per cent per year between 1993 and 1998 continue in the near term and gradually taper off to 3 per cent per year by 2015, resulting in an average annual growth rate of about 4 per cent. St. Lucia has experienced very high demand growth rates of around 10 per cent per year in recent years. A recent study suggests these rates may decline to about 8 per cent in 2005 and then decline further to 5 per cent per year in 2015, resulting in an average annual growth rate of nearly 7 per cent per year (OLADE studies).

Table 3.1: Electricity production forecast

	System generation (GWh)		
	1995	2015	Growth rate
Jamaica	5 811	10 883	3.2%/yr
Barbados	644	1 388	3.9%/yr
St Lucia	191	510	6.7%/yr

Source: OLADE

Note: For Jamaica, system generation assumptions are based on data obtained from JPSCo as well as from OLADE.

Impacts of the reference scenario on selected environmental issues

A combination of rising energy use, expanding populations and a 'business as usual' scenario (Box 3.2) will have a severe impact on the sub-region's socio-economic development and living conditions. If current trends continue, the region may encounter not only increasing environmental problems, but also balance of payments problems due to rising energy costs.

Historically, the Caribbean countries have had to rely on external sources of fuel to meet their energy requirements. Trinidad and Tobago is the only country in the region with oil reserves of its own. The use of crude oil and petroleum-based products extends throughout the islands' economies, from transportation to the generation of electrical power.

Of the environmental issues that present themselves in the energy sector, climate change, deforestation and watershed deterioration are of most concern, along with the increasing incidence of air pollution. Informal sector pressures are also having a severe impact on forest resources.

One of the main environmental impacts of energy production is the gaseous and particulate emissions that are discharged. The gases include carbon dioxide, methane, sulphur dioxide and nitrous oxides, which result from the combustion of fossil fuels. The low quality fuels and technologies typically used in the region (high sulphur content fuels and negligible emission controls) emit a variety of pollutants that contribute to public health effects. Caribbean countries along with most of the world's nations have committed themselves to the United Nations Framework Convention on Climatic Change (1994) which recognizes this change in global climate.

Also related to the evolution of these gases is the damage done to the ozone layer and their contribution to the greenhouse effect. Emissions from fuel-consuming enterprises are made up mainly of carbon dioxide and methane which are discharged into the atmosphere and subsequently attack the earth's protective ozone layer.

While the Caribbean is not a major contributor to greenhouse gas emissions, the region will be adversely affected by climate change. As such, leading the way with alternative non-polluting energies will set an example for higher polluters.

For these reason, revision of existing energy policies and formulation of new policy frameworks that impact the environment less than current practices do need to be carried out. Promoting the transition to different energy forms, for example through aggressive conservation and emissions regulation, is an important step.

Alternative policies

As previously stated, there is a great dependence in the Caribbean region on energy generated from fossil fuel sources. One alternative that must be explored and indeed implemented in Caribbean states is a shift to new, renewable forms of energy, for example wind, solar power and natural gas. An obvious advantage of adopting these forms of energy is the reduction in the quantities and related costs of crude oil imports. Secondly, the emissions associated with the refining of crude oil and actual use of the refined product will be abated. Also, the incidence of oil spills – which are likely with the frequent transport of the commodity through the region's oceans from oil-producing areas in North and South America – will be dramatically reduced.

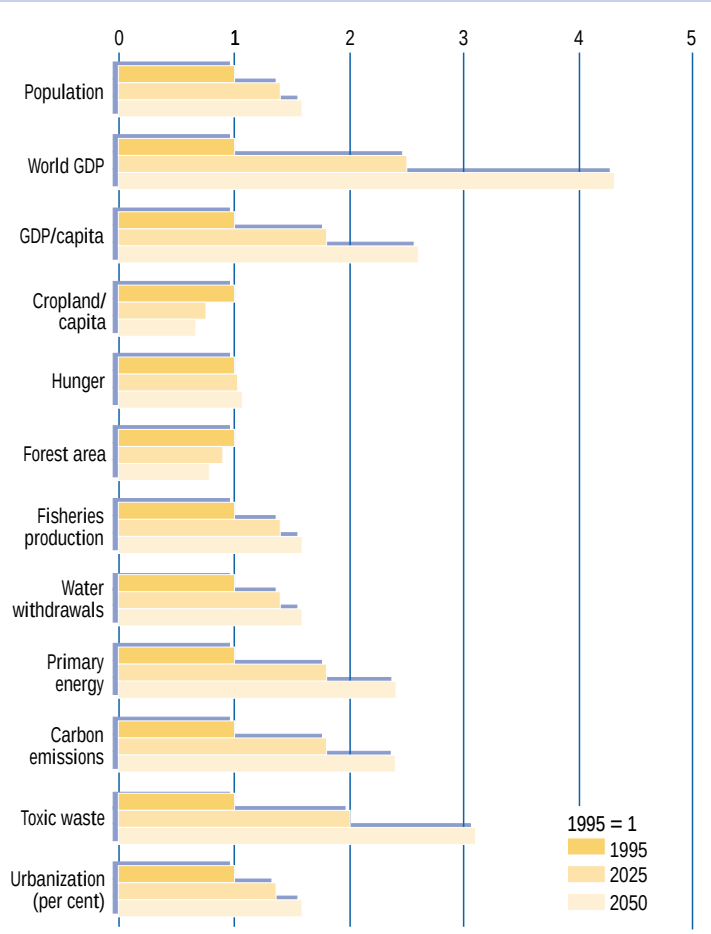
The following is a selective overview of policy options available for promoting a transition to the use of renewable energy and improved energy efficiency in the Caribbean. It is important to note that the effectiveness of any particular option has to be considered within the overall planning context in which it is introduced. Indeed, the solutions for encouraging the use of renewable energy

Box 3.2: 'Business as usual' scenario – the global picture

The conventional development or 'business-as-usual' scenario provides the framework for many projection studies (SEI/UNEP 1999). Under this scenario, world population increases 65 per cent and economic output more than quadruples by 2050. At the same time, income per capita, expressed in purchasing power parity, would grow 2.6 times. Under these conditions, energy and water requirements are expected to increase by factors of 2.4 and 1.6 respectively, and food requirements to almost double, driven by growth in population and income. Despite rising average incomes, the number of people still in poverty and unable to feed themselves adequately would rise slightly rather than decline over the next 50 years as populations grow and traditional sources of material support are eroded.

With such a continuation of present trends in population growth, economic growth and consumption patterns, the natural environment would be increasingly stressed. Many environmental gains and improvements would be offset by the pace and scale of global economic growth, increased global environmental pollution and accelerated degradation of the renewable resource base.

Widespread policy reform could make a significant difference to these outcomes (SEI/UNEP 1999).



Source: UNEP (1999)

are inherently regional and even system-specific. Issues such as a country's implementation record (if any), its stage of development, the degree of privatization of the electricity supply sector, and informational requirements of the policy, will determine the relative advantages and disadvantages of the various options available.

For the shift to new forms of fuel and/or energy to happen, a favourable environment has to be in place. This will be facilitated by economic and legislative instruments, which favour the development and use of renewable forms of energy over the current energy systems present across the region. The case studies for Jamaica and Barbados show that this is indeed possible and can be extended to other Caribbean nations. However, the task needs to be expanded to incorporate more forms of energy, for example natural gas to make use of raw materials, which are common to the region.

The shift towards more renewable forms of energy will also require mechanisms by which tariffs are levied on fuel imports so as to encourage the implementation of renewable energy technologies. There should also be a regulatory framework by which air emissions are controlled, i.e. a permit system that dictates the quantities and constituents of air emissions derived from energy-related processes. This measure would force energy producers and some consumers to adapt their operations to adhere to the new standards, and simultaneously institute efficient processes. Moreover, the permit system will reduce the impact that these emissions have on the environment.

The trend towards the unmonitored and uncontrolled importation of motor vehicles with little regard for fuel efficiency has to be arrested. At present, cars and other vehicles are brought into the region indiscriminately – and a fair number of these are 'gas guzzlers'. Also, there are no real regulations to safeguard against the emissions from these engines. The shift towards non-leaded gasoline and reduced use of diesel fuel needs to be intensified so that the air pollution hazard can be drastically reduced.

A remedial and eventually sustainable measure is recommended with respect to the production of wood fuel. This would entail the re-planting of trees specifically meant for the production of charcoal. Other options include plant oil commodity control to meet household needs and produce a product that has growth potential as a natural raw material for energy, chemicals and pharmaceuticals. Not only would this activity reduce the stress on the vegetation resource, but it would also maintain and restore the integrity of the watershed catchment areas and reduce surface run-off which can prove critical during tropical storms. Another benefit to be gained by preserving these areas is that the sinks for carbon dioxide, a major greenhouse gas, will remain intact – so helping to offset the negative effects of global warming.

In addition, the legislative and economic frameworks of the Caribbean have to be tailored to bring existing energy delivery systems into line with environmental air emission standards. This will include the setting up and enforcement of limits on the amounts and types of emissions that are allowable for energy-producing entities and a penalty, usually monetary, on entities that do not adhere to these limits. Further to these measures, economic incentives should be given to industries that attempt to transform either their process machinery or the process itself to bring about greater energy efficiency and reduced environmental impact.

Other specific policy measures could include:

INTEGRATED RESOURCE PLANNING

Integrated resource planning (IRP) is an approach that systematically evaluates potential electricity supply-side and demand-side resources with the aim of developing a plan that provides energy services to customers at the lowest societal cost under a given set of objectives. To promote renewables, an IRP could be developed that enhances energy security, minimizes the environmental impacts of electricity supply, maximizes the use of local resources (e.g. renewable energy potential), provides local economic benefits (e.g. demand-side management industries), and minimizes foreign exchange costs.

Using externality adders in an IRP can increase the comparative benefit of demand-side management (DSM) and renewables, thus making them more attractive to electricity utilities. However, this policy on its own would not necessarily increase the amount of DSM resources unless there was also some institution that had the responsibility and the incentives to implement DSM programmes. External costs can be quantified in terms of local currency, and added directly to the traditional costs of constructing and operating electricity resources. To date, externality costs have only been applied in selecting new resources in North America: they are not applied to existing facilities.

RESOURCE PORTFOLIO STANDARDS

The target percentages of different resource types could be set by individual national governments by legislation.

The target could be based on an IRP-type assessment of the resource potential, as well as the costs and benefits of obtaining those resources. For renewables, the target would require that utilities develop renewable resources as a certain percentage of their overall generation. For DSM, utilities would be required to acquire DSM resources up to a certain fraction of their customer demand. A resource portfolio requirement demands a pre-determined percentage of renewables and DSM be included in the overall resource portfolio. It is also worth mentioning one other type of portfolio requirement. A fossil plant efficiency portfolio standard would require utilities to maintain a specified maximum system-wide average combustion efficiency (i.e. heat rate) for their fossil plants. A key element to making such portfolio requirements practical would be implementation at the regional level.

EMISSION TAXES

Pollution taxes, applied as a charge per tonne of selected pollutants, could readily correct for many market failures in allocating the costs of pollution from electricity generation. There are a variety of approaches to the setting of emissions taxes. First, a tax could be set to represent the societal cost of pollutants. An emissions tax would be set at a level equal to the marginal societal cost of environmental damage. Second, a tax could be set to achieve a particular level of environmental protection. In this case, a particular environmental objective is set (e.g. 50 per cent reduction in particulate emission relative to some previous year), and then the emissions tax is set at a level designed to achieve that objective. Third, a tax could be set to raise funds for preventing or mitigating environmental damage (i.e. a trust fund). Tax revenues could then be used to develop DSM or renewable resources.

QUANTITY CONTROLS

Quantity controls aim to limit the total amount of pollutants that can be emitted from all sources owned by a utility or within a geographical region. Quantity controls are the opposite of taxes since they specify the upper threshold for total emissions that must be met collectively. Taxes, on the other hand, address the issue of pollution prevention from the other direction, by specifying the monetary penalty for pollutant emissions on the basis of some ultimate desired level of quantity control.

Within this approach, emission caps could be specified to place a ceiling on emissions in a country or region. Utilities could be allocated a certain number of pollution permits, on a pro-rated basis according to historical emission levels, each of which allows them to emit a fixed quantity of the pollutant.

GREEN ELECTRICITY PRICING

New approaches to electricity pricing may offer limited opportunities to encourage consumers to purchase cleaner sources or invest in conservation. However, these 'green pricing' schemes generally rely on the customer's willingness, voluntarily, to pay higher prices for cleaner resources, and they have not as yet been shown to be effective in North American contexts where they have been attempted. The operational premise is that there are certain customers who want to use electricity produced by 'clean' technologies, and that they will undertake to pay the expense necessary to secure it. Electricity utilities could use funds raised from environmentally oriented customers to acquire renewable resources that would not otherwise be developed, either because they are above market costs or because they are hindered by market barriers. One advantage of green pricing is that it can protect customers from fuel price fluctuations. Prior to implementation, market research and pilot programmes would have to be conducted to determine if there is general interest in green pricing options.

Changes in impacts caused by alternative policies

The economic and regulatory measures proposed for making the energy sector more efficient are expected to make alternate sources of energy more attractive relative to those that are currently being tapped. They would also provide a combined incentive-penalty scheme that would encourage efforts to incorporate energy efficiency and a wide-scale transition to renewable sources.

Implementation of the components of the alternative policy package would alter the impacts of energy production and consumption. Additional sources of energy would be made available and the environmental impact of these sources would be significantly less by virtue of the nature and quantities of the emissions they produce. The use of solar, wind and natural gas would be more environmentally friendly. The emissions from natural gas would be relatively harmless when compared to the sulphur- and nitrogen-based gases associated with the use of crude oil and fossil fuels. The decline in crude oil use would also lead to a decrease in the air emissions that arise from using this fuel. The anticipated reduction in these discharges would auger well for global warming

and ozone-layer depletion phenomena which can only worsen if remedial measures are not taken.

The development of renewable energy sources would also permit a gradual reduction in the importation of crude oil and in the expenditure of the foreign exchange reserves currently spent on purchasing the commodity and refining it for use.

The rehabilitation of forest areas, which are currently being exploited for making charcoal, would lead to the preservation of the natural vegetation cover and the protection of watershed areas. This is also directly linked to the air emissions previously outlined. Maintenance of the vegetation cover ensures that there are viable sinks for the main greenhouse gas, carbon dioxide. When the gas is utilized in the photosynthetic process, provided there are sufficient forestry reserves in existence the amount available to contribute to the greenhouse effect is significantly reduced.

Finally, the additional sources of energy production would also translate into improved energy delivery which would be better able to keep pace with the demands of the region's growing population. Renewable or alternative forms of energy are also more viable in rural areas where interconnection is too expensive or politically difficult. Consequently, new energy sources would facilitate the expansion of energy-related services such as transportation, electricity generation, domestic heating etc. into rural areas, which in some Caribbean countries are still without these services.

Conclusions

The key environmental issues in the Caribbean in the twenty-first century are likely to be unexpected transformations of old issues and well-known issues that currently do not receive enough policy attention, rather than unforeseen events and new scientific discoveries. As such, the issues that need to be addressed in the region are well known.

Clearly, to carry on with business as usual will exert immense pressures on the environment and natural resource base of the Caribbean. Widespread policy reform could make a significant difference. Implementation of alternative policies, such as those outlined above for the energy sector, could dramatically improve the environmental situation and could shift the Caribbean towards a more sustainable production and consumption pattern.

These policies are often fairly easy to implement, and in many instances may have unexpected benefits for the economy the long term. Initial finance, however, remains a major obstacle to successful policy implementation. Another obstacle is the low priority afforded to the environment: other issues, such as poverty, housing, education and health care take priority.

Nevertheless, the economy and ecology of the Caribbean are interdependent, and economies are heavily dependent on tourism, mono-crop export-led agricultural practices, mineral hydrocarbon exploration, and escalated use of marine resources. Rapid and irreversible degradation of these resources greatly reduces these countries' prospects for socio-economic growth and development.

References

Ahmad, Rafi (ed.) (1992). Natural Hazards in the Caribbean. *The Journal of the Geological Society of Jamaica*, Special Issue No. 12.

Alconsult (1998). *Harmonization of Fuels Specifications in Latin America and the Caribbean*.

Alleyne, D., Boxill, I. and Francis, A. (1994). *Economic Reform and Sustainable Development in Jamaica*. Institute of Social and Economic Research, Kingston, Jamaica.

Antigua and Barbuda, Government of (1991). *Antigua and Barbuda's National Report to the United Nations Conference on Environment and Development (UNCED).* Prepared by Ministry of Economic Development, Tourism and Industry, St. John's, Antigua.

Archer, A. (1988). *Report on Sewage Disposal Problems in the Eastern Caribbean*. Regional Sewage Disposal Coastal Conservation Studies. Prepared for the United Nations Economic Commission for Latin American and the Caribbean, Port of Spain.

Bacon, P. (1991). Integrating Wetlands in Tourism Development Planning. Unpublished paper. UWI, Kingston. Jamaica.

Bahamas, Commonwealth of (1992). *Report of the Commonwealth of the Bahamas to the United Nations Conference on Environment and Development (UNCED).* Nassau, Bahamas.

BIDC (1998) (Barbados Investment and Development Corporation, 1998). *Profile of Barbados, Data for 1996/1997*. Government Printing Department, St. Michael, Barbados.

Birdsey, R., Weaver, P. and Nicholls, C. (1986). *The forest resources of St Vincent, West Indies*. Research Paper SO-229. U. S. Department of Agriculture, Forest Service, Southern Forest Experimental Station. New Orleans, LA.

Boo, Elizabeth (1990). *Ecotourism, Volume 1: The Potential and Pitfalls*. World Wide Fund for Nature, Washington, D.C.

Bryant, D., Burke, L., McManus, J. and Spalding, M. (1998) *Reefs at Risk: A Map-Based Indicator of Threats to the World's Coral Reefs.* A joint publication by World Resources Institute (WRI), International Centre for Living Aquatic Resources Management (ICLARM), World Conservation Monitoring Centre (WCMC), United Nations Environment Programme (UNEP), Washington.

Bryant, Dirk *et al*. (1995). *Report of Workshop on Water Resource Problems in Small Island Developing States*, August 22–24, 1995. Bridgetown, Barbados.

Carbon Dioxide Information Analysis Center (CDIAC), Sciences Division, Oak Ridge National Laboratory, *1995 Estimates of CO_2 Emissions from Fossil Fuel Burning and Cement Manufacturing based on the United Nations Energy Statistics and the US Geological Survey Cement Manufacturing Data.*

Caribbean Development Bank (1997). *Annual Report*. Barbados.

Caribbean Law Institute (1998a). *Integrated Coastal Zone Management and Legislation in the Anglophone Caribbean*. Organization of American States.

Caribbean Law Institute (1998b). *Implementation of Maritime and Environmental Treaties in Organization of Eastern Caribbean States*: Case Study Reports for Antigua and Barbuda, Dominica, St. Kitts and Nevis and St. Vincent and the Grenadines. Second Draft.

Caribbean Law Institute Center/Organization of American States (1998). *Integrated Coastal Zone Management and Legislation in the Anglophone Caribbean*.

Central Intelligence Agency (1997). *World Yearbook for 1997.*

Central Romano Corporation (1998). Personal communication with Dr. F. Redman, Director of Agricultural Research.

Clayton, A., Duffy, N., Ryan, B.and Williams, J. R. (1995). 'Green Industry and Clean Technology. Chapter 1

Colchester, M. and Lohmann, L. (1990). *The Tropical Forestry Action Plan: What Progress?* World Rainforest Movement, Malaysia.

Commonwealth Secretariat (1998). *The Commonwealth Yearbook 1998 for Commonwealth Countries*.

Cote, R. and Gordon, C. (eds.) (1996). *Industrial Chemical Control and Waste Minimization in the Caribbean*. Halifax.

Cross, R. (1991). 35th Working Session, IUCN Commission on National Parks and Protected Areas, Santo Domingo, 29 April – 3 May. Personal communication quoted in Kelleher, Bleakley and Wells (1995).

Crowards, T. (1998). *A Proposed Set of Sustainable Development Indicators for the Caribbean*. A Working Document for the Caribbean Development Bank's Regional Workshop on Sustainable Development Indicators, Barbados, October 1998.

Crowards, T. (1999). An Economic Vulnerability Index for Developing Countries, with Special Reference to the Caribbean: Alternative Methodologies and Provisional Results (draft for consultation). Caribbean Development Bank.

CTO (1998). Data extracted from the *Annual Report on Caribbean Tourism for 1998* published by the Caribbean Tourism Organization, Barbados. Data were provided in digital form by the CTO Research Office.

Cuba, Government of (1994a). *Commission on Sustainable Development: Report from Cuba*. Ministry of Science, Technology and Environment, Havana.

Cuba, Government of (1994b). *National Forestation Programme*. Ministry of Agriculture, Havana.

Cuba, Government of (1995a). *Balance Areas: National Report*. ONE, Havana.

Cuba, Government of (1995b). *Report on Forestry*. Ministry of Agriculture, Havana.

Cuba, Government of (1997). *Environmental Diagnosis of Cauto Watershed*. Cauto Watershed Authority. Technical draft.

Cuba, Government of (1998a). *Dates of Cuba*. Centre of Information Management and Environmental Education, Department of Environmental Education, Havana.

Cuba, Government of (1998b). *National Biodiversity Study of the Cuban Republic.* Madrid, *CECYTA. 480 pp.* CITMA-PNUMA-IES-CENBIO.

Cuba, Government of (1998c). *National Environmental Situation*. Ministry of Science, Technology and Environment, Havana.

Cuba, Government of (1998d).*Statistical Yearbook of Cuba 1996*. National Statistical Office, Havana, 334pp.

De Meyer, K. (1997). How tourism can help protect the environment: a case study of the Bonaire Marine Park. *Tourism Focus*, No. 9. United Nations Environment Programme, Industry and Environment, Paris.

Dillon, W., Edgar, T., Scanlon, K. and Klitgord, K. (1988). 'Geology of the Caribbean'. In: *Oceanus*, Volume 30, Number 4, Winter 1987/88. Woods Hole Oceanographic Institution, Woods Hole, MA. Pp. 42–52.

Dinerstein, E., Olson, D., Graham, D., Webster, A., Primm, S., Bookbinder, M. and Ledec, G. (1995). *A Conservation Assessment of the Terrestrial Ecoregions of Latin American and the Caribbean*. The World Bank, in association with WWF, Washington.

Dominica, Commonwealth of (1994). *Dominica: National Environmental Action Plan*. Ministry of Agriculture, Lands, Fisheries and Forestry, Forestry and Wildlife Division, Roseau, Dominica.

ECLAC ( ) United Nations Economic Commission For Latin America and The Caribbean (UN/ECLAC) *Progress, Catalysts For Successes, Constraints And Priorities For The Future*.

ECLAC (1997a) United Nations Economic Commission for Latin America and the Caribbean, 1997. *A Review of the Implementation of the SIDS-POA Priorities for the Future*.

ECLAC (1997b). United Nations Economic Commission for Latin America and the Caribbean, 1997. *Caribbean Ministerial Meeting on the Implementation of the Program of Action for the Sustainable Development of Small Island Development States (SIDS).* Conference Report, Barbados, November 1997.

ECLAC (1999). *Report on Implementation in the Caribbean of the Programme of Action for Small Island Developing States to the Seventh Meeting of the Commission on Sustainable Development (CSD).* United Nations Economic Commission for Latin America and the Caribbean, Sub-regional Headquarters for the Caribbean, Port of Spain, Trinidad and Tobago.

ECLAC website: http://community.wow.net/eclac

ECLAC/CDCC (1997). United Nations Economic Commission for Latin America and the Caribbean/Caribbean Development and Cooperation Committee (ECLAC/CDCC) Secretariat, 1997. National profile reports developed on the basis of questionnaires submitted by Member Governments.

EMA (1996). *Trinidad and Tobago State of the Environment 1996 Report*. Environmental Management Authority of Trinidad and Tobago. Port of Spain, Trinidad.

EMA (1998) Personal communication with G. Goddard, Environmental Management Authority of Trinidad and Tobago. Port of Spain, July 1998.

Falconado Dominicano (1998). Personal communication with the Environmental Manager.

Falkenmark, M and Widstrand, C. (1992). Population and Water Resources: A Delicate Balance. *Population Bulletin*. Population Reference Bureau, New York.

FAO (1997a) Food and Agriculture Organization of the United Nations, Fisheries Department. *Review of the State of the World Fishery Resources: Marine Fisheries. Western Central Atlantic*. FAO Statistical Area 31. FAO Fisheries Circular No. 920 FIRM/C920.

FAO (1997b) Food and Agriculture Organization of the United Nations, Forest Resources Division, *State of the World's Forests*. Rome.

FAO website: http://apps.fao.org/

FAOSTAT Material sourced from FAOSTAT website: http://apps.fao.org/

Ferguson, R. (1995). 'Solid Waste Management in New Providence, The Commonwealth of the Bahamas'. In: *Proceedings of 1995 Caribbean Waste Management Conference – Waste Reduction and Recycling Opportunities*. San Juan, 1995.

Finger, J. M, Ng F. and Soloaga, I. (1998). 'Trade Policies in the Caribbean Countries: A Look at the Positive Agenda.' A paper prepared for discussion at the meetings of the Caribbean Group for Co-operation on Economic Development, Washington, D.C, (June 1998) and National Statistics Office of Cuba (June 1998). *Statistical Yearbook* 1996.

Forde, L., Tate, D. and Arlosoroff, A. (1997). *Report of the Working Group on Demand Management and Conservation*. Water Supply and Sanitation Collaborative Council. Geneva, Switzerland.

Forde, Lester H. (1994). *Privatisation of the Water Industry in Trinidad and Tobago*. Prepared for 8th Annual Technical Conference of the Association of Professional Engineers of Trinidad and Tobago, St. Augustine.

Goddard, Glen (1997). Background Paper on Solid Waste Management in Trinidad and Tobago. Environmental Management Authority of Trinidad and Tobago, Port of Spain.

Grenada, Government of (1994). *Grenada: National Environmental Action Plan*. Ministry of Health, Housing and Environment, St. Georgeís, Grenada.

Gumbs, Barbara (ed.) (in press). *National Environmental Information Strategies*. International Federation for Information (FID).

Haggerty, Richard (ed.) (1989). *Dominican Republic – A Country Study*. Federal Research Division, Library of Congress, Washington, DC.

Haiti, Republic of (1992). *National Report on Environment and Development*. UNCED National Report.

Howell, Calvin A. (1994). 'Environmental Education in the English Speaking Caribbean' In: *Environmental Education in Small Island Developing States*. The Commonwealth of Learning. Walter Leal Filho. Ed. Canada.

Inter-American Development Bank (1995). *Periodic Notes on Economic Integration*. CARICOM.

Inter-American Development Bank/Pan American Health Organization (1996). *Caribbean Regional Health Study*. Submitted to the Consultative Group for Caribbean Economic Development (CGCED).

Intergovernmental Oceanographic Commission (1994). IOC Workshop on Geographic Information Systems Applications in the Coastal Zone Management of Small Island Developing States, Barbados, 20 - 22 April 1994. Workshop Report No. 103.

IRC International Water and Sanitation Centre (1995). Water and Sanitation for All: *A World Priority. Vol. 1: A Developing Crisis*. The Hague, The Netherlands.

Island Resources Foundation (1991a). *Antigua and Barbuda Country Environmental Profile*. A joint project of the Government of Antigua and Barbuda, Environmental Awareness Group, Caribbean Conservation Association, and Island Resources Foundation.

Island Resources Foundation (1991b). *Dominica Country Environmental Profile*. A joint project of the Government of the Commonwealth of Dominica, Dominica YES Committee, Caribbean Conservation Association, and Island Resources Foundation.

Island Resources Foundation (1991c). *Grenada Country Environmental Profile*. A joint project of the Government of Grenada, Grenada National Trust, Caribbean Conservation Association, and Island Resources Foundation.

Island Resources Foundation (1991d). *St. Kitts and Nevis Country Environmental Profile*. A joint project of the Government of St. Kitts and Nevis, St. Christopher Heritage Society, Nevis Historical and Conservation Society, Caribbean Conservation Association, and Island Resources Foundation.

Island Resources Foundation (1991e). *St. Lucia Country Environmental Profile*. A joint project of the Government of St. Lucia, National Research and Development Foundation, Caribbean Conservation Association, and Island Resources Foundation.

Island Resources Foundation (1991f). *St. Vincent and the Grenadines Country Environmental Profile*. A joint project of the Government of St. Vincent and the Grenadines, St. Vincent National Trust, Caribbean Conservation Association, and Island Resources Foundation.

Island Resources Foundation (1993a). *Anguilla Environmental Profile. Part 1–A Resource Management Framework: An Assessment of the Critical Environmental Issues Facing Anguilla*. A joint project of the Government of Anguilla, Anguilla Archaeological and Historical Society, and Island Resources Foundation.

Island Resources Foundation (1993b). *Montserrat Environmental Profile: An Assessment of the Critical Environmental Issues Facing Montserrat with An Action Agenda for the Future*. A joint project of the Government of Montserrat, Montserrat National Trust, and Island Resources Foundation.

Island Resources Foundation (1998). *Biodiversity Assessment of the Eastern Caribbean*. St. John's, Antigua.

ISRS (1999). *Statement on Global Coral Bleaching in 1997–98*. International Society for Reef Studies. Florida Institute of Oceanography, Florida, United States.

ITMEMS (1998). *Statement on Coral Bleaching.* International Tropical Marine Ecosystems Management Symposium. 24 October 1998, Townsville, Australia.

ITTO (1997). *Annual Review and Assessment of the World Tropical Timber Situation*. International Tropical Timber Organization.

IUCN–The World Conservation Union (1993a). *Environmental Synopsis: Barbados*. Gland, Switzerland.

IUCN–The World Conservation Union (1993b). *Environmental Synopsis: Dominican Republic (Perfil Ambiental: Republica Domicana).* Gland, Switzerland.

IUCN–The World Conservation Union (1993c). *Environmental Synopsis: Jamaica*. Gland, Switzerland.

Jamaica Bauxite Institute (1995). *Recommendations for the Jamaica Bauxite Institute to meet its obligations under the memorandum of understanding with the Natural Resources Conservation Authority*. Report prepared by Bovar-Concord Environmental for the Jamaica Bauxite Institute.

Jamaica, Government of (1992). *Jamaica National Report to the United Nations Conference on Environment and Development (UNCED).* Ministry of Finance, Planning and Development with the Planning Institute of Jamaica. Kingston, Jamaica.

Jamaica, Government of, and Ralph M. Field Associates. Inc. (1987). *Jamaica Country Environmental Profile*.

Kelleher, G., Bleakley, C. and Wells, S. (eds) (1995). *A Global Representative System of Marine Protected Areas. Vol. II: Wider Caribbean, West Africa and South Atlantic*. Great Barrier Reef Marine Park Authority, World Bank and World Conservation Union (IUCN).

Kjellen, Marianne and McGranahan, Gordon (1997). *Comprehensive Assessment of the Freshwater Resources of the World, Urban Water – Towards Health and Sustainability*. Stockholm Environment Institute, Stockholm, Sweden.

Lang, J., Alcolado, P., Carricart-Ganivet, J. P., Chiappone, M., Curran, A., Dustan, P. Gaudian, G., Geraldes, F., Gittings, S., Smith, R., Tunnell, W. and Weiner, J. (1998). Status of Coral Reefs in the Northern Areas of the Wider Caribbean. In: Wilkinson, C. (ed.), *Status of the Coral Reefs of the World*. Australian Institute of Marine Science, Townsville, Australia.

McElroy, J. and de Albuquerque, K. (1998). Tourism Penetration Index in Small Caribbean Islands. *Annals of Tourism Research*, 25(1), pp. 145-168.

Monastersky, R. (1999). 'Hidden Threats Take Toll in Amazon' IN: Science News, Volume 155, April 10, 1999. Science Service, Washington, DC. Also, see Nature, April 8, 1999.

Montserrat, Government of (1994). *Montserrat: National Environmental Action Plan*. Ministry of Agriculture, Trade and Environment with United Nations Development Programme and World Bank.

National Seminar on Sustainable Development Law, Kingston Jamaica, June 1998. Final Report: *Sustainable Development Laws and International Treaty Obligations*

NRCA (1994). Natural Resources Conservation Authority. *Jamaica: National Environmental Action Plan*. Prepared by NRCA, Planning Institute of Jamaica, and World Bank.

NRCA (1996). Natural Resources Conservation Authority. *Stack Emission Standards for Jamaica*. Report prepared by Claude Davis for the Jamaica Natural Resources Conservation Authority.

NRCA (1998). Natural Resources Conservation Authority. *Draft Ambient Air Quality Regulations*. Report prepared by Claude Davis for the Jamaica Natural Resources Conservation Authority.

Nurse, Leonard (1998). Integrated Coastal Zone Management in the Caribbean: Lessons Borrowed from Empirical Experience. In: *Natural Resource Management in the Caribbean, Discussion Papers*. OECS Coastal Zone Management Project, St. Lucia

Organization of Eastern Caribbean States, Natural Resources Management Unit (n.d.). Coastal Management Act and Regulations for the OECS. OECS-NRMU\GTZ Project Activity.

PAHO/WHO (n.d.) Pan American Health Organization/World Health Organization *A World Safe from Natural Disasters. The Journey of Latin America and the Caribbean*.

PAHO/WHO (1996) Pan American Health Organization/World Health Organization. *Municipal Solid Waste Management in Latin America and the Caribbean*. Washington, D.C.

PANOS/CANARI. (1994). *Protected Areas and Community Management*. Community & the Environment, Lessons from the Caribbean. PANOS Institute, Caribbean Natural Resources Institute (CANARI).

PCJ (1998) Petroleum Corporation of Jamaica. *Update to the National Action Plan for the Phase-Out of Leaded Gasoline in Jamaica*. Report prepared for the Petroleum Corporation of Jamaica by Claude Davis.

Planning Institute of Jamaica (1995). *Economic and Social Survey, Jamaica, 1994* (ISSN 0256-5013).

Potter, B., Towle, E. L. and Brower, D. (1995) *Hazard Mitigation Plan for the US Virgin Islands*. Virgin Islands Territorial Emergency Management Agency (VITEMA), St. Thomas, 1995. Also on the web at HIPERVÔNCULO "http://www./irf.org/irhazmit.htm" http://www./irf.org/irhazmit.htm

PREPA (1998). Puerto Rico Electric Power Authority (Autoridad de Energìa ElÈctrica de Puerto Rico). On line.

Rajkumar, W. (1995). *Rapid Assessment of Air Pollution in Trinidad and Tobago*. Report prepared for the Pan American Health Organization. Port of Spain, Trinidad.

Regional Conference of National Councils on Sustainable Development of Central America and The Caribbean: Caribbean Report (posted online).

Regional Program Implementation Unit for CPACC Project (1997). Caribbean Planning for Adaptation to Global Climate Change Project, Project Document. University of the West Indies, Centre for Environment and Development, Barbados.

Sammy, G. K., Singh, N. C., Jitman, K. and Sweeney, V. (1995). *Industrial Wastewater Management in the Caribbean Region*. UNEP Industry and Environment, April–September 1995.

Seabright, Paul (1997). *Comprehensive Assessment of the Freshwater Resources of the World, Water: Commodity or Social Institution. Stockholm Environment Institute*, Stockholm, Sweden.

SEI/UNEP (1998). Raskin, P., Gallopin, G., Gutman, P., Hammond, A. and Swart, R. *Bending the Curve: Toward Global Sustainability*. PoleStar Series Report No. 8. Stockholm Environmental Institute, Stockholm, Sweden and UNEP/DEIA/TR.98–3, UNEP, Nairobi, Kenya <http://www.gsg.org/>

Serageldin, Ismail (1994). *Water Supply, Sanitation and Environmental Sustainability – The Financing Challenge*. World Bank, Washington, DC.

Singh-Renton, S. (1997). The Atlantic Yellowfin Tuna – Fishery and Stock Trends. CARICOM *Fisheries Newsnet*, Vol. 4, No. 3.

Smith, A., Rogers, C. and Bouchon, C. (1998). Status of Coral Reefs in the Lesser Antilles, Western Atlantic. In: Wilkinson, C. (ed.), *Status of the Coral Reefs of the World: 1998*. Australian Institute of Marine Science, Townsville, Australia.

St. Hill, Yvonne L. (1996). *Summary Report On The Implementation Of The Small Island Developing States Programme Of Action (SIDS POA) In The Caribbean:*

St. Kitts and Nevis, Government of (1992). Saint Kitts and Nevis Country Position Paper. Prepared for the United Nations Conference on Environment and Development (UNCED).

St. Kitts and Nevis, Government of (1994). *St. Kitts and Nevis: National Environmental Action Plan*.

St. Lucia, Government of (1994). Saint *Lucia: National Environmental Action Plan*. Ministry of Planning and Development, Castries, St. Lucia.

St. Vincent and the Grenadines, Government of (1994). *Saint Vincent and the Grenadines: National Environmental Action Plan*. Ministry of Health and the Environment, Kingstown, St. Vincent, with World Bank and United Nations Development Programme.

Statistical Institute of Jamaica (1997). *Statistical Abstract 1996.*

Sugar Industry Research Institute (1998). Personal communication with Mr. T. Falloon, Sugar Industry Research Institute, July.

Suite, W. (1990). *The Caribbean Perspective on Waste Management*. Paper presented at the Seventh Annual Technical Conference on Waste Management in Developing Countries, Washington, D.C., September 1990.

Sullivan, K. M., and Bustamante, G. 'Geographic Priorities in Marine Conservation', In: *Bahamas Journal of Science*, February, 1998, Nassau, pp 8–15. The Dinerstein *et al*. methodology applied to marine systems. This article is an excerpt from a larger work, in press.

Sweeney, V. (1995). Case Studies in Waste Minimization in CARICOM Countries. In: *Proceedings of 1995 Caribbean Waste Management Conference – Waste Reduction and Recycling Opportunities*, San Juan Puerto Rico.

The DR1 Daily News (1998a). Fernandez Administration to Resolve Energy Crisis (Monday, 1 June 1998).

The DR1 Daily News (1998b). New Environmental Protection Institute (Monday, 8 June, 1998).

The Economist Intelligence Unit (1997) *Annual Country Reports 1997*, Jamaica, Belize, Windward and Leeward Islands, Trinidad and Tobago, Guyana and Suriname. EIU, London.

The Jamaica Gazette (1991). The Natural Resources Conservation Authority Act, 1991. Act 9 of 1991, July 5, 1991.

The Nation (1997). The Caribbean's Top 100 Public Companies. St. Michael, Barbados.

Tobago House of Assembly (1995). *A Critical Review of Yachting Activity in Tobago.* Trinidad and Tobago (October 1995).

Towle, J. (1991). *Environmental Agenda for the 1990's: A Synthesis of the Eastern Caribbean Country Environmental Profile Series*. Caribbean Conservation Association, Island Resources Foundation, US Agency for International Development, St. Thomas. Page 42.

Trinidad and Tobago Gazette (1995). Act No. 3 of 1995, Environmental Management Act 1995, Legal Supplement Part A to the *Trinidad and Tobago Gazette*, Vol. 34, No. 49, 7 March, 1995.

Trinidad and Tobago, Government of (1992). *National Report on Environment and Development: United Nations Conference on Environment and Development (UNCED)*.

Trinidad and Tobago, Government of (1996). *Status of Natural Gas-based Projects in Trinidad and Tobago*. Ministry of Energy and Energy Industries.

Trinidad and Tobago, Government of (1996). *Trinidad, Population and Vital Statistics Report, 1995.* Central Statistical Office.

UNCHS (1996) United Nations Centre for Human Settlements (1996). *Preliminary Results of Human Settlements Indicators in Twelve Caribbean Countries Recorded to Date* (RLA/95/006-CAR-95-001). Report prepared for UNCHS by Esther Harper.

UNCHS (1997) United Nations Centre for Human Settlements (1997). The Way Forward – Land Resources. In: *Report on Caribbean Ministerial Meeting on the Implementation of the Programme of Action for the SIDS* (SIDS 97/INF), Barbados, 24 November 1997.

UNECLAC / CARICOM (1993). *Sustainable Development of Small Island Developing States with special reference to the Atlantic and Caribbean States – An Overview.* Prepared for the Regional Technical Meetings for the Atlantic/Caribbean/Mediterranean, Preparatory to the Global Conference on the Sustainable Development of Small Island Developing States, Port of Spain, Republic of Trinidad and Tobago, 12–16 July, 1993.

UNECLAC / CDCC (1994). *The World Summit for Social Development: A Caribbean Perspective*. United Nations Economic Commission for Latin America and the Caribbean / Caribbean Development and Cooperation Committee.

UNECLAC-CDCC/IDRC/UNEP (1997). Caribbean Ministerial Meeting on the Implementation of the Programme of Action for the Sustainable Development of Small Island Developing States. Barbados, 10–14 November 1997.

UNECOSOC (1999a). United Nations Economic and Social Council. *National institutions and administrative capacity in small island developing states*. (E/CN. 17/1999/6/Add.6), UN, New York.

UNECOSOC (1999b). United Nations Economic and Social Council. *Regional institutions and technical co-operation for the sustainable development of small island developing states*. (E/CN. 17/1999/6/Add.7), UN, New York.

UNEP (1997). *Global Environment Outlook 1.* (GEO-1) United Nations Environment Programme. Oxford.

UNEP (1999) *Global Environment Outlook 2000.* United Nations Environment Programme, Earthscan, London.

UNEP-CEP (1995). United Nations Environment Programme, Caribbean Environment Programme, 1995. *Report of the Consultation on Coastal Resource Management in the Tropical Americas*. Third Meeting of the Interim Scientific and Technical Advisory Committee (ISTAC) to the Protocol Concerning Specially Protected Areas and Wildlife (SPAW) in the Wider Caribbean Region. UNEP, Kingston, 11-13 October 1995.

UNEP-CEP (1996). United Nations Environment Programme, Caribbean Environment Programme, 1996. *Guidelines for Integrated Planning and Management of Coastal and Marine Areas in the Wider Caribbean Region*. Prepared by Island Resources Foundation for UNEP/CEP.

UNEP-CEP (1997) United Nations Environment Programme, Caribbean Environment Programme, 1997. *Coastal Tourism in the Wider Caribbean Region: Impact and Best Management Practices*. UNEP/CEP Technical Report No. 38.

UNEP-CEP website: http:www.cep.unep.org/

United Nations (1997). *Human Development Report*. New York.

United Nations Department for Economic and Social Information and Policy, Analysis Population Division (UNDESIPA-PD) (1995a). *The Challenge of Urbanization: The World's Large Cities*. New York.

United Nations Department for Economic and Social Information and Policy, Analysis Population Division (UNDESIPA-PD) (1995b). *World Urbanization Prospects: The 1994 Revision*. New York.

United Nations Department for Policy Coordination and Sustainable Development (DPCSD). (n.d.) *Implementation Of The Programme Of Action For The Sustainable Development Of Small Island Developing States*. Report of the Secretary-General.

United Nations Population Fund (1998). Country Support Team for Latin America and the Caribbean.

United States Department of Agriculture (1998). *United States Sugar Production by Sugar Beet and Sugarcane Processors, Fiscal Year 1997.*

United States Energy Information Administration (1997). *Caribbean Fact Sheet, Electricity in the Caribbean, 1996.*

United States Energy Information Administration (1998). *Country Specific Information, International Energy*.

United States Environmental Protection Agency (1998). Aerometric Information Retrieval Service (AIRS) Web. Office of Air Quality Planning and Standards, Information Transfer Group, Research Triangle Park, NC 27711.

United States Federal Highway Administration (1997). *Highway Statistics, Puerto and the Territories*. Office of Highway Information Management.

University of the West Indies, Centre for Environmental Studies (1997). *Plan for the Phase-Out Of Leaded Gasoline in Trinidad and Tobago*. Engineering Institute, UWI.

Vlugman, A. A. (1992). *Assessment of Operational Status of Waste Water Treatment Plants in the Caribbean*. Caribbean Environmental Health Institute/Pan American Health Organization.

Wilkinson, C. (ed.) (1998). *Status of the Coral Reefs of the World: 1998.* Australian Institute of Marine Science, Townsville, Australia.

Windgrad, Manuel (n.d.). *Environmental Indicators for Latin America and the Caribbean: Toward Land-use Sustainability*. Gase Ecological Systems Analysis Group, Inter-American Institute for Cooperation on Agriculture (IICA), Organization of American States (OAS), and World Resources Institute (WRI).

Woodley, J., De Meyer, K., Bush, P., Ebanks-Petrie, G., Garzon-Ferreira, J., Klein, E., Leendert, P. and Wilson, C. (1998). Status of Coral Reefs in the South-Central Caribbean. In: Wilkinson, C. (ed.), Status of the Coral Reefs of the World: 1998. Australian Institute of Marine Science, Townsville, Australia.

World Bank (1993). *Jamaica: Economic Issues for Environmental Management*. Washington, D.C.

World Bank (1994). *Initiatives for Regional Action on Caribbean Environmental Issues*. Washington, D.C.

World Bank (1996). *Poverty Reduction and Human Resource Development in the Caribbean*. Washington, D.C.

World Bank (1997). *Mainstreaming the Environment: The World Bank Group and the Environment since the Rio South Summit*. Washington D.C.

World Bank (1998). *Caribbean Economic Overview 1998*. Caribbean Country Management Unit, Latin America and the Caribbean Region.

World Travel & Tourism Council / WEFA (1999). Travel & Tourism Satellite Accounting, Research Estimates and Forecasts, February, 1999, Version 1.2, on the web site at HIPERVÕNCULO http://www.wttc.org/ http://www.wttc.org/ .

Worrell, DeLisle *et al*. (eds.) (1991) *Financing Development in the Commonwealth Caribbean*. Macmillan Education Ltd., London.

Wouter Lincklaen Arriens, Jeremy Bird, Jeremy Berkoff and Paul Mosely (eds.), (1996). Towards Effective Water Policy in the Asian and Pacific Region. Vol. 1: Overview of Issues and Recommendations. *Proceedings of the Regional Consultation Workshop*, Manila, Philippines, May 10 - 14, 1996.

WRI/UNEP/UNDP/WB (1994). World Resources Institute, United Nations Environment Programme, United Nations Development Programme and The World Bank, 1994. World Resources, *A Guide to the Global Environment: People and the Environment*. Oxford University Press.

WRI/UNEP/UNDP/WB (1996). World Resources Institute, United Nations Environment Programme, United Nations Development Programme, and The World Bank, 1996. World Resources 1996-97, *A Guide to the Global Environment: The Urban Environment* (ISBN: 0-19-521161-8). Oxford University Press.

Acronyms

ACP	African, Caribbean and Pacific
AGRRA	Atlantic and Gulf Rapid Reef Assessment
BCIS	Biodiversity Conservation Information System
BIONET	Biodiversity Action Network
CANARI	Caribbean Natural Resources Institute
CARICAD	Caribbean Centre for Development Administration
CARICOM	Caribbean Community
CARICOMP	Caribbean Coastal Marine Productivity Programme
CARISPLAN	Caribbean Information System for Economic and Social Planning
CBD	Convention on Biological Diversity
CBO	Community-Based Organization
CCA	Caribbean Conservation Association
CCD	Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa
CDERA	Caribbean Disaster Emergency Response Agency
CEHI	Caribbean Environmental Health Institute
CEIS	Caribbean Environmental Information System
CEO	Caribbean Environment Outlook
CEP	Country Environmental Profile
CEP-RCU	Caribbean Environment Programme – Regional Co-ordinating Unit
CEPNET	Caribbean Environment Programme Network – Information Systems for the Management of Marine and Coastal Resources at the UNEP Caribbean Environment Programme Regional Co-ordinating Unit, Jamaica
CFRAMP	Caribbean Fisheries Management Programme
CGCED	Caribbean Group for Co-operation in Economic Development
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CLOPD	International Convention on Civil Liability for Oil Pollution Damage
CMS	Convention on the Conservation of Migratory Species of Wild Animals
CPUE	catch per unit effort
ECLAC	Economic Commission for Latin America and the Caribbean
FAO/SLAC	Food and Agriculture Organization / Subregional Office for Latin America and the Caribbean
GATT	General Agreement on Tariffs and Trade
GEMCO	Guyana Environmental Management Conservation Organization
GEO	Global Environment Outlook
IABIN	Inter-American Biodiversity Information Network
ICCAT	International Commission for the Conservation of Atlantic Tunas
ICLARM	International Centre for Living Aquatic Resources Management
IDB	Inter-American Development bank
IOC-REP	Indian Ocean Commission, Regional Environment Programme
IRF	Island Resources Foundation
MARPOL	International Convention for the Prevention of Pollution from Ships
MEA	Multilateral Environmental Agreement
NAFTA	North American Free Trade Agreement
NBSAP	National Biodiversity Strategy and Action Plan
NEAP	National Environmental Action Plan
NEIS	National Environmental Information System
NGO	Non-Governmental Organization
OECS	Organization of Eastern Caribbean States
OECS/NRMU	Organization of Eastern Caribbean States/Natural Resources Management Unit
OILPOL	International Convention for the Prevention of Pollution of the Sea by Oil
OLADE	Latin American Energy Organization
SDCs	Sustainable Develpment Councils
SIDA	Swedish International Development Agency
SOLAS	International Convention for the Safety of Life at Sea
SPAW	Specially Protected Areas and Wildlife Protocol
SPREP	South Pacific Regional Environment Programme
UNCED	United Nations Conference on Environment and Development
UNCLOS	United Nations Convention on the Law of the Sea
UNECLAC	United Nations Economic Commission for Latin America and the Caribbean
UNEPNet	The UNEP Internet site dedicated to environmental information services
UNFCCC	United Nations Framework Convention on Climate Change
UWI-CED	University of the West Indies, Centre for Environment and Development
WCMC	World Conservation Monitoring Centre
WTTC	World Travel and Tourism Council

Participants in the Caribbean Environment Outlook Regional Consultation Meeting, 12–14 January 1999, Jamacia

GOVERNMENTS

ANTIGUA AND BARBUDA

Ms Dianne Black Layne
Chief Environmental Officer
Ministry of Planning, Implementation and Environment
Cecil Charles Building
St. John's
Antigua and Barbuda
Tel: (1-268) 463-0907 / 462-6428
Fax: (1-268) 462-9338
E-mail: feedinghorse@candw.ag

BARBADOS

Mr John R. A. Wilson
Senior Environmental Officer
Ministry of Health and Environment
Sir Frank Walcott Building
Culloden Road
St. Michael
Barbados
Tel: (1-246) 431-7663 / 7680
Fax: (1-876) 437-8859
E-mail: envdivn@mail.caribsurf.com

CUBA

Mr Jorge Mario Garcia Fernandez
Director, CIGEA
Ministerio de Ciencia, Tecnologia y Medio Ambiente
18A No. 4114 entre 41 y 47
Playa 11300
La Habana
Cuba
Tel: (53-7) 29-6014
Fax: (53-7) 24-9031
E-mail: jmario@cidea.int.cu

DOMINICA

The Hon. Mr Peter Carbon (Vice-Chairperson)
Minister
Ministry of Agriculture and the Environment
Government Headquarters
Roseau
Dominica
Tel: (1-767) 448-2401, ext. 3211
Fax: (1-767) 448-7999

DOMINICAN REPUBLIC

Mr Julio Moises Alvarez
National Co-ordinator Capacity 21
National Planning Office (ONAP LAN)
Edif. Oficinas Gub. Av.
Mexico ESQ. D.R.
Delgado Bloque A 1er Nivel
Santo Domingo
Dominican Republic
Tel: (1-809) 221-5140 ext. 324
Fax: (1-809) 682-5757
E-mail: cap21@tricom.net

JAMAICA

The Hon. Mr Easton Douglas
Minister
Ministry of Environment and Housing
2 Hagley Park Road
Kingston 10
Jamaica
Tel: (1-876) 920-5255
Fax: (1-876) 926-2591

Mr Franklin J. McDonald (Chairperson)
Executive Director
Natural Resources Conservation Authority (NRCA)
10 Caledonia Avenue
Kingston 5
Jamaica
Tel: (1-876) 754-7550
Fax: (1-876) 754-7594
E-mail: fmcdonald@igc.org
Nrca@infochan.com
URL: http://www.nrca.org

Mrs Anastasia Calnick
Director
Environmental Protection and Conservation Division
Ministry of Environment and Housing
2 Hagley Park Road
Kingston 10
Jamaica
Tel: (1-876) 926-1590 to 9
Fax: (1-876) 920-7267

ST. LUCIA

Mr James Louis Fletcher
Permanent Secretary
Ministry of Agriculture, Fisheries, Forestry and Environment
Government Buildings
Waterfront
Castries
St. Lucia
Tel: (1-758) 452-2526
Fax: (1-758) 453-6314
E-mail: adminag@candw.lc

TRINIDAD AND TOBAGO

Ms Hazel McShine
Deputy Director (Research)
Institute of Marine Affairs
Hilltop Lane
Chaguaramas
P. O. Box 3160
Carenage
Trinidad and Tobago
Tel: (1-868) 634-4291-4
Fax: (1-868) 634-4433
E-mail: depdir@ima.gov.tt

INTERNATIONAL AND REGIONAL ORGANIZATIONS

Mr Erick Bloomstein
Programme Office
ECLAC
22–24 St Vincent Street, 2nd Floor
Port of Spain
Trinidad and Tobago
Tel: (1-868) 623-5595 / 623-5428
Fax: (1-868) 623-8485 / 627-8249
E-mail: ebloomstein@eclaps.undp.org

Mr David W. Bowen
Representative
FAO
First Life Building, Second Floor
60 Knutsford Boulevard
Kingston 5
Jamaica
Tel/Fax: (1-876) 929-7791

Mr Thor Leif Jackson
Technical Attaché
European Union Delegation of the
European Commission in Jamaica
8 Olivier Road
P. O. Box 463
Kingston 8
Jamaica
Tel: (1-876) 924-6333
Fax: (1-876) 924-6339
E-mail: eudeljam@wtjam.net

Mr Henry Schillingford
Programme Director
Dominica Conservation Association
Representing: Caribbean Conservation Association
Savannah Lodge
The Garrison
St. Michael's
Barbados
Tel: (1-246) 426-5373
Fax: (1-876) 429-8483
E-mail: cca@caribsurf.com

Mr Ken Shimizu
Programme Officer
United Nations Development Programme
1–3 Lady Musgrave Road
P. O. Box 280
Kingston 5
Jamaica
Tel: (1-876) 978-2390 ext. 2027
Fax: (1-876) 926-8654
E-mail: ken.shimizy@undp.org.jm

Mr Steven Stone
Environmental Specialist
Inter-American Development Bank
6th Floor, Dyoll Building
40–46 Knutsford Boulevard
Kingston 5
Jamaica
Tel: (1-876) 926-2342-4
Fax: (1-876) 926-2898
E-mail: stevens@iadb.org

Mr Vincent Sweeney
Executive Director
Caribbean Environmental Health Institute
P. O. Box 111
The Morne Castries
St. Lucia
Tel: (1-758) 452-2501
Fax: (1-758) 453-2721
E-mail: cehi@candw.lc

Mr Marcel J. H. Van Opstal
E. U. Chargé D'affaires in Belize
European Commission
Blake Building, 3rd Floor
P. O. Box 907
Corner Eyre
8 Hutson Street
Belize City
Belize
Tel: (501-2) 32070
Fax: (501-2) 72785
E-mail: eudelbalz@btl.net

NON-GOVERNMENTAL ORGANIZATIONS AND EMBASSIES

Mr Ralph A. Chen
Accountant
United Way of Jamaica
122–126 Tower Street
Kingston
Jamaica
Tel: (1-876) 922-9427

Ms Isabelle Van Tol
Second Secretary
Royal Netherlands Embassy
53 Knutsford Boulevard
Kingston 5
Jamaica
Tel: (1-876) 926-1247
Fax: (1-876) 926-1248
E-mail: rnekst@cwjamaica.com

UNITED NATIONS ENVIRONMENT PROGRAMME

Mr Nelson Andrade
Co-ordinator
UNEP Caribbean Environment
Programme, Regional Co-ordinating Unit
14–20 Port Royal Street
Kingston
Jamaica
Tel: (1-876) 922-9267 to 9
Fax: (1-876) 922-9292
E-mail: nac.uneprcuja@cwjamaica.com

Mr Norberto Fernández
Regional Co-ordinator
DEIAEW-LAC
United Nations Environment Programme
Regional Office for Latin America and the Caribbean
Mexico City
Mexico
Tel: (1-525) 202-48-41 / 202-49-55 / 202-63-91 / 202-69-13
Fax: (1-525) 202-09-50 / 520-77-68

Mr Lloyd Gardner
UNEP Consultant and Rapporteur
Managing Director
ECOTECH INC. LTD
P. O. Box 501
Kingston 6
Jamaica
Tel: (1-876) 960-5569
Fax: (1-876) 929-2956
E-mail: lgardner@mail.colis.com

Mr Kenneth D. Korporal
CEPNET Project Manager
UNEP Caribbean Environment
Programme, Regional Co-ordinating Unit
14–20 Port Royal Street
Kingston
Jamaica
Tel: (1-876) 922-9267 to 9
Fax: (1-876) 922-9292
E-mail: uneprcuja@cwjamaica.com
kdk.uneprcuja@cwjamaica.com

Ms Heli Johanna Tuononen
UNEP Consultant
Rue de la Concorde 62
1050 Brusells
Belgium
Tel: (32-2) 514-5324
E-mail: htuotonen@hotmail.com

Mr Kaveh Zahedi
Environmental Affairs Officer
United Nations Environment Programme
Division of Environmental Information and Assessment
P. O. Box 47074
Nairobi
Kenya
Tel: (254-2) 62-3769
Fax: (354-2) 62-3943
Email: kaveh.zahedi@unep.org

UNIVERSITY OF THE WEST INDIES

Prof. Al Binger
Director
Centre for Environment and Development
University of the West Indies – Mona
3 Gibraltar Camp Road
Kingston 7
Jamaica
Tel: (1-876) 977-1659
Fax: (1-876) 977-1658
E-mail: abinger@uwimona.edu.jm

Mr Anthony Clayton
UWICED
3 Gibraltar Camp Road
Mona
Kingston 7
Jamaica
Tel: (1-876) 977-1659 / 977-5530
Fax: (1-876) 977-1658

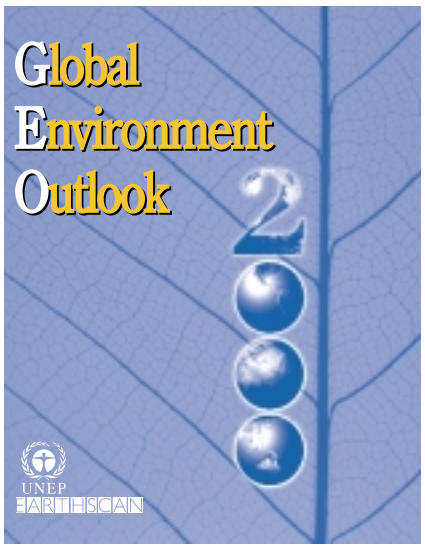
Ms Heatha M Miller
Executive Assistant / Public Relations Officer
Centre for Environment and Development
University of the West Indies – Mona
3 Gibraltar Camp Road
Kingston 7
Jamaica
Tel: (1-876) 977-1659
Fax: (1-876) 977-1658
E-mail: hmmiller@uwimona.edu.jm

Ms Patricia Northover
Research Fellow
Institute for Social and Economic Research
University of the West Indies
Mona
Kingston 7
Jamaica
Tel: (1-876) 927-1020
Fax: (1-876) 927-2409

Ms Nella Stewart
Information Systems Co-ordinator / GEO-2 Co-ordinator
Centre for Environment and Development
University of the West Indies – Mona
3 Gibraltar Camp Road
Kingston 7
Jamaica
Tel: (1-876) 977-1659
Fax: (1-876) 977-1658
E-mail: nstewart@uwimona.edu.jm

Mr Earle Sutherland
UWICED
3 Gibraltar Camp Road
Mona
Kingston 7
Jamaica
Tel: (1-876) 977-1659 / 977-5530
Fax: (1-876) 977-1658

Mr Michael Whyte
Journalist Social Science Student
University of the West Indies
44 Old Hope Road
Kingston 5
Jamaica



The *Caribbean Environment Outlook* is a report from the Global Environment Outlook (GEO) programme of UNEP. The global publication of this programme, the *Global Environment Outlook 2000* (*GEO-2000*) (ISBN: 1 85383 588 9), can be ordered from Earthscan Publications Ltd, 120 Pentonville Road, London N1 9JN, UK.
Tel: +44 (0)171 278 0433
Fax: +44 (0)171 278 1142
WWW: http://www.earthscan.co.uk

GEO-2000 is a comprehensive and authoritative review and analysis of environmental conditions around the world. It is the flagship publication of the world's leading environmental organization, the United Nations Environment Programme (UNEP), and is based on information provided by more than 30 regional and international collaborating centres.

The *Caribbean Environment Outlook* is a report from the Global Environment Outlook (GEO) programme of UNEP.