ENVIRONMENTAL INDICATORS FOR THE CARIBBEAN

This is a DRAFT report.

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'Environmental Indicators for Barbados: a pilot study for 1996'
by the same author.

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ABBREVIATIONS

BIONET	Biodiversity Action Network
BMC	Borrowing Member Country
CANA	Caribbean News Agency
CCA	Caribbean Conservation Association
CDB	Caribbean Development Bank
CEHI	Caribbean Environmental Health Institute
CEIS	Caribbean Energy Information System
CGCED	Caribbean Group for Cooperation in Economic Development
CIAT	Centre for International Tropical Agriculture
CIEL	Centre for International Environmental Law
COSALC	Coast and Beach Stability in the Lesser Antilles
ECLAC	Economic Commission for Latin America and the Caribbean
ECLAC-POS	ECLAC Port-of-Spain Office
EU	European Union
FAO	Food and Agriculture Organisation
GASE	Ecological Systems Analysis Group
IDB	Inter-American Development Bank
IDRC	International Development Research Centre
IMA	Institute of Marine Affairs
NFP	National Focal Point
NGO	Non-Governmental Organisation
NRMU	Natural Resources Management Unit
OECD	Organisation for Economic Cooperation and Development
OECS	Organisation of Eastern Caribbean States
UN	United Nations
UNCHS	United Nations Centre for Human Settlements
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNEP-ROLAC	UNEP Regional Office for Latin America and the Caribbean
USEPA	United States' Environmental Protection Agency
UNESCO	United Nations Education, Scientific and Cultural Organisation
UPR-SGCP	University of Puerto Rico - Sea Grant College Programme
WCED	World Commission on Environment and Development
WCMC	World Conservation Monitoring Centre
WHO	World Health Organisation
WRI	World Resources Institute
WWF	World Wide Fund for Nature International

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SUMMARY

This report outlines the rationale for incorporating the assessment of environmental indicators alongside routine monitoring of macro-economic indicators. The theory and background literature on formulating environmental indicators is considered, and current international and regional initiatives aimed at deriving sets of indicators are discussed. A potentital set of primary environmental indicators is presented, organised according to a 'status-cause-response' model and split into 15 broad categories of environmental concern. Some possible composite indicators, the result of further manipulation of the primary indicators, are also identified. Potential sources of data are then considered, focusing initially on international and regional sources. An ongoing pilot study assessing the feasibility of collecting relevant environmental data for Barbados at the national level is presented in the accompanying report.

INTRODUCTION

The primary aim of the Caribbean Development Bank (CDB) is to enhance the development of its borrowing member countries (BMCs). To this end it is involved in the provision of financing and assistance to these countries and, concurrent to this, regularly monitors their economic development. This monitoring involves a wide range of economic indicators, such as monetary and fiscal balances, trade balances, rates of inflation and of currency exchange, and levels of internal and external debt. Possibly the most potent indicator is that of growth in national income, with high rates of growth being a paramount policy objective.

There may be a myriad of reasons why future income growth could be expected to differ significantly from current rates. For instance, the Caribbean as a whole is currently coming to terms with the prospect of liberalised world trade and a loss of preferential trade agreements such as those with the European Union. All exports can be subject to exogenous shocks, particularly with regard to the Caribbean in terms of natural resource prices (e.g. oil, bauxite, timber), agricultural export quotas and shifts in price (e.g. sugar, rice, bananas), and changes in tourism demand due to external economic or political conditions. Agriculture and tourism industries are also particularly vulnerable to natural disasters such as hurricanes and volcanic activity. These are all factors which are considered and analysed, as far as possible, in regard to the CDB's assessment of the economies of its BMC's, the policy advice that it provides, and its lending and assistance strategies.

One important aspect of the sustainability of development which is not rigorously assessed at present in the context of analysing development performance and lending strategies is the state of the environment. There is little analysis of the degree to which environmental change is attributable to current economic activity, or the extent to which environmental degradation might limit long-term maintenance of current development gains. The importance of these issues is highlighted by the link between policies widely advocated by the world's multilateral development banks and the IMF, such as liberalisation and structural reform, and environmental degradation (Cruz and Repetto, 1992; Reed, 1992; Persaud, 1995). Indeed, as Ariel Lugo (1993, p.35) of the International Institute of Tropical Forestry, in Puerto Rico, elucidates:

> *"Society is slow to accept environmental change as the necessary consequence of resource use and economic growth. As long as we focus our energies on improving or sustaining the economic power of increasing populations, we will also have to accept that landscapes, including forests, will change."*

If we accept that some degree of environmental change is an inevitable consequence of development and improving living standards, it is essential that we are able to anticipate likely changes and their implications, and take appropriate action to ensure that development remains on a sustainable path. For, as the 'Plan of Acion' deriving from the 1997 Caribbean/United States Summit held in Bridgetown, Barbados, recognised, the sustainability of the major economic activities in the Caribbean (identified in particular as tourism, agriculture, mining, fishing and forestry), is inextricably linked to the preservation of the environment.

While the CDB explicitly regards 'sustainable development' as a crucial concept, as reflected in the environmental review process which all loans must pass through and the provision of financing and technical assistance to environmental and socially oriented programmes, macro-scale considerations have yet to be incorporated into its mainstream activities. The work involved in collecting, collating and analysing national environmentally-related data will inevitably put an increased demand on CDB staff resources. However, such an exercise conforms very much to the possible 'new direction' identified by Dr Anyadike-Danes in assessing the future role of the CDB during its Twenty Fifth Anniversary, of providing services which benefit from regional economies of scale (Anyadike-Danes, 1995). Analysis of relevant information and incorporation into a macro-economic calculus is a specialised function which CDB could usefully perform on behalf of individual countries; CDB has close ties and continual contact with individual countries and donor agencies both of which might represent a source of research findings and data; and CDB, with its close links to other international agencies such as the World Bank, the Inter-American Development Bank (IDB) and the United Nations (UN), would be in a unique position to channel both expertise and potential external funding into the region.

Assessment of suitable indicators of the state of the environment can provide crucial information on the influence that current economic activity is exerting on environmental resources within a country, and provide warning signals regarding possible limitations that environmental degradation might impose upon future development. As Rios-Gonzalez (1996, p.299) notes, *"the policy making process can be enriched from new ways of examining information, and improving our understanding of the interactions between economic systems and the natural environment."*

Just as with information on economic variables and economic performance, environmental data will be subject to errors and omissions. However, this begs the question as to whether some information, with recognised flaws, is better than no information. A lack of information on environmental problems inevitably leads to a lack of awareness that these problems exist. However, environmental problems certainly do exist in the Caribbean and can represent a direct threat to both medium-term economic performance and longer term development goals. By making environmental changes explicit, assessments of economic performance and development progress can be made more accurately within the context of sustainable development.

INTEGRATING THE ENVIRONMENT INTO ECONOMIC INDICATORS

There are a number of shortcomings of national income as an indicator of a country's development performance. These are generally well known and accepted. For instance, little account is made of non-marketed activities: a list of non-monetary activities not included in a number of developing countries' national accounts, relating to subsistence agriculture, building and construction, imputed rents and other household activities, was compiled by Blades (1975). Estimates of total income also do not provide an indication of the distribution of this income within society and hence the degree to which income disparities have been addressed. However, it has long been argued that per capita GDP is correlated with most desired indices of human welfare.

More recently, it has been acknowledged that whilst net national income aggregates allow for the depreciation of man-made capital, thereby reflecting more accurately income net of assets used up in production - or 'Hicksian income' - no account is made for the depreciation of natural capital (see, for instance, United Nations, 1993). Therefore, current national income accounting procedure makes no provision for the fact that future income generation may be jeopardised by current activities which damage the natural environment. Measures of national income and national income growth do not indicate whether or not present income levels are sustainable.

Considerable progress has been made in the theory of integrating environmental concerns directly into macro-economic indices (for instance, El Serafy, 1989; Hartwick, 1990; Hamilton, 1994). Estimation of national income accounts adjusted for natural resource degradation, or 'natural resource accounting', has been carried out for a number of countries including Indonesia (Repetto et al., 1989), Costa Rica (Solorzano et al., 1991), the Philippines (Cruz and Repetto, 1992), Papua New Guinea (van Tongeren et al., 1993), and Zimbabwe (Crowards, 1996). Such studies can provide useful evidence of the extent to which national income estimates overstate true income by ignoring reductions in the stock of natural capital resulting from the creation of that income. Thus an adjusted measure is generated which provides a better measure of sustainable income.

The method by which the monetary value of the 'depreciation' of natural capital is estimated remains in contention. For instance, there is the question of whether direct exploitation of natural resources should be regarded as the depletion of capital, hence being treated as a depreciation factor, or as depletion of available stocks (or inventory), being treated as intermediate consumption. Neither is it clear whether deductions should be made for depletion of resources for which huge reserves exist, or whether future potential benefits should be discounted and if so at what rate. There are also a number of hurdles to placing any monetary value on environmental attributes or the potential future worth of currently extracted natural resources. Furthermore, the most commonly employed valuation approach, that of the 'net price method' (Repetto et al., 1989), which is relatively easily applied and theoretically justifiable, is based on a number of assumptions regarding market conditions and optimising behaviour, and generally involves employing short-cuts in its practical implementation. Some countries in the Caribbean, such as Guyana, do have economies which rely heavily upon extractive industries including fishing, forestry and mining, for which 'net prices' could be derived. But many of the smaller island states are far more dependent on tertiary industries, tourism in particular, whose links with natural resource decline may be much harder to quantify, but which are extremely sensitive to degradation of the environment.

It has been suggested that assessing changes in overall national wealth rather than adjusting national income might be a more constructive approach to integrating environmental and economic issues - equivalent to a balance sheet approach as opposed to a profit and loss adjustment. This is an avenue being pursued by the World Bank (1997), and estimates of 'genuine savings' as proposed by Pearce and Atkinson (1993) are being employed to assess net changes in national wealth and the sustainability of current economic activity. Concentrating on national wealth allows the incorporation of a wide array of environmental concerns (as well as, for instance, investment in education and in 'social capital'), with the focus for economic development shifting towards a 'portfolio' of natural, human and man-made capital (Dixon and Hamilton, 1996). However, it is not clear that such an approach will have the same immediate impact on policy that a direct adjustment to GDP might have. Nonetheless, assessing the components of a country's 'genuine savings' - gross savings, depreciation of man-made assets, deterioration of socal capital and depletion of natural resources - may suggest direct policy measures to improve the level of genuine savings and hence the potential sustainability of current economic activity. These might include monetary policies to increase savings, public investment of royalties from resource extraction and incentives to private entrepreneurs to increase domestic investment, and efforts to reduce environmental degradation and resource depletion.

The thrust of this report is to produce quantitative indicators illustrating physical changes in key areas of environmental concern, which can be assessed *alongside* economic indicators which the CDB has traditionally monitored. Integration within economic analysis - involving monetary assessment of environmental change - to produce adjusted national income aggregates or measures of 'genuine savings', which provide a more powerful tool for informing policy, would be a logical next step. The information which forms the basis for deriving indicators of environmental quality is a pre-requisite for any integrated analysis, but the extended information and methodological requirements of such an analysis would represent a considerable extension to simply considering physical environmental indicators.

The importance of aiming for such an integrated approach, however, is emphasised in a recent volume considering economics and the environment in the Caribbean (Griffith and Persaud, 1995), with a number of the contributing authors promoting direct adjustments to national accounts as an aid to achieving sustainable development. For instance, Griffith and Persaud (1995, p.3) state that *"greening must take place ... at the level of national accounts."* Pearce (1995, p.31) suggests that deriving environmental accounting aggregates can *"elevate the status of natural assets over the existing situation in which they are still the poor partner in economic development."* Pantin (1995, p.61) calls for the need *"to modify the system of national income accounts to adequately capture the dependence on, and depletion of, natural environmental capital,"* whilst Davis and Ballyram (1995, p.184) urge that *"public and academic institutions have to foster and make commitments to develop the necessary human capital skills to develop and use the robust economic indicators [i.e. environmentally adjusted national income accounts]."* Developing these skills, collaborating with other international or regional bodies, and providing a vehicle through which progress in this emerging field could be tailored for, and adopted within, the Caribbean region, would suit the potential role of CDB identified by Dr. Anyadike-Danes as 'a provider of common services to the borrowing member countries'. However, as Anyadike-Danes (1995) further notes, there could usefully be some division of labour between regional institutions. Hence a longer term aim could be for CDB to apply its expertise to the analysis (rather than the collation) of environmental data and indicators, in the context of economic development and policy formulation, leaving the collation to other more specifically environment-oriented regional or national organisations.

Social Deprivation and Sustainable Development

There is a wide array of definitions of 'sustainable development', as outlined by Pezzey (1992). However, a key definition, much cited in the literature, is provided by the World Commission on Environment and Development (WCED, 1989), in what is frequently referred to as the Brundtland Report, which defines sustainable development as:

> *"development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within in it two key concepts:*
>
> - *the concept of 'needs', in particular the essential needs of the world's poor, to which overriding priority should be given; and*
> - *the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs."*

There is therefore a strong case for deriving indicators of *social* as well as environmental conditions, since sustainable development focuses attention on providing for both present and future generations. Poverty and a lack of essential amenities are widespread throughout the region. The link between these and economic structural reforms, which have been implemented in many Caribbean states and are generally endorsed by the multilateral development institutions, has been extensively documented (for example, Cornia et al., 1987). Social conditions clearly justify considerable attention in their own right. Social deprivation has also commonly been identified as an underlying cause of environmental degradation, perhaps manifested as over-exploitation of available natural resources, a lack of inputs into resource conservation activities, or degradation of the local environment. A report by the UN's Economic Commission for Latin America and the Caribbean (ECLAC, 1991, Chapter V) notes that poverty can not only be identified as an underlying source of pressure on environmental resources but that, given suitable conditions, the poor can improve both their own circumstances and the quality of the environment through management of the natural resources available to them. It may therefore be impractical to seek to address environmental issues entirely divorced from underlying social pressures. Furthermore, it is important to acknowledge that moves which seek to address environmental issues can themselves impact upon peoples' livelihoods, and a balance needs to be sought between preserving the environment for future generations and providing for the needs of the current generation.

Whilst acknowledging the importance of social indicators, both in their own right and in relation to environmental concerns, this report is restricted to the assessment of environmental indicators.

BACKGROUND

The concept of environmental indicators is probably most comprehensively presented in a study for the United Nations Environment Programme (UNEP) by Bakkes et al. (1994), where an environmental indicator is defined as a piece of information which is an integral part of a management process and is distinct from general-purpose statistics. It may be based on an index of various variables; it may be a single-parameter which can be used to represent a number of other variables; or a limited set of individual parameters.

Since availability of data is expected to be a limiting factor, there is not anticipated to be a need initially to aggregate data into indices. Rather, indicators representing general areas of environmental quality should be sought, along with statistics which could in time feed into a macro-economic evaluation of environmental change. In particular, the indicators are to be designed, as Rump (1996, p.71) emphasises, to *"track changes over time."*

As Bakkes et al. note, indicators are not merely assemblages of information but are instruments aimed at influencing decision making, and must therefore be geared towards achieving this final goal and shaped by the circumstances and processes peculiar to each situation. Hence, *"there is no such thing as a universal set of environmental indicators"* (Bakkes et al., 1994, p.2). Appropriate indicators can be expected to vary between regions, between countries, and even within countries, although the focus of this report is on national-level indicators to allow comparison with national economic indicators. The relevance of particular indicators can also be expected to vary over time, as environmental conditions and policy orientation change. Therefore, whilst a broad set of indicators is presented in Appendix 1, this should not be taken as a definitive list. The list of appropriate indicators can be expected to vary between countries according to environmental conditions, policy priorities and, acknowledging that in many cases this may be a limiting factor, the availability of data.

A range of criteria to be considered in the formulation of environmental indicators is considered in Table 1.

TABLE 1: CRITERIA FOR THE FORMULATION OF INDICATORS

UNDERLYING DATA	INDICATOR CRITERIA	APPLICABILITY
Availability of data: timely, regular, future time horizon	Representative of valid environmental concerns	Relevant to perceived issues and policy, and understandable
Adequacy of data: accurate, consistent, reliable	Theoretically valid; degree of aggregation	Objectives, standards or a baseline should be considered
Ease of acquisition: avoiding costly acquisition of data	Practical in terms of available resources and limitations	Comparison over time and space; future prediction

Source: adapted from Rump (1996).

Wherever possible, a benchmark against which to assess environmental indicators should be derived. This may be in the form of an historical baseline level, a physical threshold level, or a policy objective. However, in terms of showing changes over time, such a benchmark is not essential. Furthermore, it is not clear that any benchmarks can themselves ensure sustainable development (Rump, 1996), so the use of indicators should not be tied to associated benchmarks.

(a) International Indicators Initiatives

There is a comprehensive set of indicators issued by the United Nations Commission on Sustainable Development (UNCSD), accessible at the internet address given in Appendix 4, which provides detailed rationales and methodologies for a set of generic indicators. It covers not only environmental indicators but also social, economic and institutional indicators, categorised as representing measures of driving forces, the current state, or responses relating to activities resulting in unsustainable development.

In response to the Convention on Biological Diversity, the Global Biodiversity Forum, comprising the World Conservation Union (IUCN), UNEP, World Resources Institute (WRI), the Government of Sweden, Biodiversity Action Network (BIONET), Center for International Environmental Law (CIEL), World Wide Fund for Nature International (WWF) and Worldwatch Institute, organised a meeting on April 3-4, 1997 in New York for 'Dialogue on Biodiversity Indicators and Targets'. It is anticipated that a summary report will be disseminated in 1997, which should consider issues such as the potential for, and past experience with, employing biodiversity indicators. A considerable emphasis of the work on indicators under the auspices of the Convention of Biological Diversity is on measurable targets with which to assess countries' performance in implementing the Convention. Associated with this are baseline references or 'biodiversity benchmarks' with which to compare changes.

The Organisation for Economic Co-operation and Development (OECD) has recently produced a document outlining work in progress towards producing a set of environmental indicators for agriculture (OECD, 1997). The set of 13 priority areas of agri-environmental concern, with potential associated indicators, is presented in Table 2.

TABLE 2: AREAS OF AGRI-ENVIRONMENTAL CONCERN AND ASSOCIATED INDICATORS (IDENTIFIED BY THE OECD, 1997)

AREA OF CONCERN	INDICATORS
1. Nutrient Use	Soil surface balance; farm gate balance.
2. Pesticide Use	By risk category
3. Water Use	Water balances
4. Land Use and Conservation	"Retired" land; agricultural land area; change in land use; water storage capacity; infiltration vs. run-off; soil erosion.
5. Soil Quality	Soil vulnerability; extent of soil degradation; soil management practices.
6. Water Quality	Pollutant concentrations; nutrient/pesticide risk assessment.
7. Greenhouse Gases	Net release of carbon dioxide; methane and nitrous oxide.
8. Biodiversity	Diversity of "domesticated" species; impact on diversity of "wild" species.
9. Wildlife Habitats	Change in area; fragmentation; length of "contact zone" with agricultural land.
10. Landscape	Monetary value of landscape; inventory of physical landscape features.
11. Farm Management	Management of nutrients; pest; soil; irrigation; whole-farm.
12. Farm Financial Resources	Net farm and off-farm income; policy transfers; return on capital; debt/equity ratio.
13. Socio-cultural Issues	Land use changes; population changes; farmer education and training; farmer health and safety.

While the majority of these indicators are included in the set of indicators presented in Appendix 1, some are omitted due to their narrow agricultural focus (such as 'farm financial resources'); due to the presently insurmountable problems with regard to measurement or data acquisition (such as with landscape assessment and valuation, nutrient or pesticide risk assessment, and soil vulnerability); or because they are represented by a more practical if less precise measure (such as simply nutrient use rather than an input/output balance). One important omission from Appendix 1, which is included in the OECD work, is the category 'greenhouse gases'. It is felt that with the focus on incorporating the indicators within a national economic assessment, the additional workload of including such global issues as emissions of greenhouse gases or ozone depleting substances, is not initially justified.

Other literature available on identifying and applying environmental indicators, which it has not been possible to consult in the preparation of this report, (much of which is listed in a recent World Bank report on Indicators of Sustainable Development (World Bank, 1997)) is listed in a separate section of the References at the end of this document.

(b) Initiatives in the Caribbean Region

A meeting was organised by UNEP in November 1994 to discuss environmental and sustainability indicators for Latin America and the Caribbean. A second meeting, the 'Regional Workshop on the Use and Development of Environmental and Sustainability Indicators', was organised by the UNEP Regional Office for Latin America and the Caribbean (UNEP-ROLAC) and the International Center for Tropical Agriculture (CIAT), and was held in Mexico from February 14-16, 1996.

A regional project on indicators, 'Environmental and Sustainability Indicators: A Perspective from Latin America and the Caribbean', is being carried out by CIAT and UNEP, and has resulted in a report (Winograd, 1995) produced by the Ecological Systems Analysis Group (GASE). Only a Spanish version of the document has been made available at present, so in depth analysis of these indicators has not been possible, although the program outline is well presented on the internet site of CIAT, at the address given in Appendix 2. There is an emphasis on spatial datasets and geo-referencing of information, resulting in a range of land use indicators with perhaps more relevance to Latin American countries, with relatively little attention paid to issues such as deterioration of resources in the coastal zone.

Other work on environmental indicators for the Caribbean region stems from the United Nations Centre for Human Settlements (UNCHS). It is anticipated that information for this indicators initiative will be collected through UNCHS 'technical focal points' - usually the head of the physical planning office - or through the United Nations Development Programme focal points - usually the Permanent Secretary of a relevant ministry. The initial set of indicators identified is similar in many ways to the list produced in this document in Appendix 1. Deriving a set of potential indicators is not in itself a novel exercise. Difficulties arise in focusing attention on environmental issues specific to the region, in fine-tuning indicators in order to satisfy the criteria outlined in Table 1 - such as being representative, relevant and practical - and in determining the existence and accessibility of available data.

A SET OF ENVIRONMENTAL INDICATORS FOR THE CARIBBEAN

A possible set of initial indicators for assessing environmental quality is outlined in Appendix 1. This list has been split into 15 broad categories, based on different aspects of environmental concern, and an additional category for miscellaneous information. It is a set of 'primary' indicators, outlining datasets which could be collated to provide useful information on a range of environmental matters, and which can be further manipulated into more complex 'composite' indicators.

Within each category, entries are grouped according to a 'Status - Cause - Response' model. Indicators are identified as representing the current status of the environment, implying both the state of environmental quality and the significance of the resource[1]; the causes of environmental change, either underlying or proximate sources of pressure; or responses to environmental degradation, particularly from the perspective of government policies (whilst acknowledging that action might also be taken, for instance, at the international level and the individual or local community level). Relatively little attention is paid to the 'significance' aspect of environmental status, since for many of the categories which contribute measurably to economic performance, such as energy, mineral resources, fisheries and forests, an assessment of their contribution will be readily available within economic datasets. There is a certain amount of inter-relation between indicators. For instance, improved sewage disposal may be important for reduced water pollution, which in turn can influence coral reef health and subsequently beach loss. Initially, interaction between indicators is not analysed specifically, but this could be an important extension to the current work. Depending on local conditions, certain indicators might represent a combination of status, cause and response. For instance, beach alteration could be both a cause of, and a response to, beach loss; and forms of land ownership could be both a cause of, and a response to, local resource degradation.

The rationale behind seeking information for each of the categories is outlined below:

(i) Freshwater Supplies

Fresh water supplies are coming under increasing pressure from rising populations and greater individual demands. This is a particular problem on islands which are already densely populated, whose demand for water may be boosted by outside sources such as tourism, where saline intrusion into groundwater reserves is a frequent possibility, and when rainfall levels have proved to be unreliable in the recent past.

Clearly, important factors in the state of the resource are the available supply, the rate of extraction in relation to natural regeneration, and the extent of demand. High levels of leakage will exacerbate water supply problems, which are manifested in water shortages. One measurable policy response, to keep demand within supply constraints, is the imposition of water pricing based on marginal usage.

An international initiative to assess the quantity and quality of surface water and groundwater resources is being coordinated by the World Meteorological Organisation, the details of which can be found at the internet site given in Appendix 4. At the regional level, a meeting on water resources in small island developing states (SIDS) convened by the University of the West Indies Centre for Environment and Development (UWICED) in August 1995 agreed to the formulation of a Programme for Integrated Water Resources for Caribbean SIDS, and a SIDS Water Resources Information System.

(ii) Energy

Most Caribbean countries are reliant upon the importation of non-renewable fossil fuels as their primary source of energy. However, they have the potential for generating a considerable proportion of their energy requirements from renewable sources such as bio-fuels, solar power, wind and waves. Sectoral demand can be compared with the supply from each source, and the extent to which different forms of energy generation are encouraged or discouraged can be assessed, perhaps within the context of a country's tax/subsidy regime.

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[1] According to the Oxford Dictionary, STATUS stands for 'position of affairs', 'relative importance' and 'legal standing', thereby implying both an assessment of the condition of the environment, and its significance. Other similar models have used instead the term STATE - which does not allow for the varying importance of particular issues - or the term IMPORTANCE - which does not make clear that most of these indicators relate primarily to the current state of the environment.

(iii) Mineral Resources

Extraction of mineral resources is not a major industry in much of the Caribbean although there are exceptions such as the mining of bauxite in Guyana and Jamaica, and oil in Trinidad & Tobago. However, inland mining and quarrying, particularly for construction material, occurs in most countries to a varying degree. The extraction of non-renewable mineral resources limits the potential for benefitting from these reserves in the future, and so attention should be paid to:

(i) the degree to which current economic activity relies upon these resources, and
(ii) the extent to which estimated reserves are being depleted.

Mining activities can also produce undesirable external impacts, for instance in terms of a denuded landscape or water pollution. Policies may seek to restrict mining activities directly; income should hopefully being derived from mining enterprises in terms of royalties or charges; and investment in mining may be influenced through planning and fiscal incentive schemes.

(iv) Beaches

Beaches are an integral part of Caribbean tourism, one of the most prominent industries throughout the region. They also perform a number of other functions, such as protecting coastal land and providing habitat for a variety of species. As a UNEP (1989, p.6) review of environmental problems in the Caribbean acknowledges, *"When humans intervene in the dynamics of beach and dune generation, it is often with disastrous effects, both to habitat and to the value of the resource for flood and shoreline protection."* Yet beaches and the immediate coastal edge are generally accorded little if any attention in currently available sets of environmental indicators. Monitoring beach dimensions and identifying trends will be important, although given their susceptibility to natural phenomena such as sea swells and storms, attributing any observed changes directly to human activity is complicated. A number of human activities can be expected to impinge upon natural beach functioning, such as sand mining, encroachment of buildings, and the construction of artificial beach structures. Responses to beach loss might involve restrictions on beach-side construction, restrictions on mining, and projects to limit the loss of sand or to replenish denuded beaches.

(v) Fisheries

Given the relatively large coastlines of most of the countries in the Caribbean, and the fact that their exclusive maritime zone is often far larger than their land area, coastal fishing can represent an important industry, both in terms of national income and the welfare of local communities. Populations of fish species are not widely monitored and there is little modeling of population dynamics or 'maximum sustainable yield', but signs of over-exploitation are evidenced for instance in the changing composition of the fish catch[1]. These can be related to levels of catch and levels of effort employed, as sources of stress on the fishery resource. Scarcity of some species might be reflected in their price, and the relative price of fish may in turn influence the effort employed in the industry. The level of effort could be measured by the number and type of fishing vessels in the waters, or the number of trips made and the equipment employed. limiting the number of vessel licenses issued, as well as restricting activities of a particular nature or at different times of the year, are policies which can be implemented to try to limit pressure on the fishery resource.

[1] The extent of the problem faced in the region is highlighted in a recent CANA News Report (Sun Feb 2nd 1997) which states that, In a general comment on the state of Caribbean fisheries, Chakalall [Bisessar Chakalall, regional fisheries officer, FAO] said they have been fished to maximum or are at the point of being over-fished.' And as Oxenford (1991, p.2-124) states, some of the many examples of overexploited fishery resources in the Caribbean *"have resulted in virtual collapse or closure of the fisheries"*

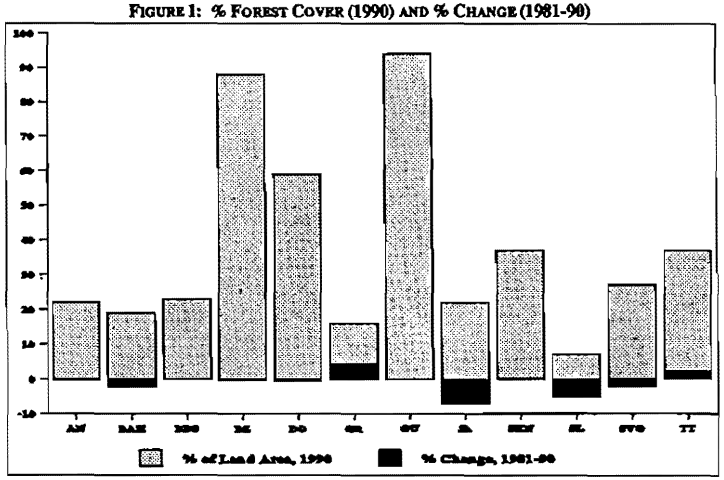
(vi) Forests

Forests do not (any longer) represent a large proportion of the land cover in most of the countries in the Caribbean. However, those forests which remain can perform valuable functions and provide a source of raw material and aesthetic value. The degree of forest cover and the change between 1981 and 1990 for a number of countries is illustrated in Figure 1. Whilst this does not illustrate the total extent of the forest resource - where, for instance, Guyana and Belize would have a far greater area of forest in absolute terms than all of the other countries represented - it shows a trend that those countries with the least forest cover (St Lucia, The Bahamas and Jamaica) tended to suffer the greatest percentage loss. This highlights cause for concern. Ideally, details of the types of forest present, the range of functions which they perform, and present management and ownership regimes would be sought. The causes of forest loss will also influence forestry policy, with some of the primary causes of loss in the Caribbean being identified by Prasad (1991) as tree cutting for charcoal and fuel wood, permanent conversion to agricultural land or to urban/residential areas and, more recently, accidental fires. Harvested volumes, prices and exports of timber (or non-timber products) can also provide an indication of one source of pressure on forests. Responses to forest loss might involve restricting licenses or concessions for logging, imposing royalties for extraction, and actively encouraging or initiating reforestation programmes.

(vii) Land Use and Degradation

Tropical countries with steep inclines, thin and erodible soils, and heavy rainfall can be particularly susceptible to soil erosion (McGregor, 1995). This can be exacerbated when natural vegetation has been replaced with crops or pasture which provide less ground cover or when areas are left bare for periods of time. Such situations may be found in a number of Caribbean countries, and extensive erosion has been widely documented, for instance, in Jamaica and Barbados. However, routine monitoring of soil erosion is not common. Some possible impacts of erosion, such as reduced agricultural performance, downstream siltation, or landslips might be recorded. Factors which could put pressure on soils and on the assimilative capacity of the environment would include the area under different land uses and farming regimes, the form of land ownership, and intensity of agri-chemical application. Possible responses include restrictions on land usage, implementation of soil conservation measures, and limiting the use of agri-chemicals (either by regulation or through fiscal measures).

FIGURE 1: % FOREST COVER (1990) AND % CHANGE (1981-90)



(viii) Biodiversity

Biological diversity is increasingly under threat due to direct exploitation and as natural and semi-natural habitats suffer degradation or conversion to other land uses. It was noted in the Declaration of Barbados emanating from the 1994 United Nations Global Conference on the Sustainable Development of Small Island States that the biodiversity of small island developing states is among the most threatened in the world. Indeed, it has been estimated that roughly 40% of all global vertebrate extinctions have occurred in the Caribbean Basin (Hinrichsen, 1990). Damage to ecosystems can also reduce their resilience in the face of natural stresses and shocks. Measuring the extent and fragmentation of broad habitat types (both terrestrial and marine) is therefore important, as is recording the abundance of species, particularly those which are endemic to the region/country or are locally endangered. It would also be useful to document known threats to habitats and species, as well as policies implemented to protect biodiversity, such as the number or extent of protected areas, and legislation and efforts afforded to protect particular species or habitats.

(ix) Coral Reefs (wetlands, seagrass beds)

Coral reefs, wetlands (including mangroves) and seagrass beds are ecosystems of particular importance and under considerable pressure in many Caribbean countries. There is a strong interdependence between these ecosystems with, for instance, wetlands and seagrass beds acting as nursery and feeding grounds for many fish species and trapping sediment which could otherwise lead to suffocation of reefs, whilst reefs help to dissipate wave energy thereby protecting near-shore ecosystems, and provide new beach material. Monitoring the extent and condition of these ecosystems may be crucial to providing timely policy advice to avoid degradation which could have a range of knock-on effects in both environmental and economic spheres. Identifying and monitoring the major threats to these ecosystems - identified by Woodley (1995), in a regional report to the International Coral Reef Initiative, as land-based runoff of sediment and nutrients, fisheries overexploitation, and direct physical damage - could also provide important information for policy formulation. Possible policy responses include restrictions on activities which directly impinge upon ecosystem health, such as the extraction of resources, and on activities which might indirectly cause damage, for instance through increased sediment and agri-chemical loads in water.

(x) Water Quality (fresh and marine)

Clean water is a precious resource in many Caribbean countries, both limited fresh water for direct use and coastal waters which support a varied biodiversity and are a focus for a great deal of social and economic activity. Water is monitored for a variety of pollutants which can be assessed for changes year-on-year or compared with water quality objectives or standards such as those set out in Table 3. The effects that human activity which degrades water quality can have on ecosystems might be better assessed by the use of 'bio-indicators' (Keeler and McLemore, 1996), in terms of general habitats or organisms such as benthic macro-invertebrates, fish and algae. For instance, the extent of seagrass beds is used as an indicator of coastal water quality in ecosystem monitoring projects in the USA (Anonymous, 1994). Water pollution might also be associated with higher levels of water-borne diseases in humans and, in fact, Hinrichsen (1990, p.52) suggests that *"pollution-induced diarrhoeal diseases are endemic throughout much of the region."* Sources of the various types of pollutant, rather than the level of pollution itself, could also be monitored, facilitating policy formulation, which might take the form of limiting potentially polluting activities.

(xi) Sewage Disposal

Disposal of fluid wastes is a growing problem in many Caribbean states, as increasing quantities of effluent put pressure on precious water resources. Deteriorating water quality threatens a wide range of activities and human health, making sewage disposal a priority issue. The ultimate source of wastes, the quantities involved, the final destination and the degree of treatment which outflows have received, are important aspects, all of which could potentially be monitored. With increasing quantities being generated, but efforts to deal with the problem ongoing in many countries in the region, these data can provide useful background for policy formulation and may vary considerably over time.

TABLE 3: WATER POLLUTION STANDARDS

Parameter	Units	Barbados Coastal Water Thresholds[a]	Alternative Directives[b]	Drinking Water Standards
Temperature	°C	31		
Salinity	ppt	30-38		
Nitrates	µg-at/litre	0.70	WHO	10 mg/l
Phosphate	µg-at/litre	0.08	EU	0.1 mg/l
Sulphate	mg/litre		WHO	250
Chloride	mg/litre		WHO	200
Potassium	mg/litre		EU	12
Pesticides	µg/litre		EU	1
Suspended Particulate Matter	mg/litre	4		
Faecal Coliforms	colonies /100ml	200[c]	US EPA	0
Faecal Streptococci	colonies /100ml	35[d]		
Sedimentation: offshore	mg/cm²/d	5		
Sedimentation: nearshore	mg/cm²/d	25		

Notes:
a) Source: 'Integrated Management Plan for the South and West Coasts of Barbados' (CCPU, 1995d).
b) Source: Environmental Engineering Division, 1993 Annual Report (Barbados Ministry of Health, 1993).
c) Similar to the USEPA standard, as a geometric mean, with the additional requirement that no more than 10% of samples exceed 400 colonies in the same period.
d) Similar to the USEPA standard, as a geometric mean, with the additional requirement that no sample taken from a high use beach should exceed 104 colonies.

(xii) Solid Waste Disposal

Particularly on small island states with limited capacity for locating solid waste disposal sites, the ever-increasing generation of wastes poses a considerable challenge. Indeed, Worrell (1995, p.82) regards waste disposal as *"perhaps the most outstanding environmental problem facing the Caribbean."* Disposal by different methods will affect areas of land and other resources, and the extent to which products are be recycled can serve to reduce the amount of waste. Quantities of waste deriving from various sectors will give an indication of where policies and possibly incentives to reduce the waste stream should be directed. Data might be available on the financial costs of waste disposal, and the degree to which the marginal costs of collection and disposal are passed on to those who produce the waste could influence individual waste disposal decisions. It is anticipated that the ongoing OECS Solid Waste Management Project funded by, among others, the World Bank and the CDB, should result in improved information on all aspects of solid waste generation and disposal in Antigua & Barbuda, Dominica, Grenada, St Kitts & Nevis, St Lucia and St Vincent & the Grenadines.

(xiii) Toxic/Hazardous Materials

As with wastes in general, disposing of or storing hazardous materials can represent a significant problem especially in countries with a limited land area. It is therefore useful to have an assessment of storage sites and their state, as well as sources of hazardous materials, and the extent to which regulations limit the potential damages that can result from these substances.

(xiv) Air Pollution

With limited urbanisation or industrial concentration, and the dispersive effect of strong Trade Winds, air pollution does not represent a significant problem in much of the Caribbean. However, a number of sites, such as Bridgetown, Kingston and Port-of-Spain, are identified with tangible air pollution problems. In these cases, changes in concentrations of various pollutants can be monitored and compared with recommended safe levels such as those proposed by the US EPA, which are illustrated in Table 4. Wherever possible, estimates of emissions of pollutants should be considered, and possible restrictions or disincentives for polluting activities identified.

TABLE 4: AMBIENT AIR QUALITY STANDARDS RECOMMENDED BY THE US EPA

POLLUTANT	MEASURE	UNIT	STANDARD
Carbon Monoxide (CO)	8 hour average 1 hour average	parts per million parts per million	9 35
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean	parts per million	0.053
Ozone (O_3)	1 hour average	parts per million	0.12
Lead (Pb)	Quarterly average	micrograms/cubic meter	1.5
Particulates (PM_{10})	Annual Arithmetic Mean	micrograms/cubic meter	50
Sulphur Dioxide (SO_2)	Annual Arithmetic Mean 24 hour average 3 hour average	parts per million parts per million parts per million	0.03 0.14 0.50

Source: US EPA internet site (See Appendix 4)

(xv) Urban Environment

Urban areas can not only house large proportions of a country's population, but are subject to particular environmental stresses. Some of these relate to volumes of traffic, housing and population density, and availability of green space. Others, such as air and water quality are covered in other categories. Urban expansion can also threaten peripheral areas. Policy responses to urban problems and urban expansion can involve planning regulations and zoning.

(xvi) Other Concerns

A number of potential indicators do not fit into the broad categories outlined above. Some are less useful as indicators in themselves than as a means to generate composite indicators (e.g. land area and population). Others suggest a potential for increased environmental pressure (e.g. tourist arrivals and port usage) and/or direct environmental impact (e.g. road network and natural disaster damages). There are also wide-ranging responses to environmental degradation, such as the emergence of environmental Non-Governmental Organisations (NGOs), expenditure on environmental protection, and the implementation of environmental legislation. Each of these measures may influence a number of the individual categories of environmental concern.

COMPOSITE INDICATORS

All of the indicators in Appendix 1 are based on primary information. From these can be generated more complex 'composite' indicators, which involve amalgamating various parameters to make comparisons more meaningful. Composite indicators can be derived for each category of environmental concern. The advantage of these indicators may derive from:

(a) condensing information from more than one dataset;
(b) producing a more relevant figure which illustrates change relative to appropriate parameters.

However, the extent to which composite indicators can be calculated will be highly dependent upon the primary data or indicators which are available. And given that the list of primary indicators is not exhaustive, it may be possible to derive a wide range of composite indicators. It is proposed here, therefore, to provide only a partial list of possible composite indicators. Those indicators applied to each country will depend upon a number of factors including data availability and the range of immediate environmental problems and their causes. Examples of such composite indicators, which relate directly to the range of primary indicators outlined in Appendix 1, are given in Appendix 2.

The rationale for concentrating initially on primary information is to make explicit those underlying time series which are being sought. It is anticipated that when the necessary primary information has been collected, it will then be relatively straightforward to manipulate the data to produce perhaps more meaningful composite indicators, although much of the primary information will also provide useful indicators without the need for transformation into composite form.

SOURCES OF DATA

Many of the more widely publicised environmental issues within the Caribbean are common knowledge. These include marine pollution, coral reef degradation, threats to endangered species, and problems of solid waste disposal. However, there is very limited information readily available on the current state of these problems, on where the issues are most pressing, on general trends, and on their economic or developmental significance. A lack of coordination between donor agencies acting on environmental issues has led to the establishment of an Environmental Interagency Coordinating Committee, chaired by CDB. Whilst this committee seeks to address areas of duplication and disparity in the funding of environmentally focused projects, there remains a *"glaring gap ... in the baseline environmental data necessary to measure the severity of environmental problems and monitor changes in environmental conditions"* (CGCED, 1994, p.38).

For environmental information at the national level, the primary source of data is going to be the countries themselves. Data may have been collected directly by government agencies; collected by other organisations on behalf of, and therefore available through, government agencies; collected by and available directly through other organisations such as NGOs; or collected by, or on behalf of, donor agencies and therefore available through them. It is therefore worth contacting, in addition to government agencies such as the Ministry of Agriculture or the Ministry of the Environment, private organisations (particularly those involved in research) and donor agencies. A list of institutions with major environmental functions in Belize, Dominica, Grenada, St Kitts and Nevis, St Lucia, and St Vincent and the Grenadines, derived from their respective National Environmental Action Plans, is provided in Griffith (1995). An example exercise in collating data for Barbados is outlined in the accompanying report.

A list of some regional and international initiatives which could provide environmental information, either directly or indirectly, is outlined in Box 1. A more comprehensive list of regional and international organisations which have been contacted, along with their contact details, is provided in Appendix 3. These represent either known or potential sources of environment-related information, many of which have shown considerable enthusiasm for:

(a) the CDB's continued interest in environmental issues;

(b) a potential 'end-user' of environmental information and research actively seeking out this information for possible application; and

(c) collaboration with the CDB in identifying information requirements and analysing the results.

It appears, however, that region-wide programmes of environmental information acquisition, management and dissemination are not yet at the stage where they can provide the information which deriving timely indicators of environmental change would require. Therefore, it is regarded as worthwhile to assess the potential for acquiring environmental information directly from national sources, with a pilot study having been carried out for Barbados. It is hoped that in time, programmes outlined in Box 1, which deal with environmental information provision and with environmental indicators formulation, might be able to provide much of the relevant data and/or subsequent indicators. The CDB could then concentrate on applying its analytical expertise to interpreting these indicators within country assessments, or perhaps even integrating environmental parameters into measures of macro-economic performance.

Secondary Sources of Information

There are a number of international organisations which collate some relevant data, but the information in their reports tends to be somewhat dated and of a limited scope. A list of such publications, the data they provide, for which countries, and the time lag involved, is provided in Appendix 6. The table considers countries throughout the wider Caribbean, and it is clear that these secondary sources tend to concentrate on the larger countries, in particular Belize, Cuba, Dominican Republic, Guyana, Haiti, Jamaica, Suriname and Trinidad and Tobago. There is considerably less information available on the smaller islands which form the bulk of the CDB's BMCs.

An array of the information available on social conditions is also included in Appendix 6. Even from this selective illustration of which details are provided, it is clear that significantly more information can be sourced on social conditions than on environmental conditions or environmental change. However, these social data suffer similarly from a significant time delay between the year being considered and the year of publication, as well as being concentrated on the larger countries of the Caribbean.

Such secondary sources of information might, however, provide useful background information on historical trends and a county's most pressing environmental concerns. As noted earlier, for instance, regional information on forestry cover and change during the 1980's as illustrated in Figure 1 indicates considerable cause for concern in several countries. Another example is the World Conservation Monitoring Centre's (WCMC) internet site - the address for which is provided in Appendix 4 - which provides a varying degree of detail (including digitized maps) on marine and terrestrial habitats and species for a number of Caribbean countries.

BOX 2 : POTENTIAL REGIONAL SOURCES OF ENVIRONMENTAL INFORMATION

UNEP-ROLAC and UN ECLAC. Following an initial consultation with regional users of environmental information organised by these two agencies and the Institute of Marine Affairs (IMA), a survey of regional environmental information needs was carried out by UNEP-ROLAC and ECLAC, with financial support from the International Development Research Centre (IDRC). The results of this survey are due to be made available in 1997. As a follow up to this survey, a draft regional strategy for environmental information management is also being formulated. It is not clear at the current time how such a strategy will influence the availability of information for use in environmental indicators, but initiatives which increase the availability of information should enhance the potential for deriving a wider array of indicators.

INFOTERRA. Part of UNEP's work on information management is the global INFOTERRA network which aims to facilitate the exchange of environmental information through a network of National Focal Points (NFPs). NFPs are usually located within the government ministry responsible for the environment, generally under the remit of a Permanent Secretary, and have been established in nine of the CDB's BMCs (listed in Appendix 5). The role of NFPs is to provide a central contact point for national sources of information on the environment as well as providing some information directly. Discussion with staff of the NFP in Barbados (see the accompanying report on Barbados) suggests that whilst a national network of environmental information sources has been organised, the low level of requests for environmental information has not encouraged a regular flow of information or identification of information requirements, capabilities and limitations. INFOTERRA NFPs should make useful starting points for assessing environmental information capabilities and sources within countries, and are listed in Appendix 5. Further details on the INFOTERRA network and a (relatively) up-to-date list of NFPs can be found at the INFOTERRA internet site listed in Appendix 4.

CEPNET. The CEPNET programme ('Information Systems for the Management of Marine and Coastal Resources') is part of UNEP's Caribbean Environment Programme, and is funded by the Inter-American Development Bank (IDB). Its core aims include improving the information management capabilities of participating countries, assisting in the dissemination of databases and information relating to marine and coastal issues, and ultimately contributing to improved natural resources management. This is to be achieved through a computerised centre at the CAR/RCU, networked via the internet to external servers throughout the Caribbean, focusing initially on a Pilot Network Program involving six countries.

Caribbean Environmental Health Institute (CEHI). This institute is responsible for collating national data from its member countries on environmental health issues. However, it appears that such data is supplied by the countries only intermittently, so that there is no consistent or continuous dataset. Nor is the institute large enough to collect its own data directly, other than from a few specific project sites, especially in St Lucia. It appears, therefore, that whilst CEHI has the potential, and a remit, to provide a useful central source of environmental health data, it is not able at present to act in this capacity.

Natural Resources Management Unit (NRMU) of the OECS. A potential central source of environmental data for the OECS, particularly fisheries information. However, although contact has been made, it has not yet been possible to ascertain the extent to which relevant information would be available.

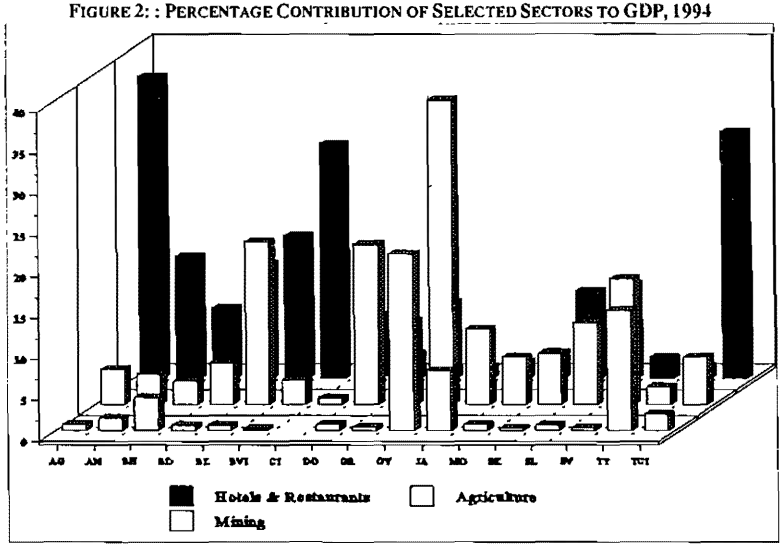
Institute of Marine Affairs (IMA). A bibliography is available outlining the Institute's publications which relate primarily to one-off studies rather than continuous monitoring. Much of the work has been focused on Trinidad & Tobago, including some continuous monitoring of beach profiles, wetlands, and a range of parameters in the Gulf of Paria.

UNESCO COSALC Programme. UNESCO's Environment and Development in Coastal Regions and in Small Islands (CSI) project is responsible for the regional Coast and Beach Stability in the Lesser Antilles (COSALC) programme. This is jointly administered by UNESCO and by the Sea Grant College Program at the University of Puerto Rico (UPR-SGCP). Beach monitoring data for the Lesser Antilles is collated at UPR-SGCP, having started anywhere between 1985 and 1996 for different islands. A considerable number of beaches are monitored for each country. Discussion is ongoing with UPR-SGCP to determine how best the data could be treated to provide appropriate indicators of changing beach conditions, due to both natural and anthropogenic causes.

Caribbean Energy Information System (CEIS). This is a system of National Focal Points (NFPs), with a Regional Focal Point in Jamaica. Regional data collection does not occur every year and could involve a certain time delay, so NFPs should be contacted directly.

Standard economic data can also be utilised to point to possible environmental concerns. For instance, Figure 2 shows the high dependence of economies such as those of Anguilla, British Virgin Islands and Turks and Caicos Islands on tourism; the importance of agriculture to Belize, Dominica, Guyana and St Vincent and the Grenadines; and the contribution of mining (including oil extraction) in Guyana, Jamaica and Trinidad and Tobago. Each of these sectors of economic activity suggests different pressures on, importance of, and responses to environmental change. Deriving indicators which can highlight these issues will help to ensure that the contribution these sectors make to economic development will be sustainable.

FIGURE 2: : PERCENTAGE CONTRIBUTION OF SELECTED SECTORS TO GDP, 1994



RECOMMENDATIONS

The points and recommendations arising from this report can be summarised as follows:

(i) To better enable countries to achieve *sustainable* development, policy formulation should explicitly consider:

(a) the environmental implications of current economic activity;

(b) the potential adverse impact that present environmental degradation could have on future economic performance;

(c) the link between natural capital and long-term developmental objectives; and

(d) policy options to deal with environmental issues directly, or to limit the environmental impact of other initiatives.

(ii) In order to incorporate environmental concerns into macro-level assessment, environmental (and social) indicators should be considered alongside indicators of economic performance as standard practice.

(iii) As a provider of specialised services, the CDB could perform a useful regional role in collating and assessing national environmental indicators within the context of economic performance. In the future such a role could evolve so that:

(a) the collation of data be taken up by more environmentally-specialised regional or national agencies or organisations; and

(b) environmental indicators could be integrated within economic analysis to substantively link economy and environment, providing a more compelling guide to the sustainability of current economic performance.

(iv) With regard to (ii) above, the CDB is well situated to collaborate with international agencies involved in this field; to introduce advances in techniques to the region and perhaps tailor these techniques to suit regional circumstances; and to channel potential external funds related to such exercises into the region.

Such measures would complement ongoing work of many of the region's environment ministries, of regional natural resource and environmental institutions, and of international organisations such as other multilateral development banks and the United Nations who are actively involved in addressing these issues.

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Primary Environmental Indicators

STATUS; CAUSE; RESPONSE	INDICATOR
	FRESHWATER SUPPLIES
S	total available water supplies (and sources)
S	regeneration rates for water supplies and therefore renewability of supplies
S'	recorded water shortages
C	annual demand/usage: type of consumer (e.g. commercial, domestic, agricultural)
C	annual leakages (total supply less total demand)
C	annual withdrawals/pumped supply: type of source
R	charges (cost recovery); metering
	ENERGY
S	types of energy sources by importance for provision (renewable: bio-fuels, solar, wind, wave, hydro, geothermal; non-renewable: fossil fuels)
C	consumption: by sector
R	subsidies/taxation: alternative and traditional energy sources
R	charges (cost recovery); energy conservation measures
	MINERAL RESOURCES
S	total reserves
S	affected land area (wastes, operations)
C	annual output
C	external effects
C	real prices for output
C	incentives for extraction
R	charges for extraction
R	restrictions on mining activities

STATUS; CAUSE; RESPONSE	INDICATOR
	BEACHES
S	average beach dimensions (width, depth, slope), by district
C	natural (non-anthropogenic) causes of loss, e.g. hurricane damage
C	sand mining
C	beach encroachment
C/R	beach alteration
R	expenditure on beach renewal/replenishment
R	restrictions or charges for potentially damaging activities: e.g. sand mining, construction
	FISHERIES
S	species densities (and MSY)
S'	signs of over-exploitation, e.g. decreasing size of individuals, changing composition of catch
C	landings or catch (by species)
C	fishing/catch/boat licenses issued; number of trips made; equipment used
C	real prices of fish
R	restrictions or charges for potentially damaging activities: fishing techniques, periods or activities
	FORESTS
S	total extent, fragmentation (sites/area) and constituents (including non-timber products)
S	potential ecosystem functions, by area (e.g. soil conservation, flood control), biodiversity maintenance, carbon storage)
S/C/R	areas of forest designated and/or used for particular purposes, e.g. logging (selective/clear-cut, managed/unmanaged) or protected; ownership
C	annual deforestation (and cause, eg clear-cut logging, fuelwood, conversion)
C	harvests of timber and non-timber products
C	forestry exports
C	real prices of timber, fuelwood and charcoal
R	issuance of licenses to forestry enterprises

STATUS; CAUSE; RESPONSE	INDICATOR
R	charges for extraction: e.g. royalties or stumpage fees
R	annual and total reforestation
	LAND USE AND DEGRADATION
S	annual rates of erosion
S	area classified as eroded/denuded or otherwise of poor quality
S	area annually affected by erosion or waterlogging
S	downstream siltation
S	changing agricultural yields and area
S'	degree of flooding and landslides
C	area classified as arable (annual, perennial), pasture, irrigated, drained
C	livestock density
C	extent of activities threatening erosion: eg monocultures, overgrazing, vegetation burning, marginal/steep land cultivation
C	property rights and land tenure: existence of long term leases, free-hold, communal ownership (and its efficacy)
C	subsidies: pesticides, fertilizers, land conversion
C/R	annual use of fertilizer (N, P, K), pesticide (tonnes of active ingredient), fungicide and herbicide - or imports, sales or manufacture
R	extent of soil conservation measures implemented
R	extent of environmentally sensitive farm management practices (e.g. integrated pest control, organic farming)
R	restrictions on usage of agricultural chemicals
R	land use regulations or restrictions e.g. along river banks or gullies

STATUS; CAUSE; RESPONSE	INDICATOR
	BIODIVERSITY
S	number of sites and acreage of various broad habitat types (eg forest, grassland, wetlands, mangroves, coral reef, seagrass beds)
S'	numbers of species (total and whether endangered and/or endemic)
C	loss of or damage to various habitat types; cause of loss (eg conversion, natural disaster)
C	threats to species and changes in these threats
R	protected areas: number and size (perhaps according to IUCN categories)
R	protected species: numbers and degree of protection
	CORAL REEFS (WETLANDS, SEAGRASS BEDS)
S	extent, annual loss (no. of sites and area); quality variable changes
S	local species (eg reef fish) populations
C	major threats and changes in associated activities
R	restrictions or charges for potentially damaging activities (eg tourism diving and yachting; reef fishing)
	WATER QUALITY (FRESH AND MARINE)
S	measured levels of pollution at monitoring sites; or signs of pollution, e.g. species mortality, algae or plankton concentrations
S'	numbers (and type) of pollution incidents
S'	water-borne diseases
C	estimated emissions by source/type
R	adoption or alteration of quality standards
R	implementation of land use zoning restrictions
R	issuance of licenses to or other restrictions on potentially polluting industries or activities

STATUS; CAUSE; RESPONSE	INDICATOR
	SEWAGE DISPOSAL
S	ultimate destination of treated waste
C	quantities involved and sources
R	degree of treatment (primary, secondary, tertiary or none)
R	investment in sewage disposal facilities
	SOLID WASTE DISPOSAL
S	disposal: extent, type and quantities going through each type of disposal facility; eg landfill (number/area of sites: current, old, and re-landscaped), incineration, composting, recycling (eg of Al, glass, paper, plastics)
C	generation: quantity, type and source/sector (eg industrial, municipal, mining/construction, energy production, agricultural, and imported)
C/R	annual expenditure (current and capital) on waste disposal
R	charges (cost recovery): waste collection and disposal
R	restrictions or charges for potentially damaging activities; incentives for waste reduction, re-use or recycling
	TOXIC / HAZARDOUS MATERIALS
S	storage sites (number, area and type); rehabilitation/de-contamination
S'/C	annual number of toxics/hazardous materials incidents
C	quantities manufactured, imported or exported (by type)
C	disposal - quantities and destination
R	restrictions on imports, use, transportation, storage, disposal
	AIR POLLUTION
S	concentrations of pollutants (by locality)
S'	occurence of respiratory illness
C	annual emissions by pollutant and source (eg CO, O_3, PM_{10}, SO_x, NO_x)
C/R	market share of unleaded petrol (subsidised?)
R	restrictions on polluting activities, e.g. BAT, emissions permits

STATUS; CAUSE; RESPONSE	INDICATOR
	URBAN ENVIRONMENT
S	total urban (residential) housing and population
S	total urban green space
S/C	road traffic flows; urban road network length; public transport provision
C	urban (by land use) total area; and encroachment on agricultural/semi-natural areas
R	planning restrictions and area/districts covered
	OTHER
S	land area
C	population (rural, urban coastal); growth rates; migration
S'/C	tourist arrivals and nights
C	port usage: eg shipping traffic; volume of goods loaded/unloaded
C	road network: length and type
C	number of motor vehicles licensed or in use, by type of vehicle
C	natural disasters: extent of damages/losses
R	total environmental protection expenditures
R	local environmental NGOs, eg Future Centre Trust in Barbados
R	environmental protection legislation and/or institutions, eg Environmental Protection Agency

Key: S = Status: state of the environment
S' = Status: significance and/or state
C = Cause of environmental change
R = Response (policy level and individual/community level)

Composite Indicators

The following is a list of some potential composite indicators, based on the set of primary indicators identified for each broad category in Appendix 1.

General	'Per capita' measures, such as energy consumption, waste generation, water usage etc.
Freshwater Supplies	Water withdrawals as a % of total water availability
	Water leakages as a % of water pumped/withdrawn
Energy	Energy consumed per unit of GDP
	Renewable energy as a % of total energy production
Minerals	Mining output as a % of total reserves
Beaches	Beach change (e.g. volume) as a % of total beach
	Average beach profile, % change on baseline year
Fisheries	Fishing productivity as a function of fishing effort (e.g. average catch per boat per year)
Forests	Net deforested area as a % of total forest area
	Timber production as a proportion of Mean Annual Increment
Land Use	Fertilizer or pesticide use per area of cropland
Biodiversity	Terrestrial protected areas as a % of total land area
Coral Reefs	Total ecosystem area / number of sites (i.e. degree of fragmentation)
	Percentage change in ecosystem areas
Water Quality	Water pollution site exceedances as a percentage of total number of monitoring sites
Sewage Disposal	Tertiary sewage treatment applied as a % of total sewage treatment
Solid Waste	Sectoral waste generation per unit of sectoral GDP
	Recycling as a % of total waste generation
Toxic Waste	Toxic waste generation per unit GDP
Air Pollution	Air pollution: exceedances of recommended daily average or maximum safe limits
Urban	Green space as a % of total urban area
	Average residential housing density (total houses or households per residential area)
Other	Vehicles per unit of road; e.g. heavy vehicles per unit of primary road

INTERNATIONAL ORGANISATIONS CONTACTED

Institution	Person(s)	Date*	Medium
Birdlife International	birdlife@gn.apc.org	16/01/97	email
BDDC British Development Division in the Caribbean	Mr. Richard Beales	27/01/97	tel 436 9873 personal visit
CANARI Caribbean Natural Resources Institute	Dr. Yves Renard canari@isis.org.lc	02/01/97	email, St. Lucia
CARDI Caribbean Agricultural Research and Development Institute	Dr. Francis Chandler	24/01/97	tel 425 1334/5
CCA Caribbean Conservation Association	Ms. Glenda Medina	19/12/96	tel 426 5373 personal visit
CIDA Canadian International Development Agency	Ms. Deborah Ramsey	06/01/97	tel 429 3550
CEHI Caribbean Environmental Health Institute	Mr. Vincent Sweeney cehi@candw.lc	08/01/97	tel 45 22501
CEPNET UNEP Caribbean Environment Programme	Mr. Mats Soderstrom Mr. Ken Korporal uneprcuja@toj.com	06/02/97 17/03/97	email
CIAT International Center for Tropical Agriculture	Mr. Manuel Winograd m.winograd@cgnet.com	03/01/97	email
CMC Center for Marine Conservation		24/02/97	fax: 02 872 0619
CTO Caribbean Tourism Organisation	Mrs. Morgan	03/01/97	tel 427 5242
ECLAC UN Economic Commission for Latin America and the Caribbean	Dr. Erik Blommestein eblommestein@eclacps.undp.org	03/01/97	email
FAO UN Food and Agriculture Organisation	Mr. Chakalow	08/01/97	tel 426 7110
ICCAT International Convention on the Conservation of Atlantic Tunas		27/01/97	letter sent
IMA Institute of Marine Affairs	Ms. Judith Gobin gobi@ima.gov.tt	03/01/97 24/02/97	fax 809-634-4433 email
IITF International Institute of Tropical Forestry	Dr. Ariel Lugo Mr. William Edwards	15/01/97 18/02/97	fax 787-753-4335

INSTITUTION	PERSON(S)	DATE[a]	MEDIUM
IRF Island Resources Foundation	Dr. Bruce Potter bpotter@irf.org Dr. Edward Towle etowle@irf.org	16/01/97	email
NRMU-OECS Natural Resources Management Division of the Organisation of Eastern Caribbean States	Dr. Vasantha Chase oecsnrmu@candw.lc	03/01/97 24/02/97	fax 809-452-2194 email
OAS Organisation of American States	Mr. Wendell Gooding (Barbados) Mr. Jan Vermeiren (Washington.)	06/01/67	tel 426 1564
PAHO Pan American Health Organisation	Dr. Sealy's Secretary	23/01/97	tel 426 3860
UK Dependent Territories Conservation Forum	Dr. Sara Cross	27/01/97	letter sent
UNCHS UN Centre for Human Settlements	Mr. Floyd Homer Mr. James Armstrong	07/01/97 17/01/97	tel 429 2521 letter sent
UNEP - ROLAC UN Environment Programme - Regional Office for Latin America and the Caribbean	Dr. Norberto Fernandez norberto@latino.rolac.unep.mx	03/01/96	email
University of Puerto Rico; Sea Grant College Program	Dr. Gillian Cambers	15/01/97 ...	fax 787 265 2880
UWICED University of the West Indies Centre for Environment and Development	Dr. Bishnodat Persaud Dr. Al Binger abinger@uwimona.edu.jm	Nov. 96 20/02/97	email
UWI - MAREMP University of the West Indies - Marine Resources and Environmental Management Programme	Dr. Malcolm Hendry	14/01/97	tel 425 1310
UWI - SEDU SIDS UWI - Sustainable Economic Development Unit	Mr. Axel Kravatsky sedu@trinidad.net	12/03/97	visited CDB
WCMC World Conservation Monitoring Centre	Ms. Jo Taylor Jo.Taylor@wcmc.org.uk	15/01/97	email
World Bank	Dr. Kirk Hamilton khamilton@worldbank.org	Dec 96	email to/from

Notes: (a) Dates given refer to the initial communication. Subsequent communication has occurred in most instances, but the date is only recorded if it has been with another member of the organisation or via a different medium.

Internet Site Addresses for Regional and International Organisations Directly Relevant to this Report

Barbados Environmental Unit
http://isis.uwimona.edu.jm/cesd/barbados/envunit.html

Caribbean Centre for Development Administration (CARICAD)
http://www.uwimona.edu.jm/cesd/caricad/caricad.html

Caribbean Community Ocean Sciences Network (CCOSNET)
http://www.uwimona.edu.jm:80/cesd/ima/ccosnet.html

Caribean Conservation Association (CCA)
http://www.uwimona.edu.jm:80/cesd/cca/cca.html

Caribbean Development Bank: 5/3/96, Environmental Coordinating Committee meeting
http://www.irf.org/ircdb.html

Caribbean Environment and Sustainable Development Homepage
http://www.uwimona.edu.jm:80/cesd/

Institute of Marine Affairs (IMA)
http://www.uwimona.edu.jm:80/cesd/ima/ima.html

Intergovernmental Oceanographic Commission (of UNESCO) for the Caribbean (IOCARIBE)
http://www.unesco.org/ioc/regions/car.htm

International Center for Tropical Agriculture (CIAT)
http://www.ciat.cgiar.org/land/indicators/project.html

Island Resources Foundation (IRF)
http://www.irf.org/irhome.html

Sustainable Economic Development Unit for Small and Island Developing States (SEDU-SIDS)
http://www.tidco.co.tt/seduweb/home.htm

United Nations Commission on Sustainable Development (UN CSD)
http://www.un.org/dpcsd/dsd/csd.htm

United Nations Environment Programme (UNEP); Caribbean Regional Co-ordinating Unit (CAR/RCU)
http://rolac.unep.mx/cepnews/ing/first.htm

INFOTERRA National Focal Points

(None of these contact points have been followed up, nor have the contact details been verified, other than for Barbados)

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Ministry of Agriculture and Fisheries
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Information Systems for the Management of Marine and Coastal Resources (CEPNET)
http://rolac.unep.mx/cepnews/ing/cepnet.htm

INFOTERRA
http://unep.unep.no/unep/eia/ein/infoterr/home.htm

United States Environmental Protection Agency (US EPA)
http://www.epa.gov/
National Ambient Air Quality Standards
http://www.epa.gov/oar/airs/criteria.html

University of the West Indies Centre for Environment and Development (UWICED)
http://isis.uwimona.edu.jm/cesd/jamaica/uwiced/uwiced.html

World Conservation Monitoring Centre (WCMC)
http://www.wcmc.org.uk/
Marine information available for ANT, BAH*, BDS*, BEL, CUBA, DR, GRE, GUY, HAITI, JAM, STK, STL, SVG, SUR, TT. (* includes country maps)
Forest information available for BEL, GUY, SUR.

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Secondary Sources of Environmental and Social Data for the Caribbean

INDICATOR	SOURCE	Number of Years Delay																															
		ANG	ANT	BAH	BDS	BZE	BVI	CIs	Cuba	DOM	DR	GRE	Guad	GUY	Haiti	JAM	Mrtq	MON	N Ant	PRico	SKN	STL	SVG	Surin	TT	TCI	USVI						
Freshwater																																	
Internal renewable water resources	33, 41				5	1		1		1				1	1	1								1	1								
Water withdrawals, total	17, 29, 30, 36, 41				6	1		1	5	1	5			1	1	1						5		1	1								
Water withdrawals, by sector	29, 33, 41				30	5		9	5	9	5			9	9	9						5		5	9								
Energy																																	
Total Energy Use	18, 28, 29, 36, (39)		2	2	2	2		2	2	2	2	2	2	2	2	2	2		2	2	2	2	2	2	2			x					
Consumption of hydrocarbons	6, (18)		2	2	2	2		2	2	2			2	2	2						2	2	2	2	2								
Consumption of electric energy	4, 18, (13)		2	2	2	2		2	2	2	x	x	2	2	2	x		x	x	2	2	2	2	2	2			x					
Commercial energy consumption	11, 33, (39)					3		3		3			3	3	3									3	3								
Traditional fuels consumption	33, (39)					3		3		3			3	3	3									3	3								
Electricity generation	18, 29, (13), (33)			x	x			x		x		x	x	x	2	x		x	x					x	2			x					
Mining																																	
Beach Loss																																	
Fisheries																																	
Marine fish catch	33, (10)					3		3		3				3	3	3								3	3								
Freshwater fish catch	18, 33, (10)					3		3		3				3	3	3								3	3								
Aquaculture fish catch	18, 33, (10)					3		3		3				3	3	3								3	3								
Forests																																	
Total forest area	7, 17, 20, 29, 33, 35, 41, (2)		4	3	4	3		3	4	3	4	4	3	3	3	4	4	4	4	4	4	4	4	3	3								
Natural forest	33, (37)					6		6		6			6	6	6									6	6								
Other wooded land	33, (37)					6		6		6			6	6	6									6	6								
Reported plantation area	8		4		4	4			4	4	4		4	4	4		4				4	4	4	4								
Annual deforestation	7, 17, 20, 29		4		4	4		6	4	4			4	4	4						4	4		4								
Logging closed forest, % primary	33					6		6		6			6	6	6									6	6								
Annual reforestation	3, 33		4		4	4		6	4	4			4	4	4								4	4	4								
Roundwood production	33, 41, (8)					3		3		3			3	3	3									3	3								
Other wood production	33, 41, (8)					3		3		3			3	3	3									3	3								
Land Use																																	
Broad land use changes	18, (FAO)		4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4								
Arable, Pasture, Forest, Other land	17, 18, 33, 41, (37)		3	3	3	3		3	3	3	3		3	3	3						3	3	3	3	3								
Average yield, cereals	33, (37)					2		2		2			2	2	2									2	2								
Average yield, roots/tubers	33, (37)					2		2		2			2	2	2									2	2								
Fertilizer use	18, 29, 33, (8), (FAO)			4	4	3		3	4	3		4	3	3	3	4				4	4	4	4	3	3		4						
% irrigated cropland	17, 18, 33, (37), (FAO)			4	4	3		3	4	3		4	3	3	3	4				4	4	4	4	3	3								

APPENDIX 6, page 1 of 4

Secondary Sources of Environmental and Social Data for the Caribbean

INDICATOR	SOURCE	Number of Years Delay: ANG	ANT	BAH	BDS	BZE	BVI	Cla	CubaDOM	DR	GRE	GuadGUY	Haiti	JAM	MrlqMON	N Ant	PRico	SKN	STL	SVG	Surin	TT	TCI	USVI
Biodiversity																								
Totally protected areas	18, 25, 35, (37)		2	2		2	2	2	2	2	2		2	2	2	2	2		2	2		2	2	2	2	2
Partially protected areas	18, (36)					3			3		3			3	3	3						3	3			
Biosphere reserves, no	18, 34, (36)		2	2		2	2	2	2	2	2		2	2	2	2	2		2	2		2	2	2	2	2
World Heritage sites, no	18, 35, (36)		2	2		2	2	2	2	2	2		2	2	2	2	2		2	2		2	2	2	2	2
Wetlands of International Importance	18, 33, (36)		2	2		2	2	2	2	2	2		2	2	2	2	2		2	2		2	2	2	2	2
Endemic species	32, (37)					4			4		4			4	4	4						4	4			
Threatened species	18, 33, (36)	x	x	x	x	4	x	x	4	x	4	x	x	4	4	4	x	x	x	x	x	4	4			
Coastal marine fish species	32		x			x			x	x	x			x	x	x						x	x			
Marine turtle species	33		x			x	x			x	x	x		x	x	x						x	x			
Threatened marine mammals	32		x			x	x			x	x	x		x	x	x						x	x			
Marine Protected areas	32		x			x	x			x	x	x		x	x	x						x	x			
Regional Priority Sites	32		x			x	x			x	x	x		x	x	x						x	x			
Ecosystems																										
Mangroves, area	32		x			x			x		x			x	x	x						x	x			
Coral reefs, area	32		x																							
Coral reef uses and disturbances	18, (36)	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x
Water Pollution																										
Waste Disposal																										
Air Pollution																										
Urban Environment																										
Other Data																										
Tourist Arrivals	1, 5, (34)		3	1	1	3	1			1	1	3		1		1		1	1	1	3	1	3	3	3	1
Tourist Earnings	2, (34)		3	3	3					3		3		3		3		3	3	3	3	3	3			
Tourist (stayover) arrivals	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Average length of stay	5	1		1	1		1	1	1	1	1	1	1	1				1	1	1	1	1	1	1	1	1
Cruise Passenger Arrivals	5		1	1	1	1	1	1		1	1	1	1	1				1	1	1	1	1	1		1	1
Visitor Expenditure	1, 5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Tourism Penetration ratio	5	1	1	1	1		1	1		1	1	1	1	1				1	1	1	1					1
Tourism Density ratio	5	1	1	1	1		1	1		1	1	1	1	1				1	1	1						1
Port volume of activity	31		7	7	7	7			7	7	7	7		7	7	7					7	1	1	1	1	1
Urban Population %	12, 27, 28, (27)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Annual interpolated population	14 (27)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Roads in good condition	34											7													7	
Total road length	35, (16)				3	3						3				3					3				3	3

Secondary Sources of Environmental and Social Data for the Caribbean

INDICATOR	SOURCE	Number of Years Delay: ANG	ANT	BAH	BDS	BZE	BVI	Cla	CubaDOM	DR	GRE	GuadGUY	Haiti	JAM	MrlqMON	N Ant	PRico	SKN	STL	SVG	Surin	TT	TCI	USVI
SOCIAL																								
Physical Quality of Life Index	2, (29)		3	3	3					3			5		3		3		3	3	3	3	3	
Food Security Index	31, 40		2		2	2			2	2	2	2		2	2	2			2	2	2	2	2	
Integrated Poverty Index	31, 40		4		2	2			2	2	2	2		2	2	2			2	2	2	2	2	
Basic Needs Index	31, 45		4		2	2			2	2	2	2		2	2	2			2	2	2	2	2	
Relative Welfare Index	31, 40		4		2	2			2	2	2	2		2	2	2			2	2	2	2	2	
Population in poverty	15, 17, (12)								5						5	5								
Human Development Index	2		3	3	3	3			3	3	3	3		3	3	3			3	3	3	3	3	
% share of income/consumption: lowest 20%	30, 39									x					x									
% share of income/consumption: highest 20%	30, 39									x					x									
Distribution of Landholdings	1		4		4	4			4	4	4	4		4	4	4			4	4	4	4	4	
Flush Toilets (%)	5		4	4	4	4	4			4		4		4			4		4	4	4	4	4	
Access to Sanitation Services	17, 33, (21), (24)					1			1		1			1	1	1					1	1		
Electricity for lighting (%)	5		4	4	4	4	4			4		4		4			4		4	4	4	4		
Households with electricity, rural/urban	16			25		25																		
Water supply: private	5		4		4	4	4			4		4		4			4				4		4	
Water supply: public piped	5		4		4	4	4			4		4		4			4				4		4	
Water supply: public collection	5		4		4	4	4			4		4		4			4				4		4	
Access to Safe Drinking Water	17, 28, 29, 33, (24), (31)					1			1			1		1	1	1					1		1	
Fertility Rate	27, 35, 41, (26)		2	2	2	2				2	2	2		2	2	2			2	5	2	2	2	
Dependency Ratio	5			1	1	1			1	1	1	1		1	1	1	1	1	1		1	1	1	
Mothers under 18 (%)	5			2	2	2	2			2		2										2	2	
Population per physician	7, 9, 17, 36, (32)			1	1	1			1		4				1	4				1			5	4
Population per nurse	7, 9, 17, 36, (32)			3	3	3			3		4				3	3								3
Population per hospital bed	9, 38, 39			3	3	3			3	3					3	3			3				3	3
Access to Health Services	17, 26, (24)								2		2				2	2								2
Low Birthweight Infants	17, 29, (23), (24)(c)								5	4	5				5	4					4			4
Underweight children age 5	17, (28)								5		5				5	5								5
Infant Mortality Rate	numerous	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Under 5 Mortality	4, 17, 26, 29, 41, (21), (22)			5	5	5	5		2		2			2	2		5		2	5	5	5		2	
Maternal Mortality	17, 29, (24)(c)								3					3	3				2					3	
AIDS cases	17, (35)		2	2	2	2			2	2	2	2		2		2				2	2	2	2	2	
Life Expectancy	numerous	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Life Expectancy, M/F	5			5	5	5	5				5											5	5			
Deaths due to nutritional deficiencies	5			3	3	3		3	3	3	3	3		3		3				3		3	3	3	3
Primary School Enrollment	5, 27, 28, 41			3	3	2			3		2	2		2	2	2						2	2	3	3	
Secondary School Enrollment	5, 27, 28				3				3		3			3	3	3						3			3	
Third level enrollment	5				6				6		5			6	6	6								6	6	
Pupil-teacher ratio, primary	5, 17, 28, (20)			3	3	3			5	3	5	3		5	3	3						5	3	3	5	3
Pupil-teacher ratio, secondary	5, 17, 28		3	3	3	3			3	3	3	5		3		3						5		5	5	2
Adult literacy	5, 13, 17, 28, 29-35, (23)			3	3				1		1			3	1	1								3	1	
Youth unemployment	5					4	4			4		4		4			4					4	4	4	4	
Urban unemployment	5				2																				2	
Unemployment M/F	22			2	1								3	7	4	4			2	1				1	1	1
Employment by Industry M/F	13, 15, 17, 28, (19), (31)				1		7		6						2	2		7	5	1				1	1	1w
Proteins, g/day/person	5, 28, (37)		3	3	3	3			3	3	3	3	3	3	3				3			3		3	3	
Calories available p.c	9, 17, 28, 41, (37)		3	3	3	3			3	3	3	3	3	3	3				3			3		3	3	
Nutrition 'wasting' % under 5's	28, 33								5		5				5										5	
Nutrition 'stunting' % under 5's	28, 33										5				5	5									5	

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NOTES

a Those sources numbered in bold italic have been consulted in deriving the appendix, and references are provided in the 'bibliography for secondary sources'
b Numbers in brackets in the 'SOURCE' column indicate an ultimate source of the data. Other figures come from reports which collate data from elsewhere
c It is always the minimum delay which is given, although some of the reports included might have a longer delay
d The difference in years of delay reported here for a given indicator sometimes derives from alternative reports using the same original, one-off study, but being published at different times. So delay might not relate simply to time to collate and publish data, but on the date of the original study
e The year of publication might not necessarily correspond with the year report was made available.
f Some figures are only available as ranges of years. The most recent year of the range has been taken here to represent the minimum delay time, despite the fact that such a range has limited application as a continuously monitored indicator