

# The Impact of Natural Disasters on the Biodiversity of Small Island States

BY SÁLVANO BRICEÑO<sup>1</sup>

In many island settings in the world, ecosystems are under threat as a result of human activity, but natural disasters are likely to amplify this trend in years to come. The loss of species and the destruction of habitats and ecosystems are undermining the resilience of islands and their ability to withstand or to recover from severe disturbances.<sup>2</sup>

Island states are vulnerable to almost all types of natural, technological and human-related hazards.<sup>3</sup> The most common and most widely experienced events are tropical

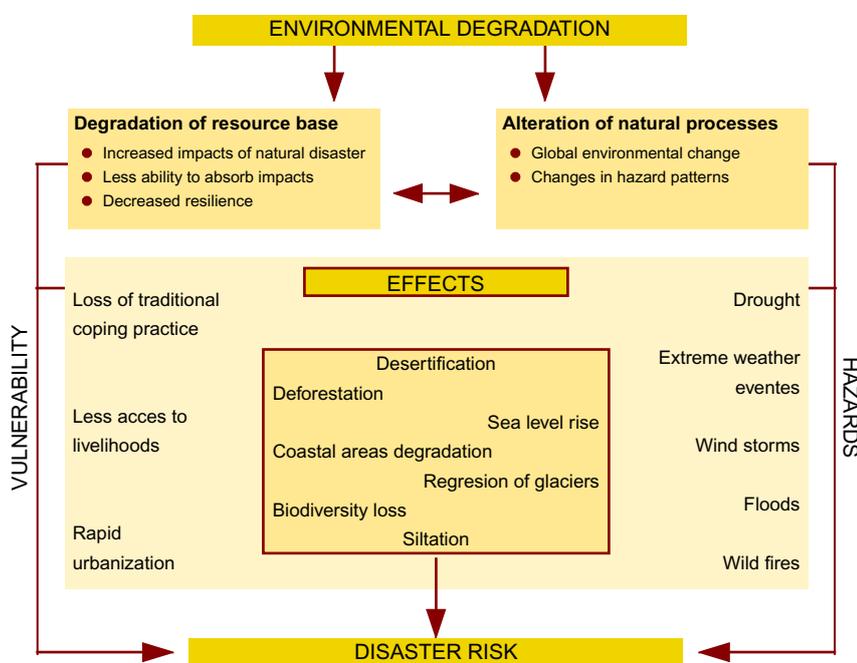
cyclones and accompanying storm surges, floods and landslides; a hazard, for example a tropical cyclone can sometimes trigger other hazards such as coastal and riverine floods.

Many small island states have grown more vulnerable to disasters because of environmental degradation caused by, among others, poor land use, deforestation, pollution from mining, rapid population growth. In those island states where agriculture plays a dominant role, indiscriminate burning, deforestation and unsustainable cropping

patterns can enhance the effects of natural disasters such as cyclone or droughts. Population growth, social change and economic transformation will place island communities under further pressure and make them more vulnerable to disasters.<sup>4</sup>

The South Pacific Regional Environment Programme (SPREP) consider that the phenomena consistent with the anticipated adverse consequences of climate change are already an unfortunate reality for Pacific Islanders. This is reflected in extensive coastal erosion, coral bleaching, persistent alterations of regional weather patterns, decreased productivity in fisheries and agriculture, and plantations are suffering increased erosion. On those islands that have not experienced inappropriate coastal development, recent devastating droughts have hit export crops, causing serious water shortages and more widespread and frequent occurrence of mosquito-borne diseases.<sup>5</sup>

Figure 1. Effects of environmental degradation and disaster risk



**Sálvano Briceño**, Venezuelan and a lawyer by training is, since 25 June 2001, the Director of the United Nations International Strategy for Disaster Reduction (ISDR) based in Geneva. Formerly, he was the Coordinator of the BIOTRADE and Greenhouse Gas Emissions Trading Initiatives at UNCTAD Geneva, and has been involved since 1978 in senior management positions at the Ministry of Environment in Venezuela, the World Conservation Union (IUCN) and since 1986, at the United Nations. He was the first Coordinator of UNEP's Caribbean Environment Programme, based in Jamaica for 5 years, followed by 8 years in Geneva with the Climate Change Secretariat (UNFCCC) and the Desertification Secretariat (UNCCD). His professional career has focused on public policy and management of international programmes in various fields of sustainable development.

<sup>1</sup> This paper was prepared with inputs from the ISDR Secretariat

<sup>2</sup> [http://www.sperp.org.ws/topic/Biodiv\\_p.htm](http://www.sperp.org.ws/topic/Biodiv_p.htm).

<sup>3</sup> ISDR defines a hazard as a potentially damaging physical event, phenomenon and/or human activity, which may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation.

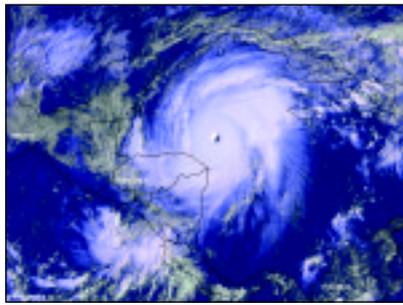
<sup>4</sup> *Climate variability and change and sea-level rise in the Pacific Island Region. A resource book for policy and decision makers, educators and other stakeholders (SPREP).*

<sup>5</sup> *Ibid.*

More than half of the 25 disaster prone islands in the world are classified as small island developing states (SIDS); as many of them are still subsistence based, this means that many island populations are dependant on local biological and other natural resources for survival. The importance of biological diversity has long been recognized in certain island settings, not simply because many islanders are dependant on local biological and other natural resources for survival but because biodiversity conservation is also a social and cultural issue. Fiji, for example, has a Biodiversity Strategy and Action Plan and has valued its ecosystem services at about USD 550 million per year.

Average economic losses from extreme weather events over the 1990s were six times greater than in the 1960s.<sup>6</sup> Small island developing nations (SIDS) pay a particular high price, mainly because many SIDS are vulnerable to natural hazards. The disastrous social and economic impacts due to Hurricanes Georges and Mitch, as well as the effects of the climate variability due to the 1997/98 El Niño/La Niña events, have highlighted that a single hazardous event can destroy social and economic infrastructures that have taken years to develop and upon whose vitality local and national economies depend. Extreme climate events can –and do– set back the development process for decades.

However, while much attention is focused on global warming causing gradual, long-term changes in average conditions, the most immediate and more significant impacts are likely to arise from changes in the nature of extreme events (e.g. flooding, tropical cyclones, storm surges) and climate variability (eg droughts and El Niño). The possibility of more extreme events such as tropical cyclones and storm surges coupled with projected rates of sea-level rise and flooding will increase

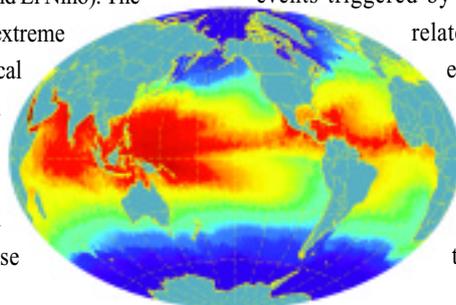


pressures on island ecosystems, as well as on critical infrastructures (e.g. port facilities, airports, roads), and vital utilities such as power and water, coastal protection structures and tourism facilities.

### Disasters as a manifestation of unsustainability

The traditional resilience of island communities to natural disasters is under threat from unsustainable practices and various economic and social pressures. The quick recovery of ecosystems can no longer be assured: poor farming and logging practices are creating massive erosion during storms; over-harvesting of coastal fish and invertebrates remove important sources of nutrients from coral reefs and sewage from urban areas have destabilised near-shore coral communities making these vital ecosystems less able to withstand and recover from the waves and rain of hurricanes.<sup>7</sup>

Disaster risk professionals now consider that the vulnerability of societies to the existing level of hazards is increasing and that many countries are accumulating large latent risk burdens such as growing populations in hazardous locations, and the stripping of environmental capacities to withstand hazards. The escalation of severe disaster events triggered by natural hazards and related technological and environmental disasters is increasingly threatening both sustainable development and poverty reduction initiatives. It is



now accepted that a close correlation exists between increased demographic pressure, especially in developing countries, growing environmental degradation (and accompanying destruction of biodiversity), increased human vulnerability and the intensity of the impact of disasters.<sup>8</sup>

### International support for disaster reduction in SIDS

The combination of current and anticipated impacts of climate variability and climate change are of great and urgent concern to SIDS. This concern has been aired in numerous international fora over the past decade or longer.

The Yokohama Strategy and Plan of Action (1994), held mid-way through the International Decade for Natural Disaster Reduction (IDNDR), declared that priority attention needed to be given to developing countries, in particular the least developed, landlocked states and small island developing states. In the same year, the Barbados Declaration (1994) which resulted from the Global Conference on the Sustainable Development of Small Island States also drew attention to the fact that: “Small island states are particularly vulnerable to natural as well as environmental disasters and have limited capacity to respond to and recover from such disasters.”

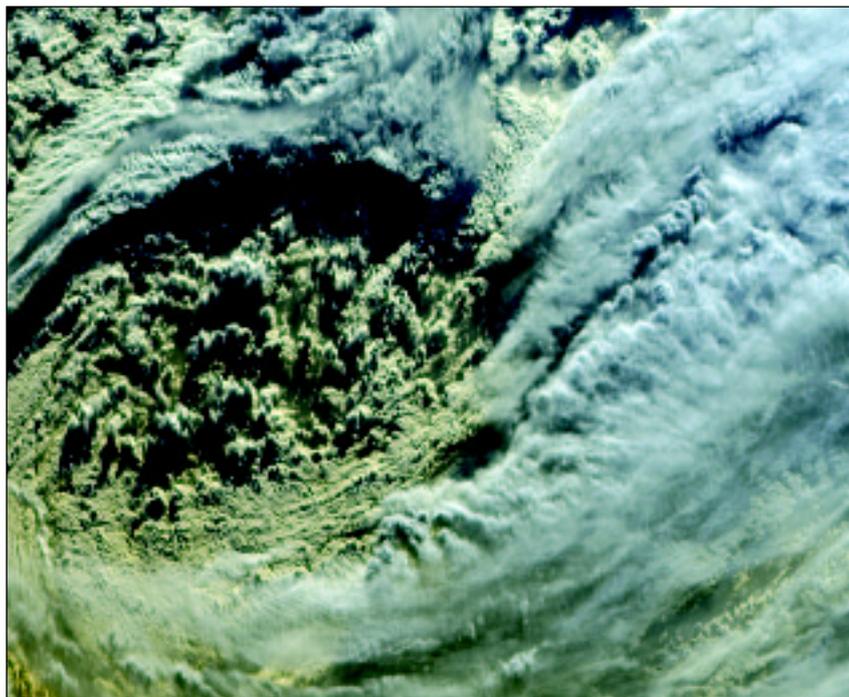
In 2002, the WSSD Plan of Implementation, in its chapter on “sustainable development of small island developing states”, calls on the international community to extend assistance to SIDS in support of local communities and develop appropriate national and regional organizations of SIDS for comprehensive hazard and risk management, disaster prevention, mitigation and preparedness and help relieve the consequences of disasters and extreme weather events.

In 2004, the Barbados Plan of Action +10 (BpoA+10) will provide substantive justification for renewing and elevating political commitment towards disaster reduction and motivate further action of governments and communities through an expanded programme for the period covering 2005-2015 to coincide with the targets of the Millennium Development Goals and the Commission for Sustainable Development.

<sup>6</sup> 2003 Geo Risk Research Dept., Munich Re., January 2003.

<sup>7</sup> ESCAP Ministerial Conference on Environment and Development in Asia and the Pacific, August 2000, Japan.

<sup>8</sup> ISDR: Disaster Reduction and Sustainable Development: Understanding the links between vulnerability and risk to disasters related to development and environment. A background paper prepared for the World Summit for Sustainable Development in Johannesburg in August - September 2002.



### Commitment of SIDS to disaster reduction

Many island states throughout the world have, in varying degrees, taken steps in recent years to address the challenges posed by natural disasters and climate change. In many settings, the management of disasters is now widely recognized as an issue of national concern, although it is equally understood that strengthening regional linkages and fostering a sense of common purpose improves overall disaster and risk management capabilities.

The similarity of hazards that Pacific SIDS face, the shared problems they experience and a generally common approach adopted in their institutional arrangements all provide a fruitful basis for regional cooperation. The current strategy for improving Pacific regional collaboration rests on two primary objectives: to support a highly functional coordinating body, the South Pacific Applied Geoscience Commission Disaster Management Unit (SOPAC-DMU), established in July 2000, and strengthen the capacity of national risk officials to accomplish effective disaster management programmes domestically.

SOPAC countries have integrated a set of principles, the Comprehensive Hazard and Risk Management (CHARM), into their national development plans. These principles envisage that changes are needed to: accomplish a paradigm shift from managing disasters to managing risks; produce

more adequate hazard and vulnerability assessments and improve presentation; ensure uniform and consistent approaches to common problems; ensure national integration and coordination; and enhance current land use systems and tenure.

One of the pioneering endeavours to safeguard and develop a strong regional capability for the coordination of information exchange, training and technical assistance in support of national biodiversity conservation efforts in the Caribbean has been UNEP's Regional Programme for Specially Protected Areas and Wildlife (SPA) in the Wider Caribbean. This programme has made it possible to improve the management of national protected areas and species in the region, including the development of biosphere reserves and develop specific regional, as well as national management plans developed for endangered, threatened or vulnerable species.

In the Caribbean, the Caribbean Disaster Emergency Response Agency (CDERA), set up by the Caribbean Community in 1991, has worked to create an expanding infrastructure for a methodical approach for developing disaster management programmes among member states, including multi-island projects. The idea of disaster reduction has been introduced in most regional initiatives at policy level, including the *Programme of Action for Small Island States*, and the programmes of the Association of Caribbean States (ACS).

### Disaster risk reduction

Disaster risk reduction or disaster risk management focuses on the areas known to be critical to risk amelioration, which can be grouped into three key areas: (i) assessment of the risk factors present; (ii) tools and practices to reduce the risks; and (iii) institutional mechanisms to support both risk assessment and risk reduction.

Risk assessment concerns the identification and analysis of hazards (natural and otherwise), and the analysis of the environmental changes and degradation and the socio-economic vulnerabilities that exacerbate risk. The information produced by risk assessment or analysis allows for the determination of government policy in different sectors (finance, agriculture, education, and infrastructural development). Risk reduction measures are most successful when they involve the direct participation of the people most likely to be exposed to hazards.

#### Risk assessment in Fiji

Risk assessment in Fiji consists of detailed hazard and vulnerability assessments, integrating the scientific, geological and meteorological information with information on the built environment (building stock, infrastructure, critical facilities and lifelines). The results and inputs have had major implications in many practical applications for disaster management, such as in helping to formulate building codes and to train emergency services personnel.

The Yokohama Strategy and Plan of Action for a Safer World (1994) describes risk assessment as a: "required step for the adoption of adequate and successful disaster reduction policies and measures." Risk assessment is undertaken to review and assess the intensity and extent of hazards and to evaluate the relative degree of risk. It also includes detailed quantitative and qualitative understanding of risk, its physical, social, economic, and environmental factors and consequences.

We need to know about the risks we face in order to be able to determine what policies and counter measures to implement. However, risk awareness varies among individuals, communities, agencies and governments, according to their particular perceptions. These can be influenced by the knowledge of hazards and vulnerabilities, as well as

by the availability of accurate and timely information about them. The information on hazard risks should be shared – and acted upon – at three levels:

**Local communities** should have sufficient familiarity with the hazards they are exposed to and an understanding of advisory information they may receive in an emergency in order to act in a manner to advice, instruct or engage the population in a manner that increases their safety or reduces the possible loss of resources on which the community depends.

**National governments** should prepare and issue hazard warnings for their national territory in a timely and effective manner to ensure that warnings and related protective guidance are directed to those populations determined to be most vulnerable to the hazard risk.

**Regional institutions** should provide specialized knowledge, advice or benefit of experience in support of national efforts to develop or to sustain operational capabilities related to hazard risks experienced by countries sharing a common geographical environment.

Institutional mechanisms are essential for effective disaster risk reduction. Risk assessment and risk reduction practices need to be strongly supported by sound administration, law and political processes. This includes the following aspects, arranged in order from more tangible to less tangible items: organizational structures (departments, consultative bodies, etc) and professional staff resources; incorporation of risk reduction into existing and new legislation; implementation

of laws via codes, standards, documents, workshops, accountability, enforcement and evaluation; integration across sectors and government departments; and political recognition and financial commitment.

### Activities associated with disaster risk reduction

Disaster risk management spans a wide range of methods and activities – assessment and analysis, mapping and data analysis, public information, community participation, early warning systems, policy and regulation, project impact assessment, education programs, conservation practices, and political processes.

While there are general approaches to risk reduction, the specific approaches must be tailored to local circumstances. Typically, the risk reduction activities will not be done as stand-alone projects, but will be implemented as integral components of other programmes, such as in specific development projects, water resources management, planning and land-use policies, environmental protection, and community development.

Many countries and regions have begun to adopt a more proactive approach on disaster reduction of disaster preparedness and mitigation in place of the former emphasis of post-disaster relief and rebuilding. Many of these initiatives are provided in the global review of disaster risk reduction initiatives, *Living with Risk* (ISDR, 2003), which contains a rich resource of information with examples

of effective risk reduction activities reported from countries around the world.

### Environmental management

The environment and disasters are inherently linked. Environmental degradation affects natural processes, alters humanity's resource base and increases vulnerability. Likewise, it exacerbates the impact of natural disasters, lessens overall resilience and challenges traditional coping strategies. It is now well known that practices that protect the integrity of nature and ensure a wise use of natural resources provide solutions to reduce vulnerability from which both the environmental and disaster communities will benefit.

Environmental management can become a cost-effective tool for disaster reduction while serving many other objectives including conservation of biodiversity, mitigation of adverse global environmental changes and poverty alleviation. The use of environmental management and knowledge needs to be promoted as a strategy for reducing risks. Environmental actions that reduce vulnerability need to be identified and applied by disaster reduction practitioners. Integrating environmental management within existing disaster reduction policy frameworks and international strategies will build a safer world.

At present, environmental management tools do not systematically integrate trends in hazards occurrence and vulnerability. Similarly, disaster reduction practitioners do not systematically explore the advantages of using environmental management tools and approaches. Some benefit might be drawn from the fact that environmental tools were developed from a risk management approach. Indeed environmental and social impact assessment processes are geared towards risk identification to address them in the design of plans and projects.

### Early warning systems

Early warning systems have an important role to play in protecting the interests of societies and communities. Political support is crucial to ensure the technical and social relevance, usefulness and efficiency of early warning strategies. As a key element of any disaster reduction strategy, early warning must be integrated into sustainable development



policies. We need to broaden the historical focus of early warning to incorporate lesser-explored issues linked to longer-term hazards and phenomena such as climate change and El Niño and La Niña phenomena.

#### Early warning measures in SIDS

Mauritius offers an interesting example of the high priority given by an island nation to early warning of cyclones. Its warning system is built into legislation and legitimized by its links to the Prime Minister's office. The Mauritius Meteorological Office is also part of the Prime Minister's Office. The Central Cyclone Committee, a communication-oriented central government body provides leadership to ensure the effectiveness of the warning system. This endorsement from the highest political authority is a particularly strong and commendable feature of its disaster planning from which others elsewhere can learn.

Lives and property can be saved by timely forecasts and issuance of warnings. When Hurricane Michelle, the strongest hurricane in 50 years, made landfall in Cuba in November 2001, reaching wind speeds of 220 km/h (category 4 Saffir-Simpson scale), early warnings made it possible to evacuate 700,000 people and roughly the same number of livestock. The resulting loss of life was very low considering the force of the hurricane. Wherever possible, farmers on the island also sought to protect important sources of revenue such as their banana plantations by wrapping the trees with burlap.

Information management and innovative communication practices play key roles in disaster risk management. Most countries with effective national risk management authorities are committed to increasing public awareness about hazards and disaster reduction practices. Only by providing evidence of the benefits of reducing vulnerability to hazards can future investment and priorities in this area be sustained.

Sustaining public interest in times of calm is one of the key disaster risk management roles that public awareness can play. It is in the time between disasters that public awareness activities can be accomplished if future losses are to be avoided. In this respect, a valuable step that can be taken is to ensure the timely and widespread circulation of lessons learned from disasters and activities that can reduce risks in the future.

## Disaster reduction practices and climate change

Disaster reduction practices will be challenged by climate change, especially in SIDS. However SIDS can provide the international momentum, given their vulnerability both to extreme events and the impacts of climate change in order to bridge the gap between the disaster reduction and climate change communities.

ISDR is currently working to solidify the links and bridge the gaps between climate change and disaster reduction activities through enhanced exchange of information, coordinate policy actions and building of partnerships, and implement activities serving common interests. The ultimate aim of these outreach activities is to promote the use of disaster risk reduction as a readily implemented component of climate change adaptation strategies.

This includes the strategies of major donors as well as those associated with the United Nations Framework Convention on Climate Change (UNFCCC), such as the National Adaptation Plans of Action (UNFCCC, 2002). At present only a few of the National Communications prepared under the Convention processes have any significant mention of disaster risk reduction activities. The ISDR Secretariat is advising on potential risk reduction elements to be included in a manual being prepared by the UNFCCC Secretariat to guide the preparation of national communications of Non-Annex 1 countries.<sup>9</sup>

ISDR is convinced that resorting to disaster reduction tools and instruments to reduce vulnerability to today's climate variability and hazards is an opportunity for a no-regrets adaptation approach to climate change that will also address extreme events. Learning to deal with climate variability and extremes is an excellent way of building adaptive capacity in the long run. In short, weather-related natural hazards and climate change can no longer be treated separately in international policy and funding.

Steps are being taken to promote the involvement of disaster risk reduction experts in the next IPCC assessment process, which will be completed in 2007. Work is also continuing under the ISDR on technical matters, such as the development of better databases on hazards, risks, vulnerabilities and disasters.

### What ISDR has to offer

The United Nations International Strategy for Disaster Reduction (UN/ISDR) is the focal point in the UN System to promote links and synergies between, and the coordination of, disaster reduction activities in the socio-economic, humanitarian and development fields, as well as to support policy integration. It serves as an international information clearinghouse on disaster reduction, developing awareness campaigns and producing articles, journals, and other publications and promotional materials related to disaster reduction.



<sup>9</sup> ISDR: Linking natural disaster reduction and adaptation to climate change: towards the integration of information, knowledge and policies. April 2003.

Recognizing that natural hazards can threaten any one of us, the ISDR builds on partnerships and takes a global approach to disaster reduction, seeking to involve every individual and every community towards the goals of reducing the loss of lives, the socio-economic setbacks and the environmental damages caused by natural hazards. In order to achieve these goals, the ISDR promotes four objectives as tools towards reaching disaster reduction for all:

- Increase public awareness to understand risk, vulnerability and disaster reduction globally.
- Obtain commitment from public authorities to implement disaster reduction policies and actions.
- Stimulate interdisciplinary and intersectoral partnerships, including the expansion of risk reduction networks.
- Improve scientific knowledge about disaster reduction.

UN agencies and governments are increasingly using the ISDR as a primary international vehicle to develop and guide commit-

ments and action. Within the UN system, numerous other initiatives are strengthening country capacities to reduce disaster risk and better manage risk, through programmes in UNDP, WMO, UNEP, WHO, FAO, UNESCO, World Bank and OCHA, for example. Civil society organizations are also very active, and include the International Federation of Red Cross and Red Crescent Societies (IFRC), and the ProVention Consortium.

### **Conclusion**

The ecosystems of many small island states support more rare, endangered and threatened species than anywhere else in the world and the marine environment comprises an enormous and largely unexplored resource, including the most extensive and diverse reefs in the world, and intact populations of many globally threatened species including whales, sea turtles, etc.

Their societal development depends on the generation of ecosystem goods such as food, timber and medicines and ecosystems services such as water purification, flood

control, carbon sequestration, pollination, seed dispersal, soil formation, among many other services and benefits. Continuing damage to the biodiversity and ecosystem of these small island states needs to be halted, for the sake of island populations and humankind as a whole.<sup>10</sup>

ISDR and disaster risk professionals are convinced that environmental and natural resource management are important cost-effective tools for disaster reduction which, at the same time, has the added advantage of working towards other objectives such as conservation of biodiversity, mitigation of adverse global environmental changes and poverty alleviation. Successful disaster reduction measures should enhance environmental quality, which includes protection of natural resources and open space, management of water run-off, and reduction of pollution. Sustainable management of natural resources should also increase the resilience of communities to disasters by reversing current trends of environmental degradation and dealing with hazard management in a comprehensive way.

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<sup>10</sup> ICSU: Resilience and sustainable development, series on science for sustainable development no. 3, 2002.