6

Climate Change and Small Island Developing States*

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Introduction

About one fifth of all politically independent countries are small island developing states. They are found in all regions of the world, but most of them are located in the South Pacific Ocean, the Indian Ocean and the Caribbean. One of the greatest challenges faced by these states in achieving sustainable development relates to climate change. It is a matter of great concern to them that although they contribute very little to global warming, they will be harmed most by its effects.

Apart from rising sea levels, SIDS are likely to experience various other effects of climate change, including extreme weather events, water shortages and increased health risks from airborne diseases. These will also impact on larger territories, but the high population density of many SIDS, their limited resource endowments and the indivisibilities of overhead costs mean that SIDS are likely to be worse affected and will bear higher per capita costs.

Two major international conferences on the sustainable development of SIDS, the 1994 Barbados Global Conference and the 2005 Mauritius International Meeting, both convened by the United Nations, assigned major importance to climate change. The Barbados Programme of Action and the Mauritius Strategy recognised that climate change could delay or prevent sustainable development in SIDS and that they face special challenges due to their particular physical and geographic characteristics. Both conferences stated that the ultimate responsibility for sustainable development lies with the SIDS governments themselves, but called on the international community to co-operate in enabling SIDS to attain sustainable development goals.

Small island states and global warming

According to the Fourth Assessment Report (Working Group II) of the Intergovernmental Panel on Climate Change (IPCC) on impacts, vulnerability and adaptation (IPCC, 2007), the regions where most SIDS are located registered temperature warming trends during the 20th century, with some studies showing that this ranged from 0° to 1°C every two decades during 1971–2004. In addition, the report states that according

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to scientific projections based on sophisticated climate models, in the 21st century there will be a general warming trend in surface air temperature in all small island regions.

Table 6.1 shows projected changes in seasonal surface air temperatures for the three 30-year periods 2010–2039, 2040–2069 and 2070–2099, relative to the baseline period 1961–1990, for the sub-continental scale regions of the world where most SIDS are located.

Table 6.1. Projected increases in air temperature (°C) by region relative to 1961–1990

Region	2010–2039	2040–2069	2070–2099
Mediterranean	0.60–2.19	0.81–3.85	1.20–7.07
Caribbean	0.48–1.06	0.79–2.45	0.94–4.18
Indian Ocean	0.51–0.98	0.84–2.10	1.05–3.77
Northern Pacific	0.49–1.13	0.81–2.48	1.00–4.17
Southern Pacific	0.45–0.82	0.80–1.79	0.99–3.11

Source: IPCC, 2007

Small island states and rising sea levels

Based on the available scientific literature, the IPCC report indicates that during the last century there was an overall tendency for sea levels to rise in the Pacific Ocean, Indian Ocean and Caribbean regions. Rising sea levels are a major concern for SIDS, especially low-lying ones, due to the fact that human settlements and industrial concerns tend to be concentrated in the coastal zones.

The economies of many SIDS depend heavily on tourism; rising sea levels are likely to harm tourism facilities. However, other industries, including fishing, agriculture and manufacturing, and infrastructure such as ports, airports and coastal reservoirs will also be negatively impacted. The coastal areas of SIDS are also associated with socio-cultural developments, so rising sea levels will also have an impact on their cultural assets.

Rising sea levels will therefore lead to heavy material and cultural losses for SIDS and will affect practically all aspects of life. This problem is, of course, particularly severe for low-lying islands, the very existence of which may be threatened. This reality is particularly harsh for SIDS because the greenhouse gas emissions they produce themselves are negligible when compared to those emitted by larger developing and developed countries.

Unfortunately, the limited resource base of small island states constrains their adaptation and coping ability, especially when large overhead costs are involved. As is well known, certain costs are not divisible in proportion to the population, and infrastructural development is often very costly for small territories with small populations.

Mainstreaming climate change in small island states

Various studies have linked climate change with sustainable development (Hay *et al.*, 2003; Huq and Reid, 2004; Munasinghe, 2003; Koshy *et al.*, 2005). This linkage is espe-

cially relevant for small island states, where the climate is a major asset for tourism, fishing and other activities that are coastal in nature. Ronneberg (2004) explains the climate change/sustainable development link by referring to the Marshall Islands. He proposes a number of innovative solutions, including waste-to-energy and ocean thermal energy conversion systems, which could promote the sustainable development of some small islands and at the same time strengthen their resilience in the face of climate change. The sustainable development and climate change link is not only relevant for low-lying, tropical SIDS, but also for others that depend heavily on coastal activities. For example, Briguglio and Cordina (2003) have shown that the impact of climate change on the economic development of Malta is likely to affect all sectors of the economy, but particularly tourism, fishing and public utilities.

One way to address this link is to integrate mitigation and adaptation measures into sustainable development strategies. Such an argument was put forward by Hay *et al.* (2003), in the context of the Pacific small island states, suggesting that the most desirable adaptive responses are those that augment actions which would be taken even in the absence of climate change, due to their contribution to sustainable development and resilience building.

It can be argued that adaptation measures may be conducive to sustainable development, even without the connection with climate change. As the 2007 IPCC report argues, the link between adaptation to climate change and sustainable development, which leads to the lessening of pressure on natural resources, improvement of environmental risk management and bettering of the social well-being of the poor, may not only reduce the vulnerability of small islands to climate change, but also may put them on the path towards sustainable development. A good starting point would be an assessment of the climatic variables and the implementation of 'win-win' or 'no regret' adaptation options (Koshy *et al.*, 2006).

The experience of adaptation in small island states[1]

The Caribbean region

The SIDS in the Caribbean region include Antigua and Barbuda, the Bahamas, Barbados, Cuba, Dominica, Dominican Republic, Grenada, Haiti, Jamaica, St Kitts and Nevis, St Lucia, St Vincent and Grenadines, and Trinidad and Tobago. Some non-island states in the region, with characteristics similar to those of SIDS, are Belize, Guyana and Suriname. There are also many non-sovereign small islands which have similar problems.

Recognising the tremendous socio-economic and environmental risks posed by climate change, Caribbean governments have embarked on several important initiatives to enhance the region's capacity to respond.

Planning for adaptation to climate change

A major activity is the project entitled Caribbean Planning for Adaptation to Climate Change (CPACC), covering the period 1997–2001 and funded by the GEF. Its main

objective was to provide support to Caribbean countries in coping with the adverse effects of global climate change, in particular rising sea levels in coastal areas, through vulnerability assessment, adaptation planning, training and capacity building. CPACC consisted of four regional projects and five pilot schemes. The regional schemes involved the design and establishment of a sea level and climate monitoring network, the establishment of databases and information systems, preparation of a detailed inventory of coastal and marine resources, and formulation and initial implementation of adaptation policies at national level.

The five pilot projects consisted of coral reef monitoring for climate change (in the Bahamas, Belize and Jamaica), coastal vulnerability and risk assessment (in Barbados, Guyana and Grenada), economic valuation of coastal and marine resources (in Dominica, St Lucia, and Trinidad and Tobago), the formulation of economic and regulatory proposals (in Antigua and Barbuda, and St Kitts and Nevis) and the preparation of national communications to the UN Framework Convention on Climate Change (UNFCCC) (in St Vincent and the Grenadines).

CPACC was followed by another important project, entitled Adaptation to Climate Change in the Caribbean (ACCC), which lasted from 2001 to 2004 and was funded principally by the Canadian Climate Change Development Fund; its implementation was overseen jointly by the World Bank and CARICOM. The project was designed to build on activities initiated under CPACC and to address issues of adaptation and capacity building not undertaken by CPACC, thus enhancing regional capacity for climate change adaptation. It also sought to ensure the sustainability of future initiatives by developing a comprehensive business plan and strategy to support the establishment of a permanent entity for the co-ordination of activities to cope with climate change. It included project design and preparation of a business plan for a regional climate change centre, as well as public education and outreach. It also dealt with the integration of climate change into a physical planning process, using a risk management approach, and identification and implementation strategies for adaptation in the water resources sector. Of interest is that the project sought to develop linkages with academic, research and other regional institutions in the south Pacific island states for the pursuit of joint activities.

Together, the projects have generated significant outputs for the Caribbean region. Among their achievements are the establishment of a sea level and climate monitoring system. A total of 18 monitoring systems, together with related data management and information networks, were installed in 12 countries, and these have improved access to data and its availability. A major outcome relates to the development of an integrated database for the monitoring of the effects of climate change, established through the Inventory for Coastal Resources. In addition, these initiatives have led to the development of a regional public education and outreach strategy. This, in turn, has led to increased appreciation of climate change issues at the policy-making level. The CPACC has enabled more collaboration among regional partners and better articulation of regional positions in negotiations under the UNFCCC and the Kyoto Protocol.

Other benefits include the establishment of monitoring protocols and early warning capabilities, and the articulation of national climate change adaptation policies and implementation plans. Such policies and plans have been formulated in 11 participating countries and guidelines have been developed for incorporating climate change adaptation in environmental impact assessments.

Mainstreaming adaptation to climate change

This initial work led to the implementation of a third major regional initiative, the Mainstreaming Adaptation to Climate Change (MACC) project, initiated in 2004 with funding from the GEF and scheduled for completion in 2008. The overall objective of the project is to provide guidelines and processes for mainstreaming adaptation to climate change into national development planning. The project involves various initiatives, including the mainstreaming of adaptation to climate change in national development planning and public and private sector strategies, support for the formulation of a regional strategy on adaptation, and the implementation and monitoring of demonstration pilot schemes.

Spillover effects

These three projects have had a considerable effect in raising awareness of climate change in the Caribbean. They have also provided a solid foundation for the implementation of further intensive national and regional activities. One of these, recently approved by the World Bank and GEF, is the Special Adaptation Project for the Caribbean (SPAC), covering the period 2006–10. Its projected cost is US$5 million, of which the GEF is providing US$2.05, with CARICOM states and others providing co-financing of US$2.95 million. The project provides support to three CARICOM countries, Dominica, St Lucia, and St Vincent and the Grenadines, for the design implementation and monitoring of various measures for minimising the impact of climate change on coastal biodiversity and land degradation.

One of the most significant achievements in the Caribbean to date was the establishment of the Caribbean Community Climate Change Centre (CCCCC) in December 2003. The Centre, which is based in Belize and is now fully operational, was mandated by the CARICOM Heads of Government at their annual meeting in July 2002. It co-ordinates the regional response to climate change and is responsible for advising regional governments on all policy matters relating to the subject. It is the key node for information on climate change and the Caribbean's efforts to manage and adapt to its adverse effects. It also functions as a regional clearinghouse, and is a proactive information-exchange facility which co-ordinates the sharing and accessing of information by the general public, private sector and NGOs. In addition, the CCCCC is responsible for the co-ordination and mobilisation of funding and other resources for climate change activities. It also plays an important role in quality assurance. It is required to ensure the standardisation of procedures for the application of methodologies for vulnerability and risk

assessments, national greenhouse gas accounting and climate modelling, and to provide training in the interpretation and use of the outputs.

The region's leading tertiary academic institution, the University of the West Indies, has initiated an MSc programme in climate change. The course commenced with initial funding from CIDA in 2003 in the Centre for Resource Management and Environmental Studies at the Cave Hill Campus, Barbados.

The Pacific region

SIDS in the Pacific region include Cook Islands, Federated States of Micronesia, Fiji Islands, Kiribati, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Palau, Samoa, Solomon Islands, Tuvalu, Tonga and Vanuatu. There are also a considerable number of non-sovereign small islands in the region that have similar problems to SIDS.

Traditionally, the peoples of the Pacific islands have lived a subsistence lifestyle with taboos and practices that ensured sustainability of resource use and allowed for natural adaptation to gradually changing environments. However, in a modernising world the Pacific SIDS have become exposed and increasingly vulnerable to a host of global change issues of which climate change is the most severe. Most Pacific island countries have already experienced its impact in the form of climatic extremes such as droughts related to the El Niño-Southern Oscillation, cyclone-related floods, rising sea levels and eroding coastlines. Internationally, the Pacific SIDS have been very vocal in negotiating global commitments to mitigation measures to reduce global warming resulting from increasing emissions of greenhouse gases. All Pacific island countries are parties to the UNFCCC and 13 have signed up to the Kyoto Protocol.

There have been a number of major initiatives by Pacific SIDS at the regional and national levels, including those described below.

Pacific islands climate change framework

At the regional level, a Framework for Action on Climate Variability, Climate Change and Sea-level Rise was developed in 2000 as a blueprint for collective action by Pacific island governments, organisations and individuals, and was supported by an annual multi-stakeholder round table meeting. After five years the Framework was revised through regional consultation and dialogue, and at the Pacific Islands Forum in 2005, regional leaders adopted the revised Pacific Islands Framework for Action on Climate Change 2006–2015.

The major goal of the Framework is to ensure that Pacific island peoples build the capacity to be resilient in the face of climate change by:

- Implementing adaptation measures;
- Good governance and decision making;
- Improving the understanding of climate change;

- Education, training and awareness;
- Contributing to the reduction of global greenhouse gases; and
- Partnerships and co-operation.

Currently, under the leadership of SPREP, negotiations are underway to develop an action plan and a round-table mechanism for the implementation of the Framework.

Community-based adaptation

The Capacity Building for the Development of Adaptation Measures in the Pacific Island Countries (CBDAMPIC) project was funded by CIDA and implemented by SPREP in Cook Islands, Fiji Islands, Samoa and Vanuatu as one of the first community-based adaptation implementation pilots. A fully community-based participatory methodology for community vulnerability and adaptation assessment and action was used in the project. To empower the communities to adapt, a collaborative bottom-up and top-down approach was adopted and adaptation measures were found to have maximum cost effectiveness when they were jointly executed. For example, in Samoa the cost of building a seawall was reduced by 50 per cent because the community provided labour and raw materials. In Torres Islands, Vanuatu, the CBDAMPIC project was only responsible for 30 per cent of the community's relocation costs. The importance of capacity building at all levels to mainstream climate change into national and community development strategies was highlighted throughout the project, which was rated as a successful example of climate adaptation implementation.

Capacity building for climate change

The Climate Change Vulnerability and Adaptation Assessment Research Programme was funded by GEF and UNEP and implemented by the System for Analysis, Research and Training (START) and the Third World Academy of Sciences (TWAS). It was completed with the development and hands-on use of the new generic modelling features developed for SimClim, both in the application and capacity-building contexts. With these tools, practitioners have acquired a much clearer appreciation of:

1. Vulnerability and the impact of climate change as a change in risks from extreme events, especially at the local or community level;
2. Adaptation as a means of reducing such risks, both from current climate variability and the incremental risks arising from a changing climate; and
3. How risk-based approaches to adaptation can enhance sustainable development. A training version of the model, TrainClim, has been incorporated into a new course on climate change at the University of the South Pacific (USP). The SimClim model has been used in vulnerability and adaptation assessments of pilot sites in Fiji Islands and Cook Islands as part of an Assessments of Impacts and Adaptations to Climate

Change (AIACC) project, and in the Federated States of Micronesia as part of a scheme funded by the Asian Development Bank. The model is now available for region-wide use on a case-by-case basis.

In 2004, the University of the South Pacific and the East-West Center, together with the New Zealand National Institute of Water and Atmospheric Research, developed a 12-day training programme, Pacific Island Training Institute on Climate and Extreme Events. Two related in-country training sessions were provided in Samoa (in 2005) and in Kiribati (in 2006). The training package has now been revised on the basis of feedback from the participants, and is now ready for wider use in the Pacific.

SOPAC offers short training courses as part of the community risk programme in order to build capacity. The main goal of a major USAID/Office of US Foreign Disaster Assistance (OFDA) Pacific Disaster Management Programme, co-ordinated by SOPAC, is to reduce the vulnerability of Pacific island communities to disaster by building sustainable regional, national and community level disaster management capacity through enhanced training, improved advocacy and strengthened local institutions.

The AIMS region

AIMS is an acronym referring to the Atlantic and Indian Oceans, the Mediterranean and the South China Sea. The following small states are included in the grouping: *Atlantic* – Cape Verde, Guinea Bissau, and São Tomé and Principe; *Indian Ocean* – Comoros, Maldives, Mauritius and Seychelles; *Mediterranean* – Malta and Cyprus; *South China Sea* – Singapore. As with other regions, in the AIMS regional grouping there are many non-sovereign small islands that share similar problems to those faced by SIDS.

The AIMS SIDS have also undertaken various adaptation initiatives. Various funding agencies, including GEF, UNEP, World Bank and UNDP assist them in addressing climate change issues, mostly on an *ad hoc basis*. However, unlike in the Pacific and Caribbean regions, there is no well-developed regional framework to co-ordinate these initiatives.

The Indian Ocean region

In the Indian Ocean region, the Indian Ocean Commission acts as a regional co-ordinator, but there is considerable scope for a well-developed regional strategy, given that all Indian Ocean SIDS face the threat of rising sea levels and that they are all heavily dependent on their coastal resources.

According to Ragoonaden (2007), precautionary measures are being taken in most of the Indian Ocean islands to address climate change and sea level rise. These include sensitisation campaigns to change the mindset of the population so that they save electricity by lifestyle changes and adopting environmentally sound technologies in the transport, industrial and domestic sectors. Mining of coral, used mainly as a construction material, has been banned in almost all islands; incentives are being provided to make optimum use of solar energy and the potential of wind energy is being explored.

In Mauritius, measures are being take to derive energy from bagasse, a biomass obtained from sugar cane; approximately 15 per cent of the island's energy requirements are now being met from this source and this proportion is expected to increase. Another interesting initiative relates to the use of cold water from the deep seas for air conditioning in coastal hotels.

Seychelles acceded to the UNFCCC on 22 September 1992 – the second country to do so. A major project in this small island state was one which enabled activities to prepare its initial national communication to the UNFCCC. The communication helped Seychelles to focus on issues that link climate change with sustainable development, a new theme for the island. This process has created awareness at all levels of government, among local communities, and in NGOs and the private sector.

In Maldives, the government has given serious attention to adaptation measures. A breakwater costing US$30 million has been constructed around the capital, Male, to protect the population and capital investment from high waves and rising sea levels.

Atlantic Ocean region

The Atlantic Ocean SIDS are also accessing support from the GEF to enhance regional synergy. For example, the GEF–UNDP project 'Adaptation to Climate Change – Responding to Shoreline Change and its Human Dimensions in West Africa through Integrated Coastal Area Management' seeks to mainstream adaptation into coastal area planning in Cape Verde, The Gambia, Guinea Bissau and other countries through the development of pilot adaptation activities in response to shoreline change. Given the extensive coastal continuity, in terms of sediment transport and river discharge, there is a strong rationale for addressing the issue of adaptation and shoreline change through the development of a regional approach in order to maximise available resources.

Mediterranean small island states

Two small island states in the Mediterranean, Cyprus and Malta, are EU members and are therefore considered as developed countries, with responsibilities for abating climate change in line with EU commitments. The EU has adopted a wide set of policy measures aimed at reducing GHG emissions, including the greenhouse gas emission allowance trading scheme, the Renewables Directive (which sets an indicative target of 22 per cent renewables by 2010) and the Framework Directive on the Eco-design of Energy-using Products, setting conditions relating to energy consumption and other products which affect the environment. Malta and Cyprus are therefore expected to promote climate-friendly, low-emission technologies and related research to encourage flexible market- and project-based mechanisms (Ecologic, 2007; European Commission, 2007).

Singapore

Despite sharing many of the physical characteristics of SIDS, Singapore has a very high GDP per capita and is a modern city state, with a virtually 100 per cent urbanised

population. Prior to 2006, its climate change policy focused on mitigation measures, with less emphasis on vulnerability and adaptation (Ministry of Environment, 2000).

After acceding to the Kyoto Protocol in 2006, Singapore formed the National Climate Change Committee, which focused on four areas:

- *Mitigation:* promoting greater energy efficiency and less carbon-intensive energy in key sectors;
- *Public awareness:* raising awareness among citizens and the private and public sectors of the impact of climate change and the opportunities arising from it, and the actions they could take;
- *Competency building:* building competency to better respond to climate change by promoting research and development of low-carbon technologies; and
- *Vulnerability and adaptation:* understanding Singapore's vulnerability and facilitating the adaptation actions needed.

Although the strategy is meant to be evolving, the emphasis is still on mitigation and economic opportunities. The impact of climate change will be most severe on the coast, because of the population, coastal reservoirs and economic activities. One study indicated that the high cost of coastal land justified the benefits of protection through the construction and heightening of seawalls (Ng and Mendelsohn, 2005). A vulnerability study was commissioned in March 2007. Given the need to protect water resources and reclaimed land, a new Singapore-Dutch research centre is evaluating hard protection measures, although other measures are not discounted. The 2004 Indian Ocean tsunami has given added urgency to the need to protect Singapore from rising sea levels.

Conclusion

Small island states are very vulnerable to climate change, even though their contribution to global greenhouse gas emissions is minimal. They are set to suffer great material losses from sea level rise and climate variability unless they put in place appropriate adaptation measures. Many initiatives have been taken by SIDS to foster an understanding of climate change and its repercussions, and to promote mitigation and adaptation strategies. Various adaptation procedures that can be put in place in anticipation of rising sea levels, water shortages and extreme weather events have been proposed (Klein, 2003; Sem, 2007; United Nations, 2007).

In many cases, adaptation measures, such as building infrastructures that withstand strong winds, clearing valleys to avoid floods in case of extreme weather events, preparing for eventual retreat from the beaches, withholding permits for building on low-lying areas and putting in place early warning systems, can be mainstreamed in development policies, so that their benefits can be enjoyed, even if climate change predictions do not materialise.

In practice, small island states face many constraints in trying to mainstream climate change into their sustainable development strategies, due mainly to their limited resources and indivisibilities of overhead expenditures, including those associated with infrastructural projects. It is for this reason that at the 1994 Barbados and 2005 Mauritius conferences, governments of developed and developing countries agreed that although SIDS themselves are ultimately responsible for their sustainable development, the co-operation of the international community is called for to enable them to attain this objective.

Note

1 Due to limitations of space, this section covers only a selection of climate-change related activities in SIDS.

References

Briguglio, L. and Cordina, G. (2003). 'The Economic Vulnerability and Potential for Adaptation of Islands to Climate Change, with Special Reference to the Maltese Island', Paper presented at the International Policy Dialogue on Vulnerability and Adaptation to Climate Change: a Common Agenda for Developing Countries, Zacatecas, Mexico, 17–18 June.

Ecologic (2006). *Future Climate Change Policy in Cyprus, Hungary, Malta and Slovenia, Germany*. Berlin: Institute for International and European Environmental Policy.

European Commission (2007). 'Limiting Global Climate Change to 2 Degrees Celsius The Way Ahead for 2020 and Beyond', Brussels, 10 January 2007, COM(2007) 2 final.

Hay, J., Mimura, N., Campbell, J., Fifita, S., Koshy, K., McLean. R.F., Nakalevu, T., Nunn, P. and de Wet, N. (2003). *Climate Variability and Change and Sea-level rise in the Pacific Islands Region: A Resource Book for Policy and Decision Makers, Educators and Other Stakeholders*. Apia, Samoa: SPREP.

Huq, S., Murray, L. and Reid, H. (2004). 'Mainstreaming Adaptation to Climate Change in Least Developed Countries', *IDS Bulletin*, 35(3). Brighton, Sussex: Institute of Development Studies at the University of Sussex.

Intergovernmental Panel on Climate Change (2007). 'Small Islands', in *Climate Change, Impacts, Adaptation and Vulnerability*, available at http://www.gtp89.dial.pipex.com/chpt.htm

Klein, R.J.T. (2003). 'Adaptation to Climate Variability and Change: What is Optimal and Appropriate', in Giupponi, C. and Schechter, M. (eds), *Vulnerability and Adaptation*. Cheltenham, UK: Edward Elgar Publishers, pp. 32–50.

Koshy, K.C, Mataki, M. and Lal, M. (2005). *Sustainable Development and the Pacific Island Countries*. Suva, Fiji: University of the South Pacific.

—— (2006). 'Baseline Climatology of Viti Levu (Fiji) and Current Climatic Trends', *Journal of Pacific Science*, 60 (1): 49–68.

Ministry of Environment (2000). 'Singapore's Initial National Communication'. Singapore: Ministry of Environment.

Munasinghe, K. (2003). *Analysing the Nexus of Sustainable Development and Climate Change: an Overview*. Paris: OECD.

Ng, W.S. and Mendelsohn, R. (2005). 'The impact of sea-level rise on Singapore', *Environment and Development Economics*, 10: 201–215.

Ragoonaden, S. (2007). Sea Level Activities and Changes on the Islands of the Western Indian Ocean. Quatre Bornes, Mauritius: Mauritius Oceanography Institute.

Ronneberg, E. (2004). 'Environmental Vulnerability and Economic Resilience: The Case of the Republic of the Marshall Islands', in Briguglio, L. and Kisanga, E. (eds), *Economic Vulnerability and Resilience of Small States*. Commonwealth Secretariat and the University of Malta, pp. 163–72.

Sem, G. (2007). *Vulnerability and Adaptation to Climate Change in Small Island Developing*

States. Available at http://unfccc.int/files/adaptation/adverse_effects_and_response_measures_art_48/ application/pdf/200702_SIDS_adaptation_bg.pdf

Silver. N. (2007). 'Climate Change, SIDS and Insurance', Presentation at the UNFCC Expert Meeting on Adaptation for SIDS, Rarotonga, Cook Islands, 26–28 February 2007. Available athttp://unfccc.int/files/adaptation/adverse_effects_and_response_measures_art_48/application/pdf/200702_uk_mr._nick_silver.pdf

United Nations (2007). Report on the Expert Meeting on Adaptation for Small Island Developing States. Available at http://unfccc.int/resource/docs/2007/sbi/eng/11.pdf