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CLIMATE CHANGE AND SMALL ISLAND DEVELOPING STATES[1]

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1. INTRODUCTION

About one fifth of all politically independent countries are Small Island Developing States (SIDS). These are to be found in all regions of the world, but most of them are located in the South Pacific Ocean, the Indian Ocean and the Caribbean Sea. One of the greatest challenges to the sustainable development faced by these states relates to climate change. A matter of great concern for these states is that although they contribute very little to global warming, they are the ones that will be harmed most by the effects of climate change.

Apart from sea-level rise, SIDS are likely to experience various other effects of climate change including extreme weather events, water shortages and increased health risks from air borne diseases. These will also impact larger territories, but the high population density of many SIDS, their limited resources endowments and the indivisibilities of overhead costs, are likely to result in higher impacts on SIDS and higher per capita costs.

Two major international conferences on the sustainable development of small island developing states, namely the Barbados 1994 Global Conference, and the 2005 Mauritius International Meeting, both convened by the United Nations, assigned major importance to Climate Change. Both the Barbados Programme of Action[6] and the Mauritius Implementation Strategy[7] recognized that climate change could delay or prevent sustainable development in SIDS and that SIDS face special challenges due to their specific physical and geographic characteristics. Both conferences stated that the ultimate responsibility for sustainable development lies with the SIDS' governments themselves, but called for the cooperation of the international community to enable SIDS to attain sustainable development goals.

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[1] Paper prepared for the Commonwealth Policy Studies Unit (CPSU) seminar "Kampala's Commonwealth Summit: A briefing on issues before the leaders in Kampala in November 2007" London, 9th November 2007.

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[6] http://www.un.org/documents/ga/conf167/aconf167-9.htm (Annex II)

[7] http://www.unesco.org/csi/B10/mim/mimStrategy_English.pdf (Annex II)

2. SMALL ISLAND STATES AND GLOBAL WARMING

According to the IPCC Fourth Assessment Report (Working Group II) 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 the 1971 to 2004 period. In addition, the report states that according 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 1 shows projected changes in seasonal surface air temperature for the three 30-year periods (2010 to 2039, 2040 to 2069 and 2070 to 2099) relative to the baseline period 1961 to 1990, for sub-continental scale regions of the world, where most SIDS are located.

Table 1
Projected increase in air temperature (°C)
by region, relative to the 1961–1990 period.

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

Source: IPCC (2007)

3. SMALL ISLAND STATES AND SEA-LEVEL RISE

Basing on available scientific literature, the IPCC report (*op cit*) indicates that during the last century there was an overall tendency for sea-level rise in the Pacific, Caribbean and Indian Ocean regions. Sea-level rise is a major concern for SIDS, especially low-lying ones, due to the fact that in such states human settlements and industrial concerns tend to be concentrated on the coastal zone.

The economy of many SIDS depends heavily on tourism and sea-level rise is likely to harm tourism facilities and infrastructure. However, other industries, including fishing, agriculture and manufacturing as well as 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 in these states and sea-level rise will therefore also have an impact on their cultural assets.

Sea-level rise will therefore lead to heavy material and cultural losses for SIDS and will affect practically all aspects of life in such states. This problem is of course particularly severe for low-lying islands, the very existence of which may be threatened by sea-level rise. This reality is particularly harsh for SIDS because greenhouse gas emissions

produced by these states 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 a small population.

4. MAINSTREAMING CLIMATE CHANGE IN SMALL ISLAND STATES

Various studies have linked climate change with sustainable development (e.g., Hay et al., 2003; Huq and Reid, 2004, Munasinghe, 2003, Koshy et al., 2005). This linkage is especially relevant for small islands 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 linkage by referring to the Marshall Islands and 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 linkage 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 climate change impacts on the economic development of Malta are likely to affect all sectors of the economy, but particularly tourism, fishing and public utilities.

One way to address this linkage 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 contributions 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 (op cit), the link between adaptation to climate change and sustainable development, which leads to the lessening of pressure on natural resources, improving environmental risk management, and increasing 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 variabilities and the implementation of ‘win-win’ or ‘no regret’ adaptation options (Koshy et al., 2006).

5. 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 with sea-level rise and climate variability unless they put in place appropriate adaptation measures. Many initiatives have been taken by SIDS in the different regions to foster an understanding of climate change and its repercussions and to promote mitigation and adaptation strategies in this regard (see Appendix). Various adaptation procedures that can be put in place in anticipation of sea-level rise, 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 building permits 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 materialize.

In practice small islands states face many constraints in trying to mainstream climate change into their sustainable development strategies mainly due 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 responsibility for their sustainable development, the cooperation of the international community is called for to enable SIDS to attain this end.

[9] http://www.nccc.gov.sg/aboutnccc/about.shtm

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APPENDIX

ADAPTATION EXPERIENCE IN SMALL ISLAND STATES[8]

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 SIDS', are Belize, Guyana and Suriname. In the Caribbean region, there are many non-sovereign small islands which also share similar problems with SIDS.

Recognizing 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 to these challenges.

Caribbean Planning for Adaptation to Climate Change

A major activity in this regard is the project entitled Caribbean Planning for Adaptation to Climate Change (CPACC), covering the period 1997 to 2001, and funded by the Global Environment Facility (GEF). The main objective this project was to provide support to Caribbean countries to better prepare the region to cope with the adverse effects of global climate change, in particular sea-level rise in coastal areas through vulnerability assessment, adaptation planning, training and capacity building. CPACC consisted of four regional projects and five pilot projects. The regional projects involved design and establishment of a sea-level and climate monitoring network, establishment of databases and information systems; preparation of a detailed inventory of coastal and

[8] This appendix does not cover all climate-change related activities in SIDS, and due to space limitations, only a selection of the relevant projects are mentioned in this summary.

marine resources; and formulation and initial implementation of adaptation policies, at the national level.

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

Adaptation to Climate Change in the Caribbean

The 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, and its implementation was overseen jointly by the World Bank and CARICOM. This 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. The project 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 coordination of climate change activities in the region. The ACCC 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 to adaptation and identification and implementation strategies for adaptation in the water resources sector. Of interest is that this project sought to develop linkages with academic, research and other regional institutions in the south Pacific island states for the pursuit of joint activities in climate change.

Together, these projects have generated significant outputs for the Caribbean region. Among the achievements are the establishment of a sea level and climate monitoring system. A total of 18 monitoring systems, along with the related data management and information networks were installed in 12 countries and improved access and availability of data. A major outcome of these projects relates to the development of an integrated database for the monitoring of climate change effects was established through the Inventory for Coastal Resources. In addition these regional initiatives have led to the development of a regional Public Education and Outreach (PEO) strategy for climate change. This has in turn led to increased appreciation of climate change issues at the policy-making level. The CPACC enabled more unification among regional parties and better articulation of regional positions for negotiations under the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol.

Other benefits associated with these initiatives include the establishment of monitoring protocols and early warning capabilities, the articulation of national climate change adaptation policies and implementation plans – such policies and plans were formulated

in 11 participating countries and the development of guidelines 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 adaptation to climate change in national development planning and public and private sector strategies and support for formulation of a regional strategy on adaptation and implementation and monitoring of specific measures for adaptation (demonstration pilots)**.**

Spillover effects

These three projects (CPACC, ACCC and MACC) have had a considerable impact on the raising of awareness of climate change in the Caribbean, and have provided a solid foundation for the implementation of further intensive national and regional activities. One of these, recently approved by the World Bank-GEF, is the Special Adaptation Project for the Caribbean (SPAC), which is being executed over the period 2006-2010. The projected cost is US$5.0 million, of which the GEF provides US$2.05, with CARICOM states and others providing co-financing in the amount of US$ 2.95 million. The project provides support to three CARICOM countries (Dominica, St. Lucia, St. Vincent and the Grenadines) for the assessment, design implementation and monitoring of various measures for minimizing the impacts of climate change on coastal biodiversity and land degradation.

One of the most significant achievement in the Caribbean to date, is the establishment of the Caribbean Community Climate Change Centre (CCCCC) in December 2003. The Centre, which is fully operational from its headquarters in Belize, was mandated by the CARICOM Heads of Government at their annual meeting in July 2002. The CCCCC coordinates 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 issues and the Caribbean's efforts to manage and adapt to the adverse effects of climate change. It also functions as a regional clearinghouse, and is a proactive information-exchange facility which coordinates the sharing and accessing of information by a variety of public, private sector and NGO stakeholders. In addition, the CCCCC has responsibility for the coordination and mobilization of funding and other resources for climate change activities in the region. The Centre also has an important role to play in quality assurance. It required to ensure the standardization of procedures for the application of methodologies for vulnerability and risk assessments, national greenhouse gas accounting and climate modeling, and provide training in the interpretation and use of the outputs.

It is also to be noted that the region's leading tertiary academic institution, the University of the West Indies (UWI), has also initiated a Master of Science programme in climate change. This course commenced with initial funding from CIDA in 2003 in the Centre for Resource Management and Environmental Studies (CERMES), at the Cave Hill Campus in Barbados.

The Pacific Region

SIDS in the Pacific Region include the Cook Islands, the Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Palau, Papua New Guinea, Palau, Samoa, Solomon Islands, Tuvalu, Tonga and Vanuatu. In the Pacific region, there are many non-sovereign small island that share similar problems with SIDS.

Traditionally, Pacific Island people 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 situation of Pacific SIDS is one of exposure and growing vulnerability to a host of global change issues with climate change being the most severe among them. Most Pacific island countries have already started experiencing the impacts in the form of climatic extremes such as ENSO-related droughts and cyclone-related floods and rising sea levels and eroding coastlines. Internationally, the Pacific SIDS have been very vocal in negotiating global commitment for mitigation measures to reduce global warming resulting from increasing emissions of greenhouse gases. All Pacific Island Countries are parties to the UNFCCC and 13 are Parties to its Kyoto Protocol.

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

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 blueprint for collective action by Pacific Island governments, organizations and individuals and was supported by an annual multi-stakeholder roundtable. After five years the Framework was revised through regional consultation and dialogue and at the Pacific Islands Forum in 2005, the Pacific Leaders adopted the revised Pacific Islands Framework for Action on Climate Change 2006-2015 ("the Framework").

The major goal of the Framework is to ensure that Pacific island people build their capacity to be resilient to the risks and impacts of climate change with the key objective to deliver on the expected outcomes by (a) implementing adaptation measures; (b) good governance and decision making; (c) improving the understanding of climate change; (d) education, training and awareness; (e) contributing to the reduction of global greenhouse gases; and (f) partnerships and cooperation. Currently, under the leadership of the Secretariat of the Pacific Regional Environmental Programme (SPREP), negotiations are under way to develop an Action Plan and a roundtable mechanism for the implementation of the Framework.

Community-based Adaptation

The project titled, Capacity Building for the Development of Adaptation Measures in the Pacific Island Countries (CBDAMPIC), was funded by the Canadian International Development Agency (CIDA) and executed by SPREP in Cook Islands, Fiji, 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 developed and used in the project. To empower the communities to adapt, a collaborative bottom-up and top-down approach was found to be the best and adaptation implementation measures when executed jointly had the maximum cost effectiveness. For example, in Samoa the cost of building a seawall was reduced by 50% when the community provided labour and raw materials. In the Torress island in Vanuatu, the CBDAMPIC project was only responsible for 30% of the community relocation cost. The importance of capacity building at all levels to mainstream climate change into national and community development strategy was highlighted throughout the project, which was rated as a success case in climate adaptation implementation in the region.

Capacity Building for Climate Change

The project entitled Climate Change Vulnerability and Adaptation Assessment Research Programme (AIACC) is funded by GEF/UNEP and implemented by START/TWAS. It was completed with the development and hands-on use of the new generic Modeling features for SimClim, both in applications and capacity building contexts. With such tools, practitioners have acquired a much clearer appreciation of: (1) vulnerability and impacts 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 as well as 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 called TrainClim has also been developed which has been incorporated into a new climate-change course being developed at University of the South Pacific. The SimClim model has been used for the vulnerability and adaptation assessment of pilot sites in Fiji, Cook Islands as part of the AIACC project and in the Federated State of Micronesia as part of an Asian Development Bank project (2006). The model is now available for region-wide use on a case-by-case basis.

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

The Secretariat of the Pacific Applied Geoscience Commission (SOPAC) has been offering short training as part of the Community Risk Programme to build capacity. The

main goal of a major USAID/OFDA Pacific Disaster Management Programme coordinated by SOPAC is to reduce 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 Atlantic, Indian Ocean, Mediterranean and South China Sea. The following small island states are included in this grouping: *Atlantic:* Cape Verde, Guinea Bissau and Sao Tome and Principe; *Indian Ocean:* Comoros. Maldives, Mauritius and the Seychelles; *Mediterranean Sea:* Malta and Cyprus; *South China Sea:* Singapore. As is the case with the other regions, in the AIMS regional grouping, there are many non-sovereign small islands that share similar problems with SIDS.

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

The Indian Ocean

In the Indian Ocean, the Indian Ocean Commission acts as a regional coordinator, but there is considerable scope for a well-developed regional strategy given that all Indian Ocean SIDS face sea-level rise threats, and they are all heavily dependant on their coastal resources.

According to Sachooda et al.(2007) proactive and 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 in saving electricity through the adoption of a new life style and environmentally sound technologies in transport, industrial and domestic sectors. Coral mining, use mainly as construction materials, has been banned completely through legislation 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 the case of Mauritius, measures have being take to derive energy from bagasse, a biomass obtained from sugar cane and about 15% of the energy requirement of the country is currently from this source and it is expected to increase. Another interesting initiative relates to the use of cold water from the deep seas for air conditioning of coastal hotels.

The Republic of Seychelles acceded to the United Nations Framework Convention on Climate Change (UNFCCC) on 22 September 1992, the second country to do so. A major

project executed in this small island state was 'Enabling Activities to Prepare the Initial National Communications' to the UNFCCC. The Initial National Communications have enabled Seychelles to focus on issues that link climate change to sustainable development, a domain which was not given attention before. This process has created awareness at all levels within government, amongst local communities as well as NGOs and the private sector.

In the Maldives, the government has given serious attention to adaptation measures. A breakwater to the tune of US$30 million has been constructed around the capital, Male, to protect capital investment and resident population against high waves and sea-level rise.

The Atlantic Ocean

The Atlantic Ocean SIDS are also availing themselves of GEF support 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, Gambia, Guinea Bissau and other countries through the development and implementation 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 to maximize available resources and benefits.

Mediterranean Small Island States

Two small island states in the Mediterranean, namely Cyprus and Malta are European Union (EU) members and are therefore considered as developed countries, with responsibilities for abating climate change in line with the EU commitments. The EU has adopted a wide set of policy measures aimed at reducing greenhouse gas emissions, including the Greenhouse Gas Emission Allowance Trading Scheme, the Renewables Directive, which sets an indicative target to reach a 22% share of electricity from renewable sources by 2010 and the Framework Directive on the Eco-design of Energy-using products which sets conditions energy consumption and other environmentally-relevant products. The EU, and therefore Malta and Cyprus, are 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% urbanized population. Prior to 2006, its climate change policy has focused on mitigation measures with less coverage on vulnerability and adaptation measures or plans to be undertaken (Ministry of Environment 2000).

After acceding to the Kyoto Protocol in 2006, Singapore formed the National Climate Change Committee[9] focusing on four areas namely (1) mitigation - promoting greater energy

efficiency and less carbon-intensive energy in key sectors; (2) public awareness - raising awareness amongst the people, private and public sectors on the impacts and opportunities arising from climate change, and the actions they can take; (3) competency building - building competency in Singapore to better respond to climate change such as through promoting research and development of low-carbon technologies; and (4) vulnerability and adaptation - understanding Singapore's vulnerability to climate change and facilitating the adaptation actions needed. Although the strategy is meant to be evolving, the emphasis is still on mitigation and economic opportunities.

The impacts of climate change would be most severe on the coasts because of the population, coastal reservoirs and economic activities. One study indicated that the high costs of coastal land justified the benefits of protection through the construction and heightening of seawalls at intervals (Ng and Mendelsohn, 2005). A vulnerability study was commissioned in March 2007. Given the need to protect the water resources and reclaimed land, a new Singapore-Dutch research centre is evaluating hard protection measures although other measures are not discounted. The recent 2004 Indian Ocean tsunami has also added an urgency to protect Singapore from a higher sea level.