2. Impact of Natural Disasters on Economic and Social Infrastructure

Small islands are nearly wholly coastal zones, with a heavy concentration of population and settlements on relatively small areas. This implies that economic as well as recreational activities are concentrated on coastal plains, which need integrated management in order to obtain sustainable development. One of the common characteristics of Small Island States is that natural resources are limited (in particular surface fresh water), i.e., a limited and fragile resource base exists that allows little room for mistakes in its utilization and management.

Sustaining the development of a small island is in itself a very challenging exercise for any government and people. The factors which could adversely affect this development could be divided into the following categories: those relating to socio-economic issues and those due to natural disasters. The first category includes the over-exploitation of resources, adverse terms of trade, outward migration of skills, foreign debt servicing and drug trafficking. In the other category, the devastation and deaths caused by natural hazards such as severe tropical cyclones or earthquakes often bring thriving societies and economies to a sudden halt; and there is the cost of reconstruction which is often beyond the capabilities of some countries to bear alone. A disaster is said to occur when a specific event causes "widespread human, material or environmental losses that exceed the ability of the affected society to cope using only its own resources".

Small islands are most vulnerable to the impact of natural disasters because of the limited size of their economies. In many cases, islands rely on a few key industries for economic activity. Very few small islands have any significant natural resources such as minerals or petroleum. Agriculture, tourism and fisheries normally make up the prime industries, contributing a substantial part of the Gross Domestic Product (GDP), but small-scale manufacturing activity is also fairly commonplace. Each of these industries is susceptible to the ravages of tropical cyclones and associated phenomena, namely intense rainfall and flooding, violent winds, landslides and coastal storm surges. Agricultural crops are flattened by strong winds, fields are flooded and valuable topsoil often washed away by heavy rains. Foreign visitors are forced to leave due to damaged hotels and the flow of tourist comes to a halt. Fishing fleets or individual boats are often damaged or destroyed. An increase in unemployment, a slowdown in economic activity and the reduction in valuable foreign exchange earnings are some of the results.

Disaster-related GDP reductions of 20-30 per cent in a single year are not uncommon. Such disasters might have an impact lasting several years. For example, Hurricane Allen destroyed the entire banana crop and severely damaged most hotels (located mostly near the coast) on the Caribbean island of St. Lucia in 1980. The return to full banana production took well over one year to be achieved, and it was much longer than that before tourism returned to normal. Since bananas and tourism make up the two principal industries on St. Lucia, significant unemployment and a dramatic loss of earnings ensued. Large numbers of private homes, public utilities and other infrastructure sustain intense damage in these cases. These problems are magnified by the fact that many of the Island States are not only small, but consist of a number of small islands, like the Maldives with some 1300 islands of which only 200 are inhabited. In such cases, communications are easily disrupted by a natural disaster. The recovery process itself has an impact on continuing development, as government funds earmarked for capital projects, or funds from foreign aid, are often diverted into the recovery process. The extent of the human suffering can be missed by the foreign media who have other "better" things to cover.

Even though tropical cyclones frequent the oceans, the chances of any one small island being hit very often by one of these severe storms are not very great. In addition, tropical cyclone activity tends to occur in cycles. A period with a normal or above normal number of these storms in any one region may be followed by a decade or more of very little activity. This means that development on an island can continue for many years without interruption and a certain amount of complacency can result. This complacency often becomes widespread within the community; that is, among the public, government officials and even the industrial and commercial sectors. Since islands tend to have small economies, any new development is viewed as vital. Unfortunately these developments often take place without regard to the potential impact of natural disasters. For example, increased settlement and over-development in vulnerable locations, such as beachfront property, reclaimed land, or along river banks, may be permitted without adequate safeguards, and adherence to building codes (if they exist) may be disregarded. This is precisely the setting for a disaster to occur.

On an annual basis the tropical cyclone represents a much greater risk than "geological" events such as volcanic, seismic and tsunami disasters which have a lower frequency and a very long return period. But historic records show that the disasters which result from these events have the potential to be even more catastrophic than tropical storms.

A large number of small islands have had little or no volcanic activity for centuries, but there are those with several active volcanoes. Volcanic unrest without eruptions is much more frequent than an actual eruption, with a disruptive impact on life and sections of the economy (eg tourism and agriculture). The possible impact is country-dependant since many volcanoes are located in the rugged interior of islands. Naturally, a full eruption has a much more serious social and economic impact. For example, the entire population of near 100,000 had to be evacuated from the island of Vanuatu when the volcano Lopeve erupted in 1960.

The level of earthquake activity depends largely on the how close an island is to the tectonic plate boundaries, and how deep beneath the surface the disturbance occurs. Seismic activity on many of the Small Island Developing States may be frequent, particularly on the Pacific islands, but local intensities tend to be fairly low. Deep earthquakes seldom cause damage on the land surface, and the fact that 70 per cent of the world's deep focus earthquakes are recorded in the Fiji area is not of great concern[1]. Significant damage is normally caused by shallow earthquakes, or by earthquakes centered just off-shore. Fiji experienced its worst earthquake in 1953 from this type of situation.

A direct result of seismic and some volcanic activity is the tsunami, a large wave or series of waves that is generated by a sudden violent disturbances in the Earth's crust, or by a major coastal volcano. The Pacific Rim, the world's most seismically active region, generates about 80 per cent of all tsunamis. They are very difficult to predict as these long waves are almost never apparent on the open ocean, and can travel over an entire ocean as fast as a jet aircraft and appear suddenly in bays or harbours as giant killer waves. More than 50,000 people have been killed by tsunamis over the last century, many without warning[2]. Most of the tsunamis occur on the large islands or continental areas of the Pacific, such as Japan or Hawaii, but the small islands are also very vulnerable. For example, a tsunami generated by the 12 December 1992 earthquake centered on the Indonesian Island of Flores, reached its beaches in 2 to 5 minutes, with loss of life and much destruction[3]. 1,000 people in one village were killed as some villages were totally destroyed[4].

Risk Assessment and Insurance Issues

The significant developments which have taken place on many small islands have received a sudden jolt in recent years, because of the impact of some major disasters around the world due to tropical cyclones and other natural hazards. Most insured property on small islands tend to be reinsured with the big international companies. Those international companies now face tremendous losses due to the escalating cost of damage caused by "the big ones" like Hurricane **Gilbert** in Jamaica in 1988, Hurricane **Andrew** in the Bahamas and the USA in 1992 and Cyclone **Kina** in Fiji in 1992, coupled with losses due to the California earthquakes of 1991 and 1993 and the 1993 Mississippi floods. Small islands are now being classified as high-risk areas because of their vulnerability to natural disasters. As a result, insurance rates have risen dramatically by 300 to 400 per cent in many places, or insurance companies are withdrawing coverage altogether against tropical cyclones. Consideration of the impact of these changes on the development of small islands states is important. With the insurance costs of private, commercial and industrial property becoming very expensive, and new development projects thus becoming financial risky, the sustainable development of the islands is being affected. A big fear for some insurance experts, is that new lulls in the activity of tropical cyclones and other major hazards will lead to renewed complacency and a fall in insurance rates. Then the question will be "Who will pay for the next big disaster?"

This is a crucial question for the Small Island Developing States. It is easy to see that any direct hit by a tropical cyclone on a major population centre on an island or elsewhere, will lead to significant damage and likely loss of life. But it is important to ask the question whether the increased damage cost is really due to above normal storm activity, or due to the effects of global warming on tropical cyclones, or whether it is due to other factors such as the increasing development in vulnerable areas, sub-standard infrastructure and the like, or even to mistakes within the insurance industry itself. As indicated before, tropical storms in each oceanic basin have their own cycle of activity. The activity in the Caribbean area has remained near or below the long-term average for a over a decade, although a few large and strong storms struck the islands during that time[5]. In the southwest Indian Ocean, with a number of small developing island states, statistics for the last few cyclone seasons suggest below normal activity[6], but direct hits on some of the islands have also occurred, such as cyclone **Hollanda** in Mauritius in February 1994. As will be discussed later, any significant global warming has serious consequences for coastal areas and flat islands, but it is uncertain whether it would have any significant impact on the number or intensity, or even the general area of occurrence of tropical cyclones. There is no evidence that there has been any increase over the last few decades[7,8].

These facts do not in any way suggest a reduction in risk; far from it, for even a return to historical levels of tropical cyclone activity would continue to produce the type of losses that have been experienced. What can be done is to focus the attention of the appropriate authorities on corrective measures to reduce the risks, the damage and thus the cost of rehabilitation, instead of accepting the notion that there will automatically be an uncontrollable escalation of disasters. Corrective measures and building standards must be aimed at the specific hazards which affect an island or community. What is applicable for one may be unsuitable for another. Tomblin[9] suggests that changes in building styles and construction materials have had a great impact on the relative vulnerability of housing to earthquakes and tropical cyclones. The general move to masonry in place of traditional wood or tapia as a building material, has resulted in houses with greater mass

and hence with a greater resistance (except the roofs) to destruction by the tropical cyclone, but conversely, it has resulted in much greater exposure to damage by earthquakes. Similarly, growing industrialization has resulted in the building of earthquake-susceptible structures such as dams, refineries, pipelines, electric power transmission grids and harbour facilities. For example, the earthquake of 1974 in Antigua produced ground failure in artificial land-fill, severely damaging the island's only oil refinery and newly-built deepwater harbour, both built on that type of ground.

Climate Change and associated Sea Level Rise

Much of our knowledge on climate comes from global scientific and technical programmes co-ordinated by WMO. The issue of climate change helped draw the attention of the world community to the subject of sustainable development. Climate change and sustainable development are intrinsically linked, as climate change poses a serious threat to the viability of life on earth.

The phenomenon of global warming is one of the climate change threats for the future. Very-low-lying islands and atolls, such as the archipelagos of the South Pacific and the Indian Ocean, are already vulnerable to flooding from tsunamis and storm surges. This would increase in the future if the sea level rise resulting from global warming projected by the WMO/UNEP Intergovernmental Panel on Climatic Change (IPCC) (30-50 cm by the year 2050) were to occur[9]. Two of the most probable impacts of sea level rise on small islands include the loss of land below a new water line as gently sloping or flat coastal areas would become permanently inundated, and an upward movement of the water table which could result in the impairing of water quality through the intrusion of salt into the coastal freshwater. In such cases therefore, loss or reduction of freshwater may render small atolls and limestone islands uninhabitable even before erosion results in land loss.

Coral reefs which form protective barriers for some tropical islands are vulnerable to quite a small change in sea level and are likely to be strongly affected by a possible global sea level rise. In the cases where the conversion of mangroves to other uses such as mariculture is widespread, the coastal protection against wave erosion and storms is seriously reduced. Subsistence and commercial activities of inhabitants may be affected by adverse impact on fish and shell fish resources due to changes in nutrient levels in coastal waters.

The economy of many of the small islands, especially in the Caribbean and the Indian Ocean, but also to a high degree in the Pacific Ocean, depends heavily on tourism. It is assumed that any rise of sea level will have a profound effect on the tourist industry, which again might put the sustainability of the economy in jeopardy.

An example of "unsustainable" development is the way in which the reef system in the Republic of the Maldives has been used over the past 2400 years. Coral has been mined over the centuries for building and construction materials, but the demand for coral has increased dramatically since the early 1970s. Severe erosion has occurred on those islands with a history of coral mining. The country's survival is threatened by sea-level rise since none of the islands of the Maldives is more than 2 metres above the mean sea-level. The Government has now banned the use of coral as building material in hotels and other facilities for tourists in an effort to render future developments of the Maldives sustainable.

3. How Information Supporting Warning and Monitoring Services is Obtained and Used

Weather and Climate Services

The atmosphere is a dynamic fluid and weather patterns in any one region have an impact on all other parts of the globe. To determine weather patterns fully, and thus predict the formation and behavior of disaster producers like tropical cyclones, data must first be collected on a global basis.

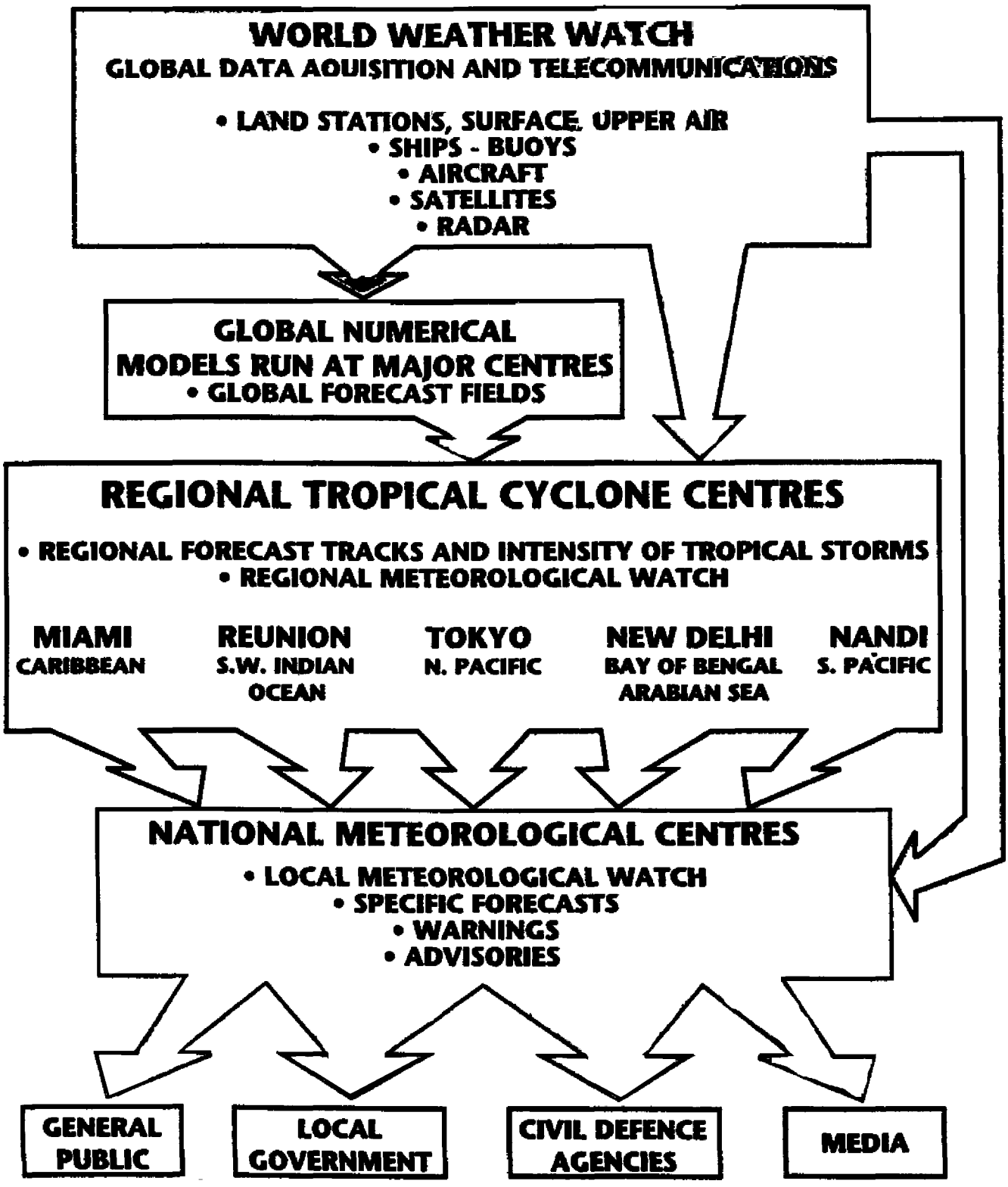
Weather data are collected by National Meteorological and Hydrological Services around the world and are rapidly exchanged via the World Meteorological Organization's Global Telecommunication System. Data on the surface and upper atmospheric conditions are collected by land stations, ships at sea, ocean buoys, commercial aircraft and by geostationary and polar-orbiting satellites. All this information is used to detect and monitor the current weather and then to predict future weather patterns. Figure 2 illustrates this data acquisition and exchange process. The tropical cyclone is a very special weather phenomenon, forming over the data-sparse warm tropical oceans, affecting international shipping lanes, and carrying its great destructive power towards island states and continental landmasses. The network of global data acquisition and telecommunications and the support to national meteorological and hydrological services provided by Regional/Specialized Meteorological Centres (RSMC) allow virtually all nations, including the Small Island Developing States, to institute a forecast and warning service (see figure 2). The international co-operation accomplishes much more than any single country, developed or developing, can do by itself.

In this regard, WMO has formed five regional bodies for the six oceanic basins prone to tropical cyclones, namely the South-West Indian Ocean, the North Indian Ocean and Bay of Bengal, the South Pacific, the western North-Pacific, the eastern North-Pacific Ocean and the North Atlantic Ocean-Caribbean Sea. The purpose of these bodies is to organize co-ordinated mitigation against tropical cyclones through co-operative actions in the detection, monitoring, forecasting and warning processes within each region. At the heart of each of their regional tropical cyclone warning system is a Regional/Specialized Meteorological Centre, indicated in Figures 1 and 2, whose role is the detection, monitoring and forecasting of the cyclones strength and motion in the open ocean and to provide scientific guidance to the National Meteorological Warning Offices. National Services then issue warnings for their territory and coastal waters.

In many parts of the tropics, routine monitoring by weather satellites and radar stations has greatly increased the probability of tropical cyclone detection, with a relatively low false-alarm ratio for timely warnings. In most case this system works well, but not without difficulties. A major problem continues to be insufficient data over the tropical oceans, which hampers the proper understanding of the storms. There is also insufficient data from some of the very islands which are vulnerable to the effects of the cyclones. More data means better forecasts and better warnings. Many small developing island states have not been able to keep up with the advances in telecommunication and computer technology, thus their meteorological systems are not able to cope with the increasing volume of data and speed of transmission. The upkeep or replacement of old weather radars is a problem for some developing countries. On islands, loss of this system means the loss of "the last line of defence". These deficiencies mean that without external assistance, some small islands are in danger of providing inadequate warning services for their citizens. These

FIGURE 2

GLOBAL NETWORK OF TROPICAL CYCLONE WARNING SYSTEMS



problem areas are targeted by WMO for special attention. A number of modern telecommunication systems are being set up through WMO projects to improve weather forecast and warning services in developing countries, including many small island states. WMO's efforts in the supply of radar detection systems for small islands are also continuing, despite the tough economic climate donor countries are experiencing. The acquisition of meteorological data supplemented by other data sources such as the chemical composition of the atmospheric from the Global Atmospheric Watch are systematically archived and made available for the study and monitoring of climate and for the provision of climate services.

Hydrological services

Assessment and monitoring of water resources are essential parts of water management on small islands. Without a thorough understanding and knowledge of the types and sustainability of island water resources, no proper decisions can be made about their development, management, conservation and protection. River basins are quite often numerous but are small in size with limited capacity. Consequently, flood waters in these small basins rise very rapidly - in minutes in some cases. Mapping of flood zones is an important strategy for combating floods. Larger islands and continents have much more complete data collection and monitoring systems for flood events than the small islands. Because of limited resources, islands tend to channel their efforts towards the principal hazard, usually the tropical cyclone. The hydrometric network in most small islands is insufficient for a proper assessment of the water resources available, and for forecasting purposes.

Seismology and volcanoes

Information on the world's active volcanoes is summarized in the Smithsonian Institute's monthly bulletin - Global Volcanism Network. The information is obtained mainly from volcano observatories, found in locations where volcanic activity is particularly frequent. Scientific methods have been applied to prediction in the last few decades and there have been major improvements in the ability to identify precursors to volcano activity. However, considerable uncertainty remains as to how far and how fast an abnormal situation could escalate[10].

With regard to earthquakes, the International Seismological Centre in Berkshire, UK, collects worldwide seismic data and produces monthly bulletins giving summaries of location, magnitude and damage reports. These normally take some time to be produced, but for large earthquakes, information is immediately transmitted to the respective locations, using the facilities of WMO's Global Telecommunication System (GTS).

Tsunamis

Tsunami information in the Pacific Rim is handled by the International Tsunami Information Center (ITIC) in Hawaii, USA. The Center is maintained by the USA for the Intergovernmental Oceanographic Commission (IOC) with a mission to mitigate the effects of tsunamis throughout the Pacific. Information on possible tsunamis is sent from this Center to 26 Pacific countries, once more via the GTS.

4. Disaster Preparedness and Response

Warning services make up one part of the entire disaster management process. The principles are almost the same for all natural disasters, dividing the process into disaster preparedness, prevention and response categories. In each of these categories, there are guidelines for activity before, during and after a disaster.

In general, the process before a disaster involves:

- Establishment and enforcement of hazard-specific construction standards;
- updating and testing of National Disaster Plans;
- public education campaigns by the Disaster Management units such as the warning services (weather, earthquake, volcano and tsunami), civil defence authorities, public health officials;
- storage of emergency supplies.

During an emergency, the process includes:

- the issuance of advisories and warnings to the public;
- public preparation;
- evacuation if necessary.

After an emergency, this will include:

- clean-up activities;
- care for displaced persons;
- damage assessment;
- rehabilitation activity (mostly with foreign assistance and the help of NGOs).

In theory, this basic plan looks good and in many places it works quite well. The key to the system is clearly to have good detection and warning capabilities and much of the effort at the national, regional and international levels goes into this area. The effective systems are those in which there has been focus on the public education, warning and response aspects; the best systems are those which also include the enforcement of hazard-specific construction standards.

A distinct problem in disaster management within small islands is that of complacency. Because long periods can pass without any major incident, less and less attention and resources are allocated to preparedness. Standards tend to be relaxed, public education is minimized and tests of emergency plans cease. At the regional and international levels, efforts can and do continue to

keep preparedness levels high, in the hope that this will also continue at the national level. As an example, WMO co-operates with regional disaster-related agencies to hold joint training workshops or seminars for senior meteorological and disaster preparedness officials, and is becoming more and more involved in providing assistance in the risk assessment activities.

5. Case Study

In section 2 above, a few examples were given of natural disasters with major impacts on the economic and social infrastructure of small island developing states. Good case studies, including comprehensive evaluations of the impact of a disaster on all aspects of an economy of a small island state are very difficult to find. For illustrative purposes I have chosen one case study - the impact of Hurricane David (1979) on Dominica, from Collymore et al[11]. The data has been obtained from the 1981, 1982 and 1983 Annual Reports of UN Economic Commission for Latin America and the Caribbean.

Hurricane David - Dominica

When hurricane David hit Dominica in 1979 serious damage was done to 50 per cent of the 16,000 houses on the island, and 2,000 houses were completely destroyed. Two thirds of the island's population of 80,000 were left homeless. Nearly all school buildings were badly damaged, while Princess Margaret Hospital in Roseau, the capital, lost the roof sheets from almost all of its buildings. The main port in Woodbridge Bay was badly damaged and required major reconstruction estimated at EC $10.8 million (US $4 million). The total cost of reconstruction, including public, private and industrial buildings, public utilities and agriculture was estimated at EC $64.3 million (US $23.78 million). The impact of the hurricane is clearly demonstrated in Table 5.1 below.

Table 5.1: Comparison of Selected Economic Indicators, Dominica, Fiscal Years 1978-1983
(millions of East Caribbean dollars)

Selected Indicator	1978	1979	1980	1981	1982	1983
Population (x 1000)	82	83	84	84	85	87
Gross Domestic Product(base year 1977=100)	102	81	88	100	103	107
Agriculture/Fishing	41	26	24.5	27.7	31.4	33.3
Mining/Construction	6.4	7.2	11.7	12.7	10.4	10.3
Manufacturing	5.5	4.5	5.0	5.4	8.0	8.2
Wholesale/Retail Trade	10.8	7.1	9.4	10.6	12.0	11.0
Hotels/Restaurants	1.3	1.0	0.9	1.0	1.1	1.2
Total Exports	42.9	25.4	26.3	50.9	66.0	74.2
Total Imports	76.8	59.9	128.7	136.6	128.2	121.7
GDP Per Capita (EC $)	1243	975	1047	1190	1212	1230
Change in Consumer Price Index (December-December variations)	+9.3	+34.1	+21.4	+8.1	+4.1	+2.7

The impact of Hurricane David was felt in the island's economy for many years after the event. Up to 1983, agriculture and fishing had not regained the share of gross domestic products that they held in 1978. Exports declined drastically in 1979, whilst GDP per capita in 1979 and 1980 fell to 78% and 84% respectively compared to the 1978 level. Even in 1983 the GDP per capita had not reached the 1978 level.

This case study illustrates the long-lasting impact that major natural disasters have on the economy and social infrastructure of a small island state. Other examples can be shown, both for other parts of the world and for other disaster types. One must approach such studies in an interdisciplinary way - involving all sectors and disciplines. It is hoped that one outcome of the International Decade for Natural Disaster Reduction (IDNDR) will be some level of standardization in this type of analysis so that the true cost of natural disasters can be estimated accurately and to evaluate the contribution early warning services and preparedness measures make to disaster mitigation.

6. Conclusion

Most of the world's small developing island states lie in or just outside the tropics, and thus are potentially at the mercy of the tropical cyclone. It is not the cyclone itself which is a disaster, but its effect on a country or community. The devastation and deaths caused by severe tropical cyclones often bring thriving societies and economies to a sudden halt, and the cost of reconstruction is often beyond the capabilities of developing countries to bear alone. Volcanic and seismic disasters are much less frequent on islands than meteorological disasters, although a number of small island developing states are volcanic in nature and lie in or near seismic zones.

Efforts to reduce the impact of natural hazards often suffer from the fact that the irregularity and the uncertainty of the future occurrences of these hazards foster the notion that they do not qualify for high priority or urgent attention. The argument that precious resources should be devoted to cases where the benefits are assured within a defined time frame is difficult to rebut, particularly in areas which have not recently experienced these hazards. Uncontrolled development, non-existent or non-compliance with disaster-related safety regulations codes, and ill-prepared populations often provide the background to many of the major disasters. Today the high cost of reconstruction and rehabilitation, along with the escalating cost of insurance as a result of recent disasters in various parts of the world, is putting considerable strain on the sustainable development of small island states.

There is no doubt that natural hazards, meteorological, seismic and volcanic, would have different impacts on a society if there were organized systems in place within the community to prepare for and combat their impact. These systems must include long-term measures aimed at the provision of early warning mechanisms and the establishment and enforcement of local preventative measures along with community education, preparedness, response and rehabilitation. The statistics show clearly that, even in less-developed countries, adherence to these measures leads to a reduction of damage and loss of life. Programmes in the World Meteorological Organization in the tropical cyclone-prone regions of the world, which include the majority of Small Island Developing States, have brought about considerable progress in this regard. Other international organizations are also addressing the issue of the improvement of early detection and warning services for other natural hazards, in the context of the International Decade of Natural Disasters

(IDNDR). Considerable assistance is usually required from the large developed donor countries to make this possible, but resources are not always easy to find in the current world economic climate. The consideration of climate change issues invokes certain options concerning possible responses to sea-level rise, such as construction of sea-walls and reclamation and maintenance of reclaimed land, installation of pumping and drainage systems, land raising and beach nourishment projects, all of which are very costly. On very small islands and atolls, the most widespread response to sea-level rise is likely to be abandonment and migration, which may be the most costly and, from the social and cultural point of view, the most disruptive option. On the other hand, the only realistic and economically viable option for many developing countries with weak economies, appears to be through long-term and environmentally sound development.

The IDNDR is providing a focus within the UN system on the theme of this paper. I would hope that this UN Global Conference on the Sustainable Development of Small Island Developing States will bring to light the unique needs and requirements for sustainable development that can go hand in hand with the efforts which are being addressed in the context of the IDNDR towards the reduction of natural disasters globally.

In summary, I would like to propose seven specific actions:

- Undertake an internationally co-ordinated comprehensive risk assessment programme that will provide a standardized base-line for disaster reduction initiatives nationally, regionally and internationally;

- Strengthen the meteorological and hydrological data acquisition, telecommunications and data processing infrastructure, utilizing regionally co-ordinate mechanisms such as the WMO World Weather Watch and Tropical Cyclone Programmes, so that improved prediction of tropical cyclones can be accomplished;

- Initiate the development of prediction capabilities of other geophysical phenomenon, such as volcanoes and earthquakes;

- Invest in specific programmes for preparedness, including the development or improvement and enforcement of hazard-specific building codes and land-use practices, public education and warning dissemination systems;

- Participate fully in the international programmes such as the World Climate Programme so that the specific concerns of Small Island Developing States are placed high on the priority list of studies determining the impact of climate, its variation and change, and potential sea level rise which are central to this issue;

- Organize and promote specific regional technical co-operation programmes designed to assist Small Island Developing States to reduce the impact of tropical cyclones, floods, volcanoes, earthquakes, tsunamis and climate change including sea level rise;

- Develop effective public information services, based on scientifically sound studies and analyses that will help eliminate confusion and controversy and lead to concerted international action to promote sustainable development.

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