NATURAL HAZARD MITIGATION POLICY AND PLAN
FOR THE
FEDERATION OF ST KITTS & NEVIS

SECTION 1 – INTRODUCTION

1.1 Legal Framework

The *Natural Hazard Mitigation Policy and Plan* hereinafter called *The Plan* has been developed under the auspices of the United States Agency for National Development (USAID) and the Organisation of American States (OAS) taking into account the existing legal framework of St Kitts and Nevis.

The *National Disaster Management Act of St Christopher and Nevis, No. 5 of 1998* was passed "to provide for the effective management and control of disasters, and to provide for related or incidental matters." In the Act, 'disaster management' is defined to include "all aspects of preparedness, prevention, mitigation, planning, control, response and recovery as they relate to natural and technological disasters." Provision is made for the establishment of a *National Disaster Management Agency,* a corporate body for co-ordinating the general policy of the Government of the Federation of St Kitts-Nevis in relation to disaster management. The Agency is governed by a Board of Directors {no more than nine (9) members}, all of whom are *appointed by the Prime Minister of St Kitts-Nevis*. Membership of the Board includes the *Director General of the Agency, the Disaster Manager for the Island of Nevis,* and *two nominees from Nevis nominated by the Premier of the Nevis Island Administration***.**

Apart from the above-mentioned legislation which speaks directly to disaster management (including mitigation), the legislation which governs Physical Planning and Development policies also has implications for disaster mitigation. This is to the extent that the nature of development (building codes and land use practices) can create environmental pressures which could exacerbate vulnerability to natural hazards. The Planning Divisions of St Kitts and Nevis, respectively, are authorised under the *Development Control and Planning Act 2000* to exercise development control measures. The Act deals with various development issues such as the management of development, building regulation, and management of the environment including coastal waters. *The National Conservation and Environment*

Planning Act (NCEPA) 1987 covers issues relating to the preservation of the environment, and vests powers of administration in the National Conservation Commission. The *St Kitts-Nevis Building Code* addresses building regulations. Building regulations have also been incorporated into the *Development Control and Planning Act 2000*.

Regulation of onsite septic tank systems which specifies minimum design and siting standards for septic tanks and drainfields is administered by the Department of Public Health.

Other pieces of legislation specific to Nevis with development-related objectives and which have indirect implications for disaster mitigation are – (a) the *Nevis Zoning Plan Ordinance 1991* which deals with land use matters and (b) the *Nevis Housing and Land Development Corporation Act 1988 (1984 Act amended)*.

Another formal policy document which has been developed for directly addressing disaster management efforts is the *National Disaster Plan*. That Plan is largely response oriented and indicates strategies to be adopted by committees comprising representatives from various critical sectors such as *Health, Transportation, Education and Tourism*, in the face of an impending disaster or in the event a disaster strikes. A review of the Plan reveals that it does not address the following areas which are key to disaster mitigation:

1. Management of Development to take into account reduction of exposure to natural hazards.
2. Strengthening of buildings and related facilities to reduce the impact of damage from storms.
3. Preservation of environmental features (beach, dune, and ghaut-side systems) for maintaining natural storm protection capabilities.
4. Management of the coastal environment to aid in the reduction of vulnerability to disasters, with particular reference to storms.
5. Post–storm redevelopment to ensure that rebuilding efforts do not repeat mistakes made in initial development. (*Hazard Mitigation and Post-Storm Redevelopment Policies in St Kitts – prepared by Physical Planning Unit, Nov. 1999*)

The existing legal framework indicates a need for reviewing and updating legislation which is outdated. There is also the need for linking and/or integrating current legislative policies which affect Development Planning and Environmental issues, in instances where such legislation is administered by separate Authorities.

1.2 Aereal Extent of the Plan

The Plan covers the geographic area of St Kitts and Nevis.

1.3 Historical Background

Over the years, the islands of St Kitts and Nevis have been impacted by a number of natural hazards, some of which have increased significantly in frequency over the past ten years.

1.3.1 Wind

Since 1989, as many as ten storms (see Table 1) have inflicted varying degrees of damage on both islands. The damage caused by those storms has occurred largely as a result of the impact from high velocity winds, with speeds in excess of *75 miles per hour*. Damage from these storms vary in terms of magnitude and nature of the facility impacted. Damage has included coastal erosion, destruction of infrastructure – roads, bridges, water and electricity facilities, public property e.g. schools, hospitals, community buildings, as well as destruction of private property. Damage costs also include the opportunity cost of lost revenues due to interruption of commercial business activities such as tourism, a major revenue earner for the Federation. Human lives have also been affected through physical injuries, psychological trauma, and indeed on occasion, actual loss of life.

Prior to 1989, the incidence of wind hazard impacting St Kitts and Nevis has been relatively infrequent compared with the later years (Table 1).

Table 1

Major hazards which have struck St Kitts and Nevis since 1899

Period	Hazard Type	Comments
1928	*Hurricane*	
1950	*Earthquake*	
1955	*Hurricane Alice*	
1961	*Earthquake*	*6+ magnitude*
1974	*Earthquake*	*7.4 Richter Scale*
1984	*Flood*	*Basseterre SK only*
1985	*Earthquake*	*6.6 Richter Scale*
1987	*Flood (major)*	
1989	*Hurricane Hugo*	
1989	*Storm Felix*	
1989	*Hurricane Gilbert*	
1989	*Hurricane Iris*	
1995	*Hurricane Luis*	
1995	*Hurricane Marilyn*	
1996	*Hurricane Bertha*	
1998	*Hurricane Georges*	
1998	*Flood (severe)*	
1999	*Hurricane Jose*	
1999	*Flood (minor)*	
1999	*Hurricane Lenny*	

As can be seen from the above table, storms have been known to impact St Kitts and Nevis more frequently in recent times; hence, disaster management efforts by these islands appear to have paid more attention to storms.

Other natural hazards which have had varying impact on St Kitts and Nevis have been – *Coastal Erosion, Flood, Volcano, Ground Shaking*. Apart from the above mentioned hazards which have impacted both islands at one time or another, St Kitts has been subject additionally to *Inland Erosion*, and Nevis has been faced additionally, with the hazard of *drought*.

1.3.2 Coastal Erosion

St Kitts and Nevis is exposed to coastal erosion with varying degrees of damage, resulting from the effects of storms and storm surge. As a result of Hurricane Luis (1995), the western coastal area of Nevis suffered significant damage through erosion brought upon by the force of waves. The western coastal areas of St Kitts and Nevis suffered most significantly as a result of the impact of Hurricane Lenny (1999) which approached from a westerly direction, an unusual development.

1.3.3 Flood

Flooding is largely localised in St Kitts. Heavy rainfall normally results in the overflow of Ghauts, as well as the retention of water in some sections of Basseterre. In 1998 severe flooding of one of the Ghauts in Basseterre resulted in significant damage and one loss of life was recorded. Flooding has been recorded in 1987 and more recently minor flooding in 1999. Prior to 1998 the last severe flooding was in 1880.

For Nevis, the Charlestown area along the Bath Ghaut has experienced relatively high flooding. Other areas where flooding has been experienced include the Stoney Grove to Charlestown road and the Newcastle International Airport.

1.3.4 Volcano

The islands of St Kitts and Nevis lie along a volcanic chain passing through the Lesser Antilles. Cones with crater formation include Mount Olivees, the Verchilds Mountain and Mount Liamuiga. It is believed that Mount Liamuiga (formerly known as Mount Misery) may have erupted in 1692 and in 1843 (*Bender 1986 with reference to World Data Centre, 1981)*. Note – Volcanic Activity is one of the priority hazards which has been identified; however, mitigation activities specific to that hazard have not been covered under *The Plan*, as work relating to vulnerability assessment relative to volcanic activity is being carried out by the Seismic Research Unit in Trinidad and Tobago, West Indies under the auspices of another ongoing project.

1.3.5 Ground Shaking

St Kitts as well as Nevis is prone to earthquakes. Relatively minor tremors have been felt infrequently, with little or no damage having been reported. Seismic activity is being monitored through the Seismic Research Unit in Trinidad and Tobago, West Indies, which is also carrying out updated work with respect to vulnerability assessment of the islands as part of their wider mandate. Accordingly, mitigation efforts for addressing Ground Shaking are not included specifically in this plan.

1.3.6 Inland Erosion

Inland Erosion is identified as a critical hazard for St Kitts only. St Kitts has been subject to inland erosion as a result of storm winds and ghaut flooding. The areas along ghaut levels have been susceptible to landslides and damage has been suffered particularly in areas where sub-standard housing has been erected, generally by squatters without official planning authority (*Bentley Associates 1998)*.

1.3.7 Drought

Drought has been identified as a critical hazard for Nevis only. More than one-half of the island receives less than fifty (50) inches of rainfall per year. Rainfall per year has been known to average forty-six (46) inches as compared to an average of 64 inches for St Kitts . Rainfall is lowest on the eastern side of the island and increases in areas of higher altitude. Although short periods of drought may occur throughout the year, extended periods of drought are more often experienced from the months of February through April.

1.4 Scope and Purpose

1.4.1 Influence of Global Climate Change

Data on various environmental phenomena have indicated that global warming has been affecting global climate changes. Increases in global temperatures, a general decline in precipitation in tropical areas, and an accompanying rise in sea levels, all symptoms of climate changes, are compelling Governments to strengthen their responses to the concomitant risks. Research has revealed that sea level has risen worldwide approximately 15 – 20 cm, (6 – 8 inches) in the last century of which 2 to 7 cm have been as a result of warmer ocean temperatures. Whereas past weather patterns have been used as a guide for future weather conditions, the

continuing impact of global warming is reducing predictability based on past weather patterns. The pattern shown for hazards in St Kitts and Nevis, Table 1, indicates that the incidence of hazards over the last ten years could not have been predicted based on the pattern for previous years. The process of change is very disruptive to the natural environment and ecological systems. The climate change disrupts planning, and forces new approaches to Development Planning and Disaster Management.

1.4.2 Learning from Experiences of St Kitts and Nevis

The damage from natural hazards experienced by St Kitts and Nevis and the high costs associated with recovery indicate a need for a proactive approach to disaster management. Vulnerability to natural hazards is dependent on location, type of development and environmental conditions. Vulnerability will therefore increase as communities grow and develop.

No longer is it sufficient for the Government to settle for disaster management strategies which speak simply to preparation just prior to the disaster or post disaster recovery efforts. The Government of St Kitts and Nevis seeks to broaden the scope of its disaster management efforts as envisaged under the 1998 Act and include strategies which speak to enhancing *hazard mitigation activities, programmes and policies.* Such strategies are aimed at reducing the vulnerability of the population and economic activities in St Kitts and Nevis to natural hazards. *The Plan* is aimed therefore at putting forward strategies for the following areas:-

I. Developing integrated policies which govern the initial development and re-development process – e.g. through building codes and improved building practices, environmental protection – so as to reduce vulnerability to natural hazards.

II. Increasing public understanding of the need and options for hazard mitigation, through public information and education programmes.

The Plan identifies *Strategies, Policies and Programmes* (SP&P's) to be undertaken in order to achieve specified goals and objectives within the overall framework of its mission. It is anticipated that projects based on those SP&P's would be identified and developed by the respective Agencies/Government Departments within their annual budgetary cycle and would be subject to periodic review under the monitoring mechanism proposed by *The Plan*.

1.5 Mission

Taking into account the vulnerability of St Kitts and Nevis to natural hazards, and bearing in mind the need to ensure a vibrant economy which is as resilient as possible in the face of such disasters, the **Natural Hazard Mitigation Policy and Plan for St Kitts and Nevis** seeks to foster -

(a) an environment supportive of proper building and land use practices for sustainable development
(b) ***effective co-ordination among agencies and institutions involved in guiding and directing development, and***
(c) ***community consciousness and commitment to carrying out disaster mitigation practices.***

1.6 Institutional Framework for Plan Preparation

The development and adoption of *The Plan* is one of four objectives being pursued under the *USAID/OAS sponsored Post-Georges Disaster Mitigation (PGDM) Programme*. The goal of the *PGDM* programme in St Kitts-Nevis is to reduce the vulnerability of the population and economic activities in St Kitts and Nevis to natural hazards.

Overseeing the overall programme is the OAS *PGDM* technical co-ordinator, who is attached to the *OAS Unit of Sustainable Development and Environment* of the OAS office in Washington D.C. USA

At the local level, is the *PGDM Programme Guidance Committee* which has been set up to co-ordinate the St Kitts and Nevis *PGDM Programme* including activities relating to the preparation of *The Plan*. Membership of the committee is cross-sectoral and consists of (*i*) *the Director of the OAS,* who is the Chairperson of the Committee, (ii) the *PGDM Co-Ordinator contracted by the OAS,(iii) representatives from the Government Planning Division in St Kitts, (iv) representatives from the Government Planning Division in Nevis, (v) a representative from the Disaster Management Office in St Kitts (vi) one from the Office of Disaster Preparedness in Nevis, (vii) representatives from various other Government Departments in St Kitts and Nevis - the Tourism Department, Public Works Department, the Department of Environment, (viii) a representative from the Building Contractors Association and (viii) the Plan Writer contracted by the OAS.*

The *PGDM Programme Guidance Committee* reports to the *National Disaster Mitigation Council* which reports to Cabinet through the Chairperson of the Council, who is the Deputy Prime Minister. The Minister

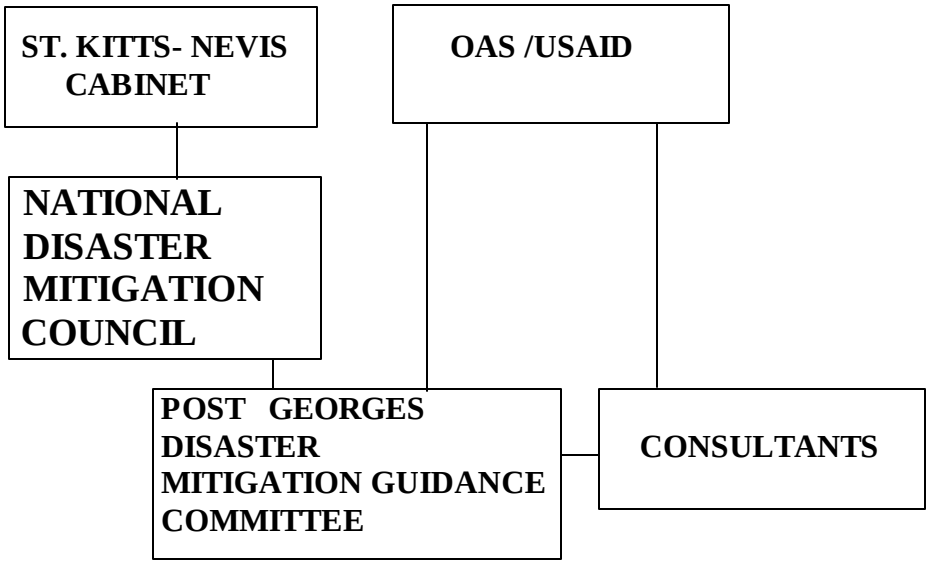
of Communications, Works and Public Utilities is the Deputy Chairperson. Other members of the Disaster Mitigation Council include senior officers from the Public and Private Sector as well as Non-Governmental Organisations (NGO' s) and The Religious Community.

Consultants have been contracted by the OAS for facilitating and advising on various aspects of preparation of *The Plan* under the PGDM *Programme* – namely, for providing *hazard assessment information and maps, Geographic Information System (GIS) assistance, mitigation planning with a hazard information and a development planning focus* respectively.

For writing of the plan, the *Plan writer* is given guidance by the *PGDM Guidance Committee* as a body. Individually, members of the Committee also provide information and support on technical and other related issues falling within their respective areas of competence and experience.

Figure 1

Chart showing Institutional Framework for Plan Preparation



1.7 Time Scale

The Plan covers a ten-(10) year time horizon from 2001 to 2011. Goals and objectives are identified for the ten-year period. Programmes are developed with a ten-year time frame in mind while it is expected that the respective Agencies/ Government Departments would develop projects in their annual budgetary provisions subject to periodic review under the programme.

1.8 Methodology

Recognising that *The Plan* is a **National** Mitigation Plan, the document has been developed as a broad-based consultative effort of stakeholders who *The Plan* is designed to serve. These stakeholders include the Government and the Government policy-making bodies, public and commercial enterprises and the general public.

Consultations were carried out with the respective parties with a view to creating awareness of *The Plan* and for incorporating their ideas. The *PGDM Programme Guidance Committee* provided direction for the development of *The Plan*. Existing legislation and policy documents which have implications for *The Plan* preparation were also reviewed.

Workshops were facilitated for the various agencies and Government Departments by OAS sponsored consultants on *Hazard Mitigation Planning* with a hazard information focus as well as a development planning focus. These workshops were aimed at giving guidance to participants (who came from various Government agencies and Departments) for the *PGDM workplan* and in particular on –

a) Identifying the priority natural hazards
b) Identifying the critical facilities, and
c) Conducting a data needs assessments for the hazard mapping exercise, identifying hazard information gaps and recommendations for filling those gaps.

Reports of hazard vulnerability assessments conducted by specialists (contracted by OAS) in the areas of the various priority hazards, have also been included in *The Plan*.

The *PGDM Project Guidance Committee* met periodically with, and reported to the St Kitts and Nevis National Disaster Mitigation Council.

Public consultations on the draft plan have informed the final copy of *The Plan*, taking into account the various issues and concerns raised by the public.

The development and implementation of the Disaster Mitigation Plan envisages collaboration among the various agencies. It also anticipates rationalisation of various functions relating to Development Planning and Disaster Management to avoid waste of resources through duplication of efforts. The plan envisages that rationalisation would involve centralization of aspects relating to Development Planning while maintaining formal and operational links with the Disaster Management Agency.

SECTION II – HAZARD AND VULNERABILITY ASSESSMENT

2.1 Hazard Identification and Prioritisation

A workshop[1] was held to carry out a formal prioritisation exercise to identify and prioritise natural hazards of critical importance to St Kitts and Nevis. Natural hazards which had impacted St Kitts and Nevis over the past years were identified. The methodology used for the prioritisation exercise involved a ranking of hazards identified on a relative ranking scale according to their probability, frequency, areas of impact and magnitude. The priority hazards identified were

(i) *Wind*
(ii) *Drought (Nevis only)*
(iii) *Storm Surge*
(iv) *Volcano*
(v) *Floods*
(vi) *Ground Shaking*
(vii) *Coastal Erosion and*
(viii) *Inland Erosion (St Kitts only).*

The Plan does not address *Volcano* and *Ground Shaking* as the Seismic Research Unit in Trinidad & Tobago is currently conducting research with regard to these hazards, as well as daily monitoring of related activities.

2.2 Hazard Analysis and Vulnerability Assessment

For the priority hazards identified, Hazard Vulnerability Zone Maps and detailed reports[2] were developed by various consultants specialising in the respective hazards. The consultants examined the vulnerability of various areas in St Kitts and Nevis to the respective hazards and made recommendations for enhancing the hazard mitigation capability of St Kitts and Nevis relative to these hazards. These recommendations have been included in the proposed programmes and policies of *The Plan*.

Vulnerability of critical facilities were also assessed. The following facilities were identified by workshop[1] participants, and the PGDM Guidance Committee as critical:

i. Facilities which were used as Emergency Shelters

[1] Rogers, C (Ph D) Natural Hazard Mitigation Workshop Report September 2000 - http://www.oas.org/pgdm
[2] See detailed reports and maps at http//www.oas.org/pgdm

ii. Hospitals and Clinics
iii. Government Administrative Buildings
iv. Airports, Sea ports and Bridges
v. Power, Water and Telecommunication Installations
vi. Oil and Gas Facilities
vii. Protective Services

Note: See Appendix for the detailed list of facilities

For assessing the vulnerability of the critical facilities identified, critical vulnerability scores were developed for each of the facilities, based on a vulnerability assessment process developed by Dr Cassandra Rogers, a consultant in the area of hazard management. (see details in the Appendix).

During a workshop attended by persons from the PGDM committee including representatives from various agencies such as *Physical Planning Units, the National Emergency Management Agency, and Public Works Department* of St Kitts and Nevis respectively, ***a hazard priority score*** *(HPS)* was computed for each of the prioritised hazards. The score took the following into account –

a) Probability of occurrence
b) The frequency of occurrence
c) The magnitude of the Hazard
d) The area impacted upon

The Facility Vulnerability Score (FVS) was computed using the following equation:

$$FVS = (L + V)HPS$$

Where ***L*** *is the Locational risk;* ***V*** *is Vulnerability =* ***DH + S + O***
DH *is Damage History;* ***S*** *is Structural Vulnerability;* ***O*** *is Operational Vulnerability.*

Hazard maps were superimposed over maps showing the location of critical facilities, enabling identification of the locational risk of the facility (see table below). The Facility Vulnerability Score was then computed by the Geographic Information System.

Table 2

CODING USED FOR LOCATIONAL RISK

HAZARD CATEGORY	LOCATIONAL RISK	MEANING
Very Low	0	No risk
Low	1	Minimal risk
Moderate/Medium	2	Possible/Probable
High	3	Probable/High
Very High	4	Extreme

Table 3

CODING USED FOR DAMAGE HISTORY, STRUCTURAL VULNERABILITY AND OPERATIONAL VULNERABILITY

NUMBER CODING	DAMAGE HISTORY (DH)	STRUCTURAL VULNERABILITY (S)	OPERATIONAL VULNERABI-LITY(O)
0	None	Exceeds Code	No effect
1	Minor	Meets Code	Minimal
2	Moderate	Does not meet Code	Significant
3	Repetitive / Significant	Known deficiencies	Life-threatening

The vulnerability assessment was carried out for each critical facility identified for St Kitts and Nevis. Kindly see the Appendix for the Vulnerability scores for the full list of facilities relative to the respective hazard. Tables 4 and 5 show a '*Summary of Vulnerability Analysis of Critical Facilities*' with facilities having the highest scores for Nevis and St Kitts respectively. *A Facility Vulnerability score was considered high if it was more than 50% of the highest score attained for a listed facility. A high score indicates relatively high vulnerability to the hazard, while a low score indicates relatively low vulnerability to the hazard.*

2.2.1 Hazard Analysis and Vulnerability Assessment - St Kitts

Wind

Table 4 shows that there are a number of facilities with relatively high vulnerability to wind in the areas of Basseterre, Cayon and Sandy Point. With regard to educational facilities, high scores were noted for the *High Schools of Basseterre, Verchilds and Cayon*, indicating the need for a review of the capacity of those buildings to withstand wind from storms (including hurricanes). Of note also of relatively high vulnerability, are two medical facilities, namely - the *Pogson Hospital, Sandy Point* and to a lesser extent the *JNF General Hospital, Basseterre.*

Inland Erosion

Facilities with the highest vulnerability to Inland Erosion are spread around the island, with a greater concentration towards the south. It is noted that *five of the six main water intakes*, as well as *six Emergency Shelters* show high vulnerability to inland erosion.

Storm Surge

Areas along the south-western seafront in particular and the *stretch along Parsons to Saddlers* as well as *Brimstone Hill to Old Road* show high vulnerability to storm surge. Other areas showing extreme vulnerability to storm surge lie along the waterfront of Basseterre, and include *The Arrival area of Port Zante, the Pelican Mall and the Robert L Bradshaw Building (which houses the Social Security Board).*

Flood

The areas showing high vulnerability to flooding lie in the north-east of Basseterre and include areas/roads alongside the College Street Ghaut, the Basseterre waterfront and Pond Road. Some of the critical facilities affected include the *Police Training Complex* and *buildings which are used as Emergency Shelters.* It is noted that a number of the facilities which are vulnerable to storm surge are also vulnerable to flooding.

Coastal Erosion

Sections of the road along the Atlantic coast have relatively high vulnerability to beach erosion. In particular, the *stretches of road along*

Parsons to Saddlers and *Brimstone Hill to Old Road*, are vulnerable to coastal erosion. These areas also have high vulnerability to storm surge.

2.2.2 Hazard Analysis and Vulnerability Assessment - Nevis

Wind

Table 5 shows that there are a number of facilities on the eastern side of the island with relatively high vulnerability to wind including *Churches and Educational facilities which are also used as Emergency Shelters*. Of particularly high vulnerability also, are the *Community Centres at Hickman and Hard Times* respectively and the *Grove Park Pavilion in Charlestown*.

Drought

Vulnerability to drought is spread throughout the island, with the greatest vulnerability towards the south and south-east section of the island. The *Charlestown water zone* and the *Butlers/Manning water zone* in particular are high-risk areas.

Storm Surge

Areas along the north-eastern to south-eastern seafront have relatively high vulnerability to storm surge. It is noted that the *Charlestown Port and the Deep Water Port at Long Point* have relatively high vulnerability to storm surge.

Flood

Facilities with high vulnerability to flooding are concentrated in the Charlestown area. Infrastructure of high vulnerability include the *Stony Grove to Charlestown Road and the Newcastle International Airport. The Netball Complex* in Charlestown also has high vulnerability to flooding.

Coastal Erosion

Sections of the western coast have relatively high vulnerability to beach erosion. The *Stony Grove to Charlestown Road* which has high vulnerability to flooding is subject to high coastal erosion. *The Ports of Charlestown and Long Point* which have high vulnerability to storm surge also have high vulnerability to coastal erosion.

2.3 Conclusions

The hazard and vulnerability assessment indicate that a number of critical facilities are at high risk with respect to various hazards. The risk of some facilities is further increased to the extent that they have high vulnerability to more than one hazard. Mitigating these risks would involve the introduction and application of policies and the development of programmes with respect to land use practices.

Table 4

		FVS break points:	*>24*	*>4*	*>9*	*>21*	*>14*	*Total*
FAC_Type	**NAME_FAC**	**LOCATION**	**WIND**	**I.EROS**	**S.SURGE**	**FLOOD**	**C.EROS**	**FVS**
Community	Redeemed Baptist Church	Upper Cayon	25					**37**
Community	Anglican Church Building	Victoria Road	25					**36**
Community	Estridge Moravian Church	Mansion	25					**37**
Community	Hope Chapel	George Street	25					**51**
Community	Trinity Anglican Church	Palmetto Point	40	5				**54**
Community	Estridge Moravian Church School	Mansion	35					**47**
Community	Rivers of Living Waters Christian Centre	Southwell Industrial Park	25					**53**
Community	Seventh-Day Adventist Church	Phillips		6				**35**
Community	Pavilion	Molineux	30					**42**
Community	Pavilion	Verchilds Pasture	30					**42**
Community	Eastern Benevolent Society Building	Camps		5				**29**
Community	Community Centre	Palmetto Point		5				**29**
Community	New Pavilion	Cleverly Hill	40					**52**
Community	Pavilion	St. Mary Play Field	30					**42**
Community	Warner Park	Basseterre	45					**56**
Community	Community Centre	Conaree	25					**37**
Education	Moravian Church Pre-School	Victoria Road	30					**41**
Education	Half Way Tree Pre-School	Half Way Tree			10		12	**44**
Education	Slack's Pre-School	New Pond Site	30					**42**
Education	Day Care Centre	Frigate Bay Road	25					**53**
Education	Women's Training Centre	Connell Street	25					**43**
Education	Old Girl Guides Building	Freeman's Village	25					**43**
Education	Edgar T. Morris	Tabernacle	25					**37**
Education	Saddlers	Saddlers	35					**47**

		FVS break points:	*>24*	*>4*	*>9*	*>21*	*>14*	*Total*
FAC_Type	**NAME_FAC**	**LOCATION**	**WIND**	**I.EROS**	**S.SURGE**	**FLOOD**	**C.EROS**	**FVS**
Education	Sandy Point	Sandy Point	25					**39**
Education	Deanne-Glasford	St. Peters	30					**42**
Education	George Moody Stuart	Basseterre	30					**42**
Education	Cayon Primary	Cayon	25					**37**
Education	Bronte Welsh	Trinity		5				**29**
Education	AVEC Building	Taylor' s Range	25					**37**
Education	Sandy Point High	Sandy Point	45					**56**
Education	Washington Archibald High	Taylors Range	50					**62**
Education	Basseterre High	Basseterre	45					**56**
Education	Verchilds High	Verchilds	45					**57**
Education	Cayon High	Cayon	50					**62**
Education	Ross University	Trinity		5				**34**
Government	Customs Adm. Building	Bird Rock	30					**42**
Government	Arrivals Hall	Port Zante	25		20			**53**
Government	Pelican Mall	Basseterre	30		10			**48**
Government	Social Security Building	Basseterre		6	10	32		**66**
Government	Gov't Headquarters	Basseterre	25					**43**
Government	Treasury Building	Basseterre	30					**56**
Government	Electricity Department HQ	Basseterre	25					**35**
Government	Electricity Building	Basseterre	25					**43**
Government	O A S Building	Fortlands	30					**40**
Government	Ministry of Health & Environment	Basseterre	25					**35**
Government	Community Affairs	Basseterre	25					**36**
Government	Physical Planning, Development Bank	Basseterre	25			24		**55**
Government	Finance Department	Basseterre	30					**40**
Government	Estate House	Stonefort Estate	25	5				**39**

		FVS break points:	*>24*	*>4*	*>9*	*>21*	*>14*	*Total*
FAC_Type	**NAME_FAC**	**LOCATION**	**WIND**	**I.EROS**	**S.SURGE**	**FLOOD**	**C.EROS**	**FVS**
Government	Estate House	Phillips Estate		5				**34**
Government	Public Market	Basseterre	30			28		**68**
Government	Customs Warehouse	Bird Rock	30					**42**
Government	Customs Shed	RLB Int'l Airport	45					**57**
Government	Post Office	Basseterre	25					**35**
Government	Factory Shells	Basseterre	35					**63**
Government	Customs Headquarters	Bay Road	30					**42**
Government	Abattoir	Basseterre	40	5				**54**
Government	School Meals Building	Basseterre	30					**58**
Infrastructure	International Airport ILS (approach)	Camps		5				**29**
Infrastructure	International Airport	Golden Rock	35					**45**
Infrastructure	Bay Rd. (War Memorial - Circus)				12	32		**67**
Infrastructure	Ponds Rd.					44		**67**
Infrastructure	Bay Rd. (Circus - Fishing Complex)				12	32		**67**
Infrastructure	Christ Church – Mansion			6		24		**50**
Infrastructure	College Ghaut (Lower)			8		44		**75**
Infrastructure	Stonefort			9				**33**
Infrastructure	College Ghaut (Upper)			8		44		**75**
Infrastructure	Fort Thomas - War Memorial				12	32		**67**
Infrastructure	SEP Rd. (Mayor's Bay)	Mayor's Bay		6				**33**
Infrastructure	SEP Rd. (Friar's Bay)	Friar's Bay		7			12	**46**
Infrastructure	Keys – Cayon			6		36		**62**
Infrastructure	Phillips			7				**40**
Infrastructure	Parsons – Saddlers				16	24	30	**88**
Infrastructure	Brimstone Hill - Old Road			6	16		27	**76**
Infrastructure	Deep Water Port	Bird Rock	40		12			**60**

		FVS break points:	*>24*	*>4*	*>9*	*>21*	*>14*	*Total*
FAC_Type	**NAME_FAC**	**LOCATION**	**WIND**	**I.EROS**	**S.SURGE**	**FLOOD**	**C.EROS**	**FVS**
Infrastructure	Port Zante	Basseterre			18			**41**
Medical Facilities	Newtown Health Centre	Basseterre	25					**56**
Medical Facilities	Old Road Health Centre	Old Road	30					**41**
Medical Facilities	Sandy Point Health Centre	Sandy Point	30					**41**
Medical Facilities	Cayon Health Centre	Cayon	30					**42**
Medical Facilities	Molineux Health Centre	Molineux	25					**37**
Medical Facilities	St. Peter Health Centre	St Peters	25					**37**
Medical Facilities	Mary Charles Hospital	Molineux	25					**37**
Medical Facilities	JNF General Hospital	Basseterre	35	5				**49**
Medical Facilities	Pogson Hospital	Sandy Point	45					**56**
Protective	Fire Hall	RLB Int'l Airport	25					**37**
Protective	Fire Station	Basseterre	25					**52**
Protective	Defence Force HQ	Basseterre	30					**42**
Protective	Police Station	Stapleton	35					**47**
Protective	Police Training Complex	Basseterre	45			32		**85**
Protective	Police Station	Cayon	45					**57**
Protective	Police Station	St Pauls	40					**52**
Protective	Police Station	Old Road	30	5				**44**
Protective	Police Station	St. Johnston Village, Basseterre	30					**41**
Protective	Police Station	Frigate Bay	25					**52**
Protective	Police Station	Tabernacle	40					**52**
Utilities	TEXACO Buckleys	Buckleys	25	5				**39**

		FVS break points:	*>24*	*>4*	*>9*	*>21*	*>14*	*Total*
FAC_Type	**NAME_FAC**	**LOCATION**	**WIND**	**I.EROS**	**S.SURGE**	**FLOOD**	**C.EROS**	**FVS**
Utilities	TEXACO Key	Keys Village	30					**42**
Utilities	SHELL Buckleys	Buckleys	25	5				**39**
Utilities	SHELL Sandy Point	Sandy Point	25					**37**
Utilities	SHELL Terminal	Basseterre				28		**59**
Utilities	Radio & TV Studios	Basseterre	30					**42**
Utilities	Conaree	Conaree	25					**53**
Utilities	17168	Basseterre Valley	25					**53**
Utilities	St.Paul's#2	St.Pauls	25					**37**
Utilities	17533	Newton Ground	25					**53**
Utilities	Profit	Profit	25					**37**
Utilities	Godwins	Godwins Ghaut	25					**37**
Utilities	Taylor's	Taylor's	25					**37**
Utilities	Mansion	Mansion	25					**37**
Utilities	Water Intake Lodge	Lodge	40	6				**71**
Utilities	18629	La Guerite	25	5				**39**
Utilities	Stonefort	Stone Fort	25	5				**39**
Utilities	Lodge#2	Lodge Estate	25					**37**
Utilities	Tabernacle	Tabernacle	25					**37**
Utilities	Sir Gillies	Sir Gilles		5				**34**
Utilities	Orton's	Orton's		5				**34**
Utilities	Water Intake Phillips	Phillips	40	7				**72**
Utilities	Water Intake Wingfield	Wingfield	30	6				**61**
Utilities	Water Intake Franklands	Franklands	35	6				**66**
Utilities	Water Intake Stonefort	Stonefort	40	6				**71**
Utilities	16072	Basseterre Valley	25					**37**
Utilities	R.L.B Airport	Conaree	25					**53**

		FVS break points:	*>24*	*>4*	*>9*	*>21*	*>14*	*Total*
FAC_Type	**NAME_FAC**	**LOCATION**	**WIND**	**I.EROS**	**S.SURGE**	**FLOOD**	**C.EROS**	**FVS**
Utilities	Lodge#1	Lodge Village	25					**37**
Utilities	St.Paul's#1	St.Pauls	25					**37**

TABLE 4 KEY:

FACILITY VULNERABILITY ANALYSIS SUMMARY

ST. KITTS

FVS break points: **FVS=(L+V) HPS**

Facility Vulnerablity Score (FVS) rated with more than 50% of the possible hazard' s FVS

"FVS" Facility Vulnerability Score

"L" Locational Vulnerability

V=DH+S+O

"V" Vulnerability Score

"HPS" Hazard Priority Score

Table 5

Nevis
Facility Vulnerability Analysis
Summary

				FVS break points:	>22	>2	>6	>14	>11	Total
FAC_Type	Fac_Class	FAC_ID	NAME_FAC	LOCATION	WIND	DROU	S.SURGE	FLOOD	C.EROS	FVS
Community	Church	NVFC056	Zion Chapel (Emmaus)	Webb's Ground		5				**34**
Community	Church	NVFC063	Wesleyan Holiness Church	Cotton Ground		3				**32**
Community	Church	NVFC041	Roman Catholic Hall	Craddock Road		4				**28**
Community	Church	NVFC067	Wesleyan Holiness Church - Barnes Ghaut	Barnes Ghaut		3				**32**
Community	Church	NVFC066	New Testament Church of God Jessups	Jessups Village		3				**22**
Community	Church	NVFC062	Methodist Church Hall -Cotton Ground	Cotton Ground		3				**27**
Community	Church	NVFC061	Methodist Church Hall – Fountain	Fountain	25	3				**37**
Community	Church	NVFC059	Rehoboth Church Of God - Liburd Hill	Liburd Hill		3				**32**
Community	Church	NVFC057	Seventh Day Adventist Church - Butlers	Butlers	25	4				**38**
Community	Church	NVFC054	Calvary Baptist Church – Rawlins	Hard Times	25	5				**45**
Community	Church	NVFC052	Wesleyan Holiness Church - Buck Hill	Bucks Hill	25	5				**39**
Community	Church	NVFC065	Church Of God of Prophecy	Jessups Village		3				**27**
Community	Church	NVFC051	Ebenezer Church of God - Old Manor	Old Manor	25	5				**39**
Community	Church	NVFC050	Church of God - Cox Village	Cox Village	25	5				**39**
Community	Church	NVFC046	Anglican Church Fig Tree	Church Ground		5				**29**
Community	Church	NVFC058	Church of God - Brick Kiln	Brick Kiln		4				**33**
Community	Community Centre	NVFC039	Grove Park Pavilion	Charlestown	40	4				**62**
Community	Community Centre	NVFC042	Community Centre	Bath Village		4				**28**
Community	Community Centre	NVFC045	Community Centre	Brown Hill		5				**40**
Community	Community Centre	NVFC038	Netball Complex	Charlestown		4		18		**43**
Community	Community Centre	NVFC055	Community Centre – Hickmans	Hickmans	30	5				**44**
Community	Community Centre	NVFC047	Sports Complex	Church Ground		5				**29**
Community	Community Centre	NVFC053	Community Centre Hard Times	Hard Times	35	5				**49**
Education	Nursery	NVFC082	St.Thomas Pre-school	Lowlands		3				**27**
Education	Nursery	NVFC084	Vern N Llew Pre-school	Charlestown		4				**28**
Education	Nursery	NVFC076	Charlestown Pre-school	Charlestown		4				**42**
Education	Nursery	NVFC074	Brown Hill Pre-school	Brown Hill	25	5				**39**
Education	Nursery	NVFC073	Maude Smith Pre-school	Butlers		4				**33**
Education	Nursery	NVFC069	Charlestown Preparatory School	Charlestown		4				**28**

Education	Nursery	NVFC060	Newcastle Pre-School	Newcastle		3				**32**
Education	Nursery	NVFC081	Newcastle Pre-school	Newcastle		3				**32**
Education	Nursery	NVFC083	Stepping Stone Nursery	Charlestown		4				**37**
Education	Nursery	NVFC075	Butlers Pre-school	Butlers	25	4				**38**
Education	Nursery	NVFC079	Learning Center	Charlestown		4				**28**
Education	Nursery	NVFC078	Gingerland Pre-school	Gingerland	25	5				**39**
Education	Others Education	NVFC043	Girls Guides HD/Qtrs	Stoney Grove		4		18		**38**
Education	Primary	NVFC049	St. John' s Primary School (Bottom floor)	Brown Pastures		5				**37**
Education	Primary	NVFC070	Combermere Primary School	Combermere		3				**32**
Education	Primary	NVFC040	Charlestown Primary School	Charlestown		4				**28**
Education	Primary	NVFC044	Prospect School - Staff Room	Brown Hill		5				**29**
Education	Primary	NVFC048	St. John' s Primary School (Top floor)	Brown Pastures		5				**37**
Education	Primary	NVFC077	Charlestown Preparatory School	Charlestown		4				**28**
Education	Primary	NVFC068	Charlestown Primary School	Charlestown		4				**28**
Education	Primary	NVFC087	St.Thomas Primary School	Lowlands		3				**27**
Education	Primary	NVFC071	St.James Primary School	Butlers	25	4				**38**
Education	Primary	NVFC086	St. John Primary School	St. John		5				**37**
Education	Primary	NVFC072	Prospect Primary School	Prospect		5				**34**
Education	Primary	NVFC085	Gingerland Primary School	Gingerland	25	5				**39**
Education	Primary	NVFC064	Anglican School Hall - Lowlands	Lowlands		3				**32**
Education	Secondary	NVFC088	Charlestown Secondary School	Charlestown		4		15		**40**
Education	Secondary	NVFC089	Gingerland Secondary School	Gingerland	25	5				**42**
Education	Secondary	NVFC090	Lyn Jeffers Secondary School	Charlestown		4				**36**
Education	Technical	NVFC091	Charlestown Sixth Form College	Charlestown		4		15		**40**
Education	University	NVFC092	University of the Americas	Potworks		3				**32**
Government	Administration	NVFC037	Long Point Port	Long Point		4				**28**
Government	Administration	NVFC018	Treasury Building	Charlestown		4				**28**
Government	Administration	NVFC030	Ministry of Youth & Sports	Charlestown		4				**33**
Government	Administration	NVFC014	Department of Agriculture	Prospect		5				**34**
Government	Administration	NVFC020	CMC Building	Charlestown		4			20	**44**
Government	Administration	NVFC010	Adm. Building	Charlestown		4				**42**
Government	Administration	NVFC035	Charlestown Sea Port	Charlestown		4				**25**
Government	Administration	NVFC016	Ministry of Communications	Stoney Grove		4				**28**
Government	Administration	NVFC015	Public Works Department	Charlestown		4				**28**
Government	Administration	NVFC036	Newcastle Airport	Newcastle		3				**33**
Government	Residential	NVFC029	Nurses Home	Charlestown	30	4				**43**
Government	Residential	NVFC031	Doctor's Residence	Gingerland	45	6				**63**
Government	Residential	NVFC025	Married Quarters	Belle Vue	25	4				**47**

Government	Storage	NVFC009	Public Market	Charlestown		4			20	**54**
Government	Storage	NVFC024	Government Repair Shop	Prospect		5				**34**
Government	Storage	NVFC012	New Castle Pottery	New Castle		3				**32**
Government	Storage	NVFC019	Cotton House	Charlestown		4	8	15	20	**62**
Government	Storage	NVFC017	Post Office	Charlestown		4				**28**
Government	Storage	NVFC023	Repair Shop & Garage	Cades Bay		3				**27**
Infrastructure	Airport	NVFC143	International Airport	Newcastle	35	3		24		**70**
Infrastructure	Roads	NVFC146	Stony Grove - Charlestown			5		30	20	**72**
Infrastructure	Roads	NVFC148	Cades Bay - Jones Estate			3		18	12	**50**
Infrastructure	Roads	NVFC147	Newcott - Jessup			4		18	20	**54**
Infrastructure	Roads	NVFC149	Jones Estate - Newcastle			3		24	16	**60**
Infrastructure	Sea Port	NVFC144	Charlestown Port	Charlestown		4	12		24	**53**
Infrastructure	Sea Port	NVFC145	Deep Water Port	Long Point		4	14		20	**56**
Medical Facilities	Clinic	NVFC097	Butlers Health Centre	Butlers		4				**33**
Medical Facilities	Clinic	NVFC094	Charlestown Health Centre	Charlestown		4				**23**
Medical Facilities	Clinic	NVFC098	Combermere Health Centre	Combermere		3				**32**
Medical Facilities	Clinic	NVFC099	Cotton Ground Health Centre	Cotton Ground		3				**27**
Medical Facilities	Clinic	NVFC096	Gingerland Health Centre	Gingerland		5				**34**
Medical Facilities	Clinic	NVFC095	Brown Hill Health Centre	Brown Hill	35	5				**49**
Medical Facilities	Hospital	NVFC093	Alexandra General Hospital	Charlestown	30	4		15		**55**
Protective	Court	NVFC002	Magistrate's House	Charlestown		4				**33**
Protective	Court	NVFC008	Courthouse/Library	Charlestown		4				**28**
Protective	Fire	NVFC006	Fire Hall	New Castle Airport		3				**38**
Protective	Fire	NVFC007	Fire Station	Charlestown		4				**33**
Protective	Police	NVFC001	Police Station	Charlestown		4				**33**
Protective	Police	NVFC004	Police Station	Gingerland	25	5				**39**
Protective	Police	NVFC003	Police Station	Cotton Ground		3				**32**
Protective	Police	NVFC005	Police Station	New Castle		3				**32**
Protective	Prison	NVFC034	Prison Farm	Maddens		4				**33**
Utilities	Electricity	NVFC011	Power House (2 buildings)	Prospect		5				**34**
Utilities	Gas	NVFC106	DELTA Jessup	Jessups Village		3				**29**
Utilities	Gas	NVFC112	SHELL Lloyd Powell	Bath Village		4				**39**

Utilities	Gas	NVFC113	SHELL Reliable Motors	Charlestown		4				**44**
Utilities	Gas	NVFC110	Govt.Garage	Prospect		5				**36**
Utilities	Gas	NVFC111	DELTA Noel	Farm Estate		5				**31**
Utilities	Gas	NVFC105	SHELL Pinney	Pinney		4				**30**
Utilities	Gas	NVFC108	DELTA Skiiti	Newcastle		3				**40**
Utilities	Gas	NVFC107	DELTA ENF	Cotton Ground		3				**29**
Utilities	Gas	NVFC109	DELTA Market Shop	Market Shop	25	5				**41**
Utilities	Gas	NVFC114	DELTA Stanley	Fig Tree		5				**36**
Utilities	Petroleum	NVFC103	DELTA Terminal	Low Ground		4				**35**
Utilities	Petroleum	NVFC104	SHELL Terminal	Charlestown		4		15	12	**52**
Utilities	Telecommunication	NVFC136	Church Ground	Church Ground		5				**35**
Utilities	Telecommunication	NVFC128	Mem's Pizzaria	Mem's Pizzaria		5				**35**
Utilities	Telecommunication	NVFC115	Rambury X	Rambury X		4				**38**
Utilities	Telecommunication	NVFC117	Newcastle X	Newcastle X		3				**37**
Utilities	Telecommunication	NVFC139	Newcastle Pottery	Newcastle		3				**33**
Utilities	Telecommunication	NVFC140	Methodist Church Liburd Hill	Liburd Hill		3				**33**
Utilities	Telecommunication	NVFC142	Butlers	Butlers		4				**39**
Utilities	Telecommunication	NVFC130	Bottom Zion Hill	Zion Hill		5				**40**
Utilities	Telecommunication	NVFC131	Fenton Hill	Fenton Hill		5				**40**
Utilities	Telecommunication	NVFC137	Hanleys Rd.	Hanleys Rd.		5				**40**
Utilities	Telecommunication	NVFC133	Rawlins	Rawlins		5				**40**
Utilities	Telecommunication	NVFC134	Chicken Stone	Chicken Stone		5				**40**
Utilities	Telecommunication	NVFC129	JNC Senior Home Prospect rd.	Prospect Rd.		5				**35**
Utilities	Telecommunication	NVFC116	Market Shop X	Market Shop X		5				**44**
Utilities	Telecommunication	NVFC122	Bottom Craddock Rd.	Craddock Rd.		4				**34**
Utilities	Telecommunication	NVFC138	Newcastle Airport	Newcastle		3		15		**39**
Utilities	Telecommunication	NVFC141	Jones Estate	Jones Estate		3				**28**
Utilities	Telecommunication	NVFC118	JNC Cotton Ground	Cotton Ground		3				**33**
Utilities	Telecommunication	NVFC119	JNC Jessups	Jessups		3				**28**
Utilities	Telecommunication	NVFC135	Strikers Car Rental	Strikers rental		5				**35**
Utilities	Telecommunication	NVFC121	New Cut Rd.	New Cut Rd.		4				**29**
Utilities	Telecommunication	NVFC124	Barclays Bank	Barclays Bank		4			20	**45**
Utilities	Telecommunication	NVFC123	JNC Govt. Rd. & Rd. to RMD	Govt. Rd.		4				**29**
Utilities	Telecommunication	NVFC125	Super Foods	Super Foods		4		18		**43**
Utilities	Telecommunication	NVFC127	Top of Govt. Rd.	Govt. Rd.		4				**29**
Utilities	Telecommunication	NVFC126	Bath Round-About	Bath Round-About		4		18		**43**
Utilities	Telecommunication	NVFC132	Market Shop	Market Shop		5				**40**

Utilities	Telecommunication	NVFC120	Four Seasons Clarke Estate	Four Seasons		3				**28**
Utilities	Water	NVFC021	Pump House	Fothergills	25	5				**39**
Utilities	Water	NVFC022	Pump House	Stoney Grove		4				**37**

TABLE 5 KEY: FACILITY VULNERABILITY ANALYSIS SUMMARY

NEVIS

FVS break points:

Facility Vulnerability Score (FVS) rated with
More than the 50% of the possible hazard's FVS

FVS = (L+V) HPS

"FVS" Facility Vulnerability Score

" L" Locational Vulnerability

V=DH+S+O

"V" Vulnerability Score

" HPS" Hazard Priority Score

SECTION III – ANALYSIS AND EVALUATION OF EXISTING SYSTEMS

3.1 Capability Assessment

Questionnaires were sent to ten (10) Government Departments/Agencies both in St Kitts and Nevis. The survey was designed to assess the capability of Government agencies to carry out measures to mitigate the impact of hazards in St Kitts and Nevis. Responses were received from seventy percent (70%) of the Departments/Agencies in St Kitts and fifty percent (50%) of those in Nevis. A summary of the responses received is included in Appendix 1.

3.1.1 St Kitts

Institutional

Responses were received from the Ministry of Tourism, Ministry of Planning and the Physical Planning Division, the National Emergency Management Agency, The Water Services Department, the Ministry of Communications, Works and Public Utilities, the Ministry of Health and the Environment, and the Royal St Christopher-Nevis Police Force. The responses revealed that even in some of the instances where mitigation was said to be carried out, the extent of such activities appeared to be limited.

Six (6) of the seven agencies from St Kitts which responded, indicated that they were involved in all four (4) aspects of disaster management, namely, (i) *Preparation*, (ii) *Response*, (iii) *Recovery and Reconstruction* and (iv) *Mitigation*. One of the agencies, Ministry of Tourism, indicated that it was involved in *Preparation, Response, and Recovery and Reconstruction* only.

Legal

Disaster Management activities of the National Emergency Management Agency (NEMA) are governed by the Disaster Management Act 1998, while the activities of the Physical Planning Department of St Kitts are governed by the Development Control and Planning Act 2000. In the case of the St Kitts Water Services Department, the 1959 Ordinance gives that Department its mandate for disaster management activities. There is no legal mandate given to the Ministry of Tourism, the Ministry of Communications and

Works and the Ministry of Health and Environment for carrying out disaster management activities.

Political

There is awareness of, and interest in the need for disaster management practices for all of the agencies. For NEMA in particular, much emphasis is placed on disaster preparation and mitigation.

Financial

Most of the respondents indicated that funding support for mitigation was negligible or non-existent.

Technical

All of the agencies indicated that there is need for enhancing their technical capability for dealing with mitigation activities.

3.1.2 Nevis

Institutional

The five (5) Agencies / Departments in Nevis, from which responses were received are - the Ministry of Education, the Department of Agriculture, the Nevis Water Services Department, the Fire and Rescue Department and the Office of Disaster Preparedness. All of the respondents indicated that they are involved in the four aspects of disaster management.

Legal

There is legislation in place with regard to disaster mitigation for three (3) of the five (5) respondents. Although legislation is in place in the case of the Water Services Department, it was noted that the legislation is not being enforced. In the case of the Office of Disaster Preparedness in Nevis, it was noted that there is need for amendment of the existing legislation.

Political

The various Agencies indicated that there was general interest in mitigation activities, with the Agricultural Department, in particular, noting that there is commitment to mitigation activities.

Financial

Relatively little, or no provision is made by the respective Agencies for financing of mitigation activities

Technical

While the other agencies made reference to having some technical expertise, albeit inadequate, in dealing with mitigation, the Ministry of Education indicated that it had no technical capability.

3.2 Mitigation Opportunity Analysis

In both St Kitts and Nevis, training of personnel in different aspects of mitigation is required in the various Agencies/Departments, for equipping these agencies with the necessary skills. The specific skills required by each Agency need to be identified and officers from the respective Agencies should be exposed to programmes with a view to upgrading their skills.

3.2.1 St Kitts

The inadequate legislative support for mitigation activities, which was cited in a number of instances, indicate a need for enhancing the legislative mandate of the respective agencies. Although, to the credit of NEMA and the Physical Planning Division of St Kitts, the legislation granting them their mandate was relatively recent, further review of the legislation would need to be carried out in light of the objectives and proposed programmes of the disaster mitigation Plan. The Water Services Ordinance of 1959 would also need to be updated, to take into account current circumstances. Efforts should also be made to establish the required legislative mandates for The Ministries of Tourism, Communication and Works, and Health and Environment, which had indicated that they had no legislative mandate relative to disaster mitigation.

The success of disaster mitigation efforts depends to a large extent on the amount of financing available, and the technical expertise present for carrying out various measures and programmes. Given that five (5) out of the seven (7) respondents in St Kitts indicated that no provision for funding was made for mitigation activities, Government needs to be mindful of the need to budget for such activities.

3.2.2 Nevis

Legislation needs to be put in place where necessary, for governing mitigation practices by the respective Agencies. For the Water Services Department, efforts need to be made to enforce the existing legislation, as appropriate.

Only the Agriculture Department indicated that some, albeit small, budget allocation was being made for disaster mitigation. This points to the need for more attention to be given to mitigation financing.

3.2.3 Summary -Capability Assessment Analysis - St Kitts and Nevis

The assessment of the capabilities of the respective Departments/Agencies is summarised in the Table below –

Table 6
Summary Capability Assessment Analysis

ASSESSED AREAS	RATING
INSTITUTIONAL	Medium
LEGAL	Medium
POLITICAL	Medium/High
FINANCIAL	Low
TECHNICAL	Medium

3.3 Conclusions

The assessment of the capabilities of the Agencies/Departments in both St Kitts and Nevis for handling mitigation activities revealed opportunities for enhancing their capabilities in various areas. There is an awareness of, and interest in the need for carrying out mitigation activities. The opportunity exists, however, for (a) increasing the technical capabilities of the agencies through training, (b) for updating and in some cases enforcing existing regulations, and (c) increasing financial allocations for mitigation. It is also important that information on mitigation practices be continually disseminated in order to heighten awareness and interest.

SECTION IV – PLAN FORMULATION

4.1 Goals and Objectives

The goals and objectives were developed during a workshop held for that purpose, for the members of the *PGDM Programme* Guidance Committee, and facilitated by the Planning Consultant, contracted by the OAS.

The goals and objectives articulated were subsequently submitted to the St Kitts and Nevis National Disaster Advisory Committee for review and approval.

The goals and objectives were developed, taking into account -

i. *the vulnerability of St Kitts and Nevis to the priority hazards identified,*
ii. *the existing capability of the Government Agencies to apply hazard mitigation practices,*
iii. *community awareness and practices with regard to hazard mitigation, and*
iv. *Expected future capability of St Kitts and Nevis to carry out hazard mitigation practices, to reduce the negative impact – socially and economically – of natural hazards on St Kitts and Nevis.*

4.1.1 Goals

I. To create a disaster resistant national environment by the reduction of vulnerability to natural hazards;

II. To improve the national capability to manage the impact of natural hazards;

III. To develop public awareness of natural hazards and their potential impacts;

IV. To increase, encourage and promote effective mitigation practices;

V. To reduce the impact of natural hazards on life and property

4.1.2 Objectives

The objectives to be pursued under the respective goals are as follows:

Goal I – To create a disaster resistant national environment by the reduction of vulnerability to natural hazards.

4.1.2.1 Objective(s)

i. Develop a legislative framework to encourage orderly management of development.

ii. Create a planning process that provides an environment for management of development to reduce vulnerability to natural hazards.

iii. Ensure that the natural environment is maintained and preserved in order to reduce the impact of natural hazards.

iv. Ensure that mitigation planning is integrated into the institutional framework.

v. Develop a database which facilitates the continuing collection, analysis and provision of information, supportive of disaster mitigation activities.

Goal II – To improve the national capability to manage the impact of natural hazards.

4.1.2.2 Objective(s)

i. Review existing institutions with a view to upgrading and/or establishing new institutions to undertake mitigation activities.

Goal III – To develop public awareness of natural hazards and their potential impacts.

4.1.2.3 Objective(s)

i. Provide communities with information relating to natural hazards in St Kitts and Nevis, the impacts of those hazards and vulnerability of communities to those impacts.

Goal IV – To increase, encourage and promote effective mitigation practices.

4.1.2.4 Objective(s)

i. Develop incentive programmes which will encourage mitigation activities to reduce vulnerability.

ii. Disseminate information supportive of mitigation practices.

iii. Develop technical training programmes

iv Increase awareness of disaster mitigation practices in the education sector, through the development of curricula which incorporates mitigation.

Goal V – To reduce the impact of natural hazards on life and property.

4.1.2.5 Objective(s)

i. Empower communities to take a proactive role in the reduction of the impact of natural hazards on life and property.

ii. Increase public knowledge and awareness of mitigation practices through the conduct of workshops.

4.2 Strategies, Policies and Programmes

Strategies, Policies and Programmes (SP&P's) have been identified for enhancing the disaster mitigation capability and practices of St Kitts and Nevis. These SP&P's take into account the experiences of St Kitts and Nevis as well as recommendations made by the consultants specialising in the respective hazards.

Consultations were held with the Government Line Ministries/ Departments in a workshop-type setting, for reviewing and making recommendations with respect to the following: -

(i) The Goals and Objectives outlined in *The Plan* and

(ii) The Strategies, Policies and Programmes (SP&P's)

The SP&P's also incorporate recommendations made during the aforementioned Consultations as well as Public Consultations held in St Kitts and Nevis – one in each island.

Schedules 1 and 2 outline various strategies, policies and programmes recommended for enhancing the disaster mitigation capability and practices of St Kitts and Nevis. Schedule 1 identifies SP&P's for mitigating against the hazards in general, while Schedule 2 addresses mitigation activities specific to the priority hazards relative to St Kitts and Nevis.

The SP&P's take into account the following considerations:

i. Legal and Regulatory framework , instruments governing Land Use as well as the mandate of the respective Agencies which are charged with monitoring.
ii. The capacity and capability of the respective Government Agencies for carrying out mitigation activities
iii. Influencing Environmental Conditions – relative to the level of development, susceptibility to the various Hazards, and vulnerability to damage
iv. Incentives for encouraging appropriate behaviours by Government agencies, private organisations and the general public

Projects are to be developed by the respective Government Agencies Departments based on the SP&P's outlined. The Agencies Departments responsible for developing and carrying out the projects based on the SP&P's would be identified by the Government through the National Disaster Mitigation Council which includes senior representatives from all of the Government Agencies / Departments.

The following are SP&P's which are to be carried out in order to attain the respective goals and objectives:

4.2.1 *Goal I: To create and continually improve a disaster resistant environment by reduction of vulnerability to natural hazards.*

4.2.1.1 Objective i. Develop Legislative Framework to encourage orderly management of development

a) Pass Development Regulations for the Development Control Planning Act 2000 (St Kitts)
b) Pass Development Control Planning Act and Development Control Planning Regulations for Nevis.
c) Review existing incentives to hotels to take into consideration mitigation practices.
d) Put systems in place for periodic review and update of legislation, regulations and policies (e.g The Development Control and Planning Act 2000, and the Building Code) to ensure that they remain relevant.

4.2.1.2 Objective ii. Create a planning process that provides an environment for the management of development to reduce vulnerability to natural hazards

a) Produce local area plans (including maps) taking into account mitigation, vulnerability and hazard mapping already established under this project.
b) Produce a new Land Use map for St Kitts & Nevis taking into account the restructuring of the St Kitts Sugar Manufacturing Corporation.
c) Develop local area plans and guidelines for areas that are prone to disaster.
d) Monitor climate change for informing Land Use and Development plans, as part of developing a proactive approach to planning.

4.2.1.3 Objective iii. Ensure that the natural environment is maintained and preserved in order to reduce the impact of natural hazards.

a) Referring to the National Conservation and Environment Protection Act (NCEPA) of 1987, re-establish and re-activate the National Conservation Commission.
b) Ensure that Environmental Impact Assessments (EIA's) are completed for all new developments
c) Develop and /or enforce specific regulations relative to the environment e.g. sand mining, protection of natural waterways, waste water disposal, solid waste management.
d) Develop an environmental management plan incorporating regular scientific monitoring of various sectors of the environment.

4.2.1.4 Objective iv. Ensure that mitigation planning is integrated into the institutional framework.

a) Ensure that full use is made of Geographic Information System (GIS) & Hazard maps produced under this project when considering Environmental impact assessments.
b) Integrate hazard mitigation planning with Land Use and Development planning, e.g mitigation planning housing with development planning.
c) Put systems in place to facilitate co-ordination and collaboration among the various departments/agencies which have responsibilities for planning and development, e.g among the *Physical Planning Department, the Department of Lands and Housing, the National Housing Corporation and the Public Works Department.*

4.2.1.5 Objective v. Develop a database which facilitates the continuing collection, analysis & provision of information, supportive of disaster mitigation activities

a) Upgrade the existing GIS database for St Kitts & Nevis and provide integrated networking facilities across sectors e.g. Intranet GIS . The data base should be aimed ultimately at including all buildings in St Kitts & Nevis

4.2.2 ***Goal II*: *To improve the national capability to manage the impact of natural hazards.***

4.2.2.1 Objective i. Review existing organisations as well as upgrade and/ or establish new organisations to undertake mitigation activities

a) Construct a new Emergency Operating Centre for the National Emergency Management Agency (NEMA)
b) Maintain and /or retrofit existing emergency shelters to ensure compliance with the Building Code. Where necessary, build new shelters in accordance with the Building Code.
c) Review Disaster Management Office staffing and other resources (such as equipment) in St Kitts and Nevis to ensure that mitigation capacity is added along with other staffing requirements.
d) Increase the Building Inspectorate capability in terms of manpower and required qualifications
e) Ensure that the Planning Offices of St Kitts & Nevis are adequately staffed, housed, & equipped to address mitigation issues.

f) Ensure that the provision under the Building Code for qualification of contractors is rigidly enforced.
g) The essential services – Ministry of Communication, Works & Public Utilities (water, electricity, and Public Works), as well as the National Radio and the Ministry of Health should be adequately staffed, equipped and funded to carry out their vital mitigation tasks.

4.2.3 *Goal III*: *To develop public awareness of natural hazards and their potential impacts*

4.2.3.1 Objective i. Provide communities with information relating to natural hazards in St Kitts & Nevis, the impacts of those hazards and vulnerability of communities to those impacts

a) Publicise *The Plan* for informing the public of the hazard and vulnerability assessments, as well as activities which are being undertaken, and can be carried out for disaster mitigation. The publicity awareness programmes is also aimed at encouraging the public to carry out mitigation activities.

b) Develop mitigation awareness programmes to empower NGO's, community-based organisations, Festival Committees and other cultural and social groups to carry out mitigation practices
c) Each district should develop a Community Contingency Plan as appropriate to potential disasters in that Community
d) District committees and other Agencies should develop and plan periodic awareness programmes/activities to enhance mitigation practices.
e) Encourage the introduction of hazard mitigation awareness activities in Community and National Festivals.

4.2.3.2 Objective ii. Increase public knowledge and awareness of mitigation practices.

a) Hold public meetings/fora, workshops to make the public aware of mitigation practices, taking the opportunity to highlight good mitigation practices

4.2.4 *Goal IV: To increase, encourage, and promote effective mitigation practices*

4.2.4.1 Objective i. Develop incentive programmes which will encourage mitigation activities to reduce vulnerability

a) Encourage the formation of a private sector committee among stakeholders e.g. Banks, Insurance Companies, mortgage Companies and underwriters to develop mitigation criteria which can assist in decision making e.g. a loan for-
   - *a home would be conditional upon the housing plan including hurricane clips and proper ties between the walls and the foundation*
b) Gov't and Lending Institutions should consider providing incentives to small business and entrepreneurs including farmers and fishermen who adopt mitigation practices in their loan and development application
   - a minimum period for deferring loan payments on loans taken to repair damage resulting from hazard
c) Government should consider granting incentives to house owners who adopt mitigation practices, e.g where shutters have been used consideration may be given to adjusting Land and House Tax payments.
d) Review the incentive regime to the Tourism Sector with a view to granting incentives to those who meet mitigation requirements.

4.2.4.2 Objective ii. Disseminate information supportive of mitigation practices

a) Publicize the Building Code and Guidelines and aggressively advertise the procurement / availability to the construction sector
b) Disseminate brochures, fliers and multi-media products to raise awareness of mitigation

4.2.4.3 Objective iii. Develop Technical Training Programmes

a) Government should facilitate and develop Training in Disaster Mitigation wherever the need has shown up through the capability assessment.
b) Provide ongoing training for Emergency Shelter managers, including such areas as management of people and other resources and dealing with issues of security.

c) Conduct Training programmes for the construction industry (e.g. building contractors, architects). Such training should include courses on site preparation for helping to minimize environmental damage.

4.2.4.4 Objective iv. Increase awareness of disaster mitigation practices in the education sector, through the development of curricula which incorporates such practices.

a) Hold workshops to sensitise teachers to mitigation practices.
b) Encourage the holding of programmes in school which reflect support for mitigation practices.
c) Integrate Disaster Mitigation practices into relevent subject areas.

4.2.5 *Goal V : To reduce the impact of natural hazards on life and property*

4.2.5.1 Objective i. Empower communities to take a proactive role in the reduction of the impact of natural hazards on life and property

a) Implement the Shelter Management Policy ensuring that the Public is aware of those aspects which would advise them of actions which may be taken to reduce possible damage.
b) Hold simulation exercises periodically, so that the public becomes more alert to actions which may be taken for reducing the impact of natural hazards.
c) Offer programmes relating to disaster planning by families and stress management.

4.2.5.2 Objective ii. Reduce personal injury and loss of life as well as damage to existing and future development.

b) Distribution lines for essential services (e.g. electricity) should be laid sub-surface

While the aforementioned mitigative SP&P' s reflect approaches which may be taken for hazards generally for St Kitts and Nevis, consideration needs to be given to SP&P' s relative to specific hazards, for St Kitts and Nevis respectively. These SP&P' s, summarised in Schedule 1 are as follows:

4.2.6 ***ST KITTS AND NEVIS***

4.2.6.1 Wind and Storm Surge

i. Strengthen and reinforce the structure of public buildings along with accompanying facilities such as water and power distribution lines, and roads.
ii. Encourage communities to strengthen and reinforce private-owned structures.

4.2.6.2 Flood

i. Frequent ghaut maintenance, in particular at road crossings.
ii In sizing culverts and bridges, pay attention to the extra waterway area for sediment deposition.
iii Develop appropriate design for silt traps and trash racks.
iv. Consider diverting the lower reach of College street Ghaut, **St Kitts,** away from its current alignment through the town centre. *As a further consideration, an economic analysis should be carried out comparing (a) likely savings in averted losses with (b) likely lost revenue because of postponement of planned development due to the flooding*
v. Institute an *' Early Warning System' (EWS)* to alert residents of pending flood wave. *EWS may be based on measurement of rainfall in the upper parts of the ghauts and an awareness of the soil saturation levels.*
vi. ***Nevis Airport***- Consider diverting crossings to the end of the runway, since the present arrangement of construction of a steel cage at the entrance of the culvert contributes to flooding when debris becomes entangled
vii. Enforce Land Use Zoning Regulations, especially in the Hermitage Region, ***Nevis*****.**

It is important to note that **in St Kitts** *where the sugarcane plantations are replaced by housing developments, one needs to be mindful of the increased runoff downstream and the potential for greater velocities which may aggravate erosion*.

4.2.6.3 Coastal erosion

i Perform preliminary selection of coastal areas for sand mining, tourism and housing development, coastal structures and infrastructure development, taking into account coastal areas that have shown historical patterns of erosion and are likely to display similar patterns in the future.

ii. Develop strategies for addressing problems relating to coastal erosion e.g. for prioritising beaches for sandmining. *Further work in this area may include an investigation of seasonal erosion and accretion patterns may be carried out for guiding the development of a rotation system for sand mining.*

iii. Sensitise the general public about coastal erosion and associated impacts.

iv. Prioritise the allocation of resources for erosion defense, increased monitoring and/ or further research of coastal dynamics.

4.2.7 ***ST KITTS***

4.2.7.1 Inland erosion

i. Institute and implement policies with respect to land use management

ii Develop and invest in programmes for informing farmers and the public on good conservation practices for minimising fertility loss and avoiding the problems created by sedimentation.

iii. Review Town and Country Planning policies and practices, to avoid/ reduce the need for correctional action – (e.g. the need for reworking of stream banks, and natural excavation of stream courses by the stream in spate indicate that planning has been neglected.

a) Avoid the building of roads across an occasional stream without providing adequate culverts
b) House construction within a gully or on the edge of vertical stream banks in weak materials should not be allowed.
c) Identify sites which are subject to earthquake induced rock falls.

iv. Plan adequate drainage systems and monitor

a) Plan drainage systems to deal with a whole sub-catchment
b) Keep drainage ways clean of impediments

v. Take action in response to Land Use Change
a) Planners and developers need to consider that converting a piece of land under bush into dwelling house lots results in a marked reduction in the way water enters the soil and hence greater run-off of water, with a likelihood of greater land erosion.

vi. Retain windbreaks, avoid large areas of exposed soil, through the use e.g. of vegetation slips

vii. Monitor and avoid areas at hazard

viii. Provide cut off-drains

ix. Use stabilising techniques which may be a costly approach and therefore used as a last resort

4.2.8 ***NEVIS***

4.2.8.1 Drought

i. Develop and monitor indicators for future identification of drought, e.g. –

Meteorological/ Environmental

a)Wilting as grass roots becomes progressively damaged by lack of soil water

b)Increase in leaf fall

c)Damage (dried leaves / broken stems) to ' indicator' plant species e.g. cacti which utilise stored water in dried periods.

Hydrological

d) Monitor water levels by measuring data such as rainfall, temperature, wind speed, evaporation and seepage.

e) Ration water before ground water levels recede to critical points.

ii. Develop policies relative to:

a) Cost of water for irrigation.
b) Regulation of livestock grazing and livestock population densities.
c) Incentives for water and soil conservation practices.
d) Drought Insurance.
e) Drought relief programmes.

Further work for mitigating the effects of drought may need to place emphasis on

i. identifying more appropriate boundaries for water resources and drought management, through a thorough analysis of drainage basins on the island
ii. Developing data to accurately predict the gap in time between recovery from meteorological / agricultural drought and the replenishment of water to average levels.

Schedule 1

PLAN FORMULATION SCHEDULE - *STRATEGIES, POLICIES, PROGRAMMES*

GOAL I: TO CREATE AND CONTINUALLY IMPROVE A DISASTER RESISTANT ENVIRONMENT BY REDUCTION OF VULNERABILITY TO NATURAL HAZARDS

OBJECTIVES	STRATEGIES /POLICIES/ PROGRAMMES	ACTION BY - AGENCY (NAME)
i. Develop Legislative Framework to encourage orderly management of development	a) Pass Development Regulations for the Development Control Planning Act (St Kitts). b) Pass Develop. Control Plan Act for Nevis & Develop. Regulations (Nevis) c) Review existing incentives to hotels taking into consideration mitigation practices. d) Put system in place for facilitating periodic review and update of legislation, regulations, and policies.	
Ii. Create a Planning process that provides an environment for the management of development such that vulnerability to natural hazards is reduced.	a) Produce Local Area Plans (including maps) taking into account mitigation, vulnerability and hazard mapping already established under this project. b) Produce a Land Use map for St Kitts & Nevis taking into account the restructuring of the St Kitts Sugar Manufacturing Corporation. c) Produce Local Area Plans and guidelines for areas which are prone to disaster. d) Monitor climate change for informing land use and development plans.	
Iii. Ensure that the natural environment is maintained and preserved in order to reduce the impact of natural hazards.	a) Referring to the NCEP Act of 1987, re-establish and re-activate the National Conservation Commission. b) Ensure that EIA' s are completed for all new developments c) Develop and /or enforce specific regulations and Environmental Management Plans, e.g. relating to sand mining, waste water disposal.	
Iv. Ensure that mitigation planning is integrated into the institutional framework	a) Ensure that full use is made of Geographic Information System (GIS) & Hazard maps produced under this project when considering environmental impact assessments. b) Develop systems for facilitating co-ordination and collaboration among Planning departments/agencies	
v. Develop a database which facilitates the continuing collection, analysis & provision of information, supportive of disaster mitigation activities	a) Upgrade the existing GIS database and provide integrated networking facilities across sectors *e.g. Intranet GIS* . The data base should be aimed ultimately at including all buildings in St Kitts & Nevis.	

GOAL II: TO IMPROVE THE NATIONAL CAPABILITY TO MANAGE THE IMPACT OF NATURAL HAZARDS

OBJECTIVES	STRATEGIES /POLICIES/ PROGRAMMES	ACTION BY - AGENCY (NAME)
i. Review existing organisations as well as upgrade and/ or establish new organisations to undertake mitigation activities	a) Construct a new Emergency Operating Centre for NEMA b) Maintain & /or retrofit existing emergency shelters to ensure compliance with the Building Code c) Review Disaster Management Office staffing and other resources (e.g. equipment) in St Kitts & Nevis to ensure that mitigation capacity is added along with other staffing requirements. d) Increase the Building Inspectorate capability in terms of manpower and required qualifications e) Ensure that the Planning Offices of St Kitts & Nevis are adequately staffed, housed, & equipped to address mitigation issues. f) Ensure that the provision under the Building Code for qualification of contractors is rigidly enforced. g) The essential services – Ministry of Communication, Works & Public Utilities (water, electricity, and public works) and the National Radio should be adequately staffed, equipped and funded to carry out their vital mitigation tasks. h) Distribution lines for essential services (e.g. electricity) should be laid sub-surface.	

GOAL III : TO DEVELOP PUBLIC AWARENESS OF NATURAL HAZARDS AND THEIR POTENTIAL IMPACTS

OBJECTIVES	STRATEGIES /POLICIES/ PROGRAMMES	ACTION BY - AGENCY (NAME)
i. Provide communities with information relating to natural hazards in St Kitts & Nevis, the impacts of those hazards and vulnerability of communities to those impacts	a) Publicise *The Plan* b) Each district should develop a Community Contingency Plan as appropriate to potential disasters in that Community c) District committees and other agencies should develop & plan periodic awareness programmes/activities to enhance mitigation practices. d) Encourage the introduction of hazard mitigation awareness activities in Community and National Festivals. e) Develop mitigation awareness programmes to empower Non Governmental Organisations (NGO' s), community-based organisations, Festival Committees and other cultural and social groups.	
Ii Increase public knowledge and awareness of mitigation practices.	a) Hold public meetings/fora, workshops to make the public aware of mitigation practices, taking the opportunity to highlight good mitigation practices.	

GOAL IV: TO INCREASE , ENCOURAGE, AND PROMOTE EFFECTIVE MITIGATION PRACTICES

OBJECTIVES	STRATEGIES /POLICIES/ PROGRAMMES	ACTION BY - AGENCY (NAME)
i. Develop incentive programmes which will encourage mitigation activities to reduce vulnerability	a) Encourage the formation of a private sector committee among stakeholders e.g. Banks, Insurance Companies, Mortgage companies and underwriters to develop mitigation criteria which can assist in decision-making e.g. *a loan for-* *- a home would be conditional upon the housing plan including hurricane clips and proper ties between the walls and the foundation* *b)* Gov' t and Lending Institutions should consider providing –*incentives to small business owners and entrepreneurs including farmers and fishermen who adopt mitigation practices in their loan and development application* *- a minimum period for which loan re-payments on loans taken to repair damage resulting from hazards is deferred.* c) Review the incentive Regime to the Tourism Sector with a view to granting incentives to those who meet mitigation requirements.	
Ii. Disseminate information supportive of mitigation practices	a) Publicise the Building Code and Guidelines, and aggressively advertise the procurement / availability to the construction sector b) Disseminate brochures, fliers and multi-media products to raise awareness of mitigation	
Iii. Develop Technical Training Programmes	a) Government should facilitate Training (to include simulation) in Disaster Mitigation - – wherever the need has shown up through the capability assessment. - for persons in the Construction sector including in particular site preparation and development.	
iv. Increase awareness of disaster mitigation practices in the education sector, through the development of curricula which incorporate mitigation.	a) Hold workshops to sensitise teachers to mitigation practices. b) Encourage holding programmes (for students) in schools which reflect support for mitigation practices	

GOAL V : TO REDUCE THE IMPACT OF NATURAL HAZARDS ON LIFE AND PROPERTY

OBJECTIVES	STRATEGIES /POLICIES/ PROGRAMMES	ACTION BY - AGENCY (NAME)
i. Empower communities to take a proactive role in the reduction of the impact of natural hazards on life and property	a) Ensure that the public is aware of the Shelter Management Policy, particularly those aspects which would inform them of actions to be taken to reduce possible damage. b) Hold simulation exercises periodically. c) Offer programmes relating to disaster planning by families and stress management.	
ii Reduce personal injury and loss of life as well as damage to existing and future development.	a) Distribution lines for essential service (e.g. electricity) should be laid sub-surface.	

Mitigative strategies, policies and programmes recommended relative to specific hazards are as follows for St Kitts and Nevis respectively:

Schedule 2

ST KITTS AND NEVIS

PLAN FORMULATION SCHEDULE (cont' d) - STRATEGIES, POLICIES, PROGRAMMES

HAZARD TYPE	STRATEGIES / POLICIES/ PROGRAMMES	OBJECTIVES	GOALS	FURTHER WORK REQUIRED / CONSIDERATIONS
Wind and Storm Surge	i. Strengthen and reinforce the structure of public buildings along with accompanying facilities such as water and power distribution lines, and roads.	*Objective i*	*Goal III*	
	ii. Encourage communities to strengthen and reinforce private-owned structures.	*Objective ii*	*Goal IV*	

ST KITTS AND NEVIS

PLAN FORMULATION SCHEDULE (cont' d) - STRATEGIES, POLICIES, PROGRAMMES

HAZARD TYPE	STRATEGIES/ POLICIES/ PROGRAMMES	OBJECTIVES	GOALS	FURTHER WORK REQUIRED/ CONSIDERATIONS
FLOOD	I. Frequent Ghaut maintenance, in particular at road crossings Ii. In sizing culverts and bridges, pay attention to the extra waterway area for sediment deposition Iii. Develop appropriate design for silt traps and trash racks. Iv. Consider diverting the lower reach of College Street Ghaut, **St. Kitts** away from its current alignment through the town centre. v. **Nevis Airport** - Consider diverting crossings to the end of the runway, since the present arrangement of construction of a steel cage at the entrance of the culvert contributes to flooding when debris becomes entangled v. Enforce Land use Zoning Regulations, especially in the **Hermitage Region, Nevis**	*Objective ii*	*Goal I*	*Consideration to replace the sugarcane plantations **in** **St. Kitts** by housing developments need to be mindful of the increased runoff downstream and the potential for increased velocities and therefore greater erosion potential within the ghauts.* With regard to ***Programme (iv)*** carry out economic analysis comparing (a) likely savings in averted losses with (b) likely lost revenue due to postponement of planned development on account of flooding Re. ***Programme (v)*** *– EWS* may be based on measurement of rainfall in the upper parts of the ghauts and an awareness of the soil saturation levels

ST KITTS AND NEVIS

PLAN FORMULATION SCHEDULE (cont' d) - STRATEGIES, POLICIES, PROGRAMMES

HAZARD TYPE	STRATEGIES/ POLICIES/ PROGRAMMES	OBJECTIVES	GOALS	FURTHER WORK REQUIRED/ CONSIDERATIONS
COASTAL EROSION	Coastal Erosion Maps may be used to: i Perform preliminary selection of coastal areas for sand mining, tourism and housing development, coastal structures and infrastructural development ii Identify coastal areas that have shown historical patterns of erosion and are likely to display similar patterns in the future. Iii. Sensitise the general public about coastal erosion and associated impacts Iv. Assist with the development of strategies for addressing problems relating to coastal erosion e.g. the information may be used for prioritising beaches for sandmining. v. Prioritise the allocation of resources for erosion defence, increased monitoring and/ or further research of coastal dynamics. Vi. Display the spatial relationship of coastal hazard areas with existing coastal developments and infrastructure – as it is important to be able to identify the developments located near coastal areas that are susceptible to erosion	*Objective v* *Objective ii*	*Goal I* *Goal V*	With regard to Coastal Erosion Map ***Use (1v) under .' .Programmes'*** additional investigation of seasonal erosion and accretion patterns may be carried out for guiding the development of a rotation system for sand mining.

ST KITTS

PLAN FORMULATION SCHEDULE (cont' d) - STRATEGIES, POLICIES, PROGRAMMES

HAZARD TYPE	STRATEGIES/ POLICIES/ PROGRAMMES	OBJECTIVES	GOALS	FURTHER WORK REQUIRED/ CONSIDERATIONS
INLAND EROSION	i. Institute and implement policies with respect to land use management.	*Objectives i, iv*	*Goal I*	
	ii Develop and invest in programmes for informing farmers and the public on good conservation practices for minimising fertility loss and avoiding the problems created by sedimentation.	*Objective v* *Objective I*	*Goal II* *Goal III*	
	iii. Review Town and Country Planning policies and practices, to avoid/ reduce the need for correctional action –(e.g. the need for reworking of stream banks, and natural excavation of stream courses by the stream in spate indicate that planning has been neglected. a) Avoid the building of roads across an occasional stream without providing adequate culverts b) House construction within a gully or on the edge of vertical stream banks in weak materials should not be allowed. c) Identify sites which are subject to earthquake induced rock falls. .	*Objective iii*	*Goal I*	

ST KITTS

PLAN FORMULATION SCHEDULE (cont' d) - STRATEGIES, POLICIES, PROGRAMMES

HAZARD TYPE	STRATEGIES/ POLICIES/ PROGRAMMES	OBJECTIVES	GOALS	FURTHER WORK REQUIRED/ CONSIDERATIONS
INLAND EROSION (Continued)	iv. *Plan adequate drainage systems and Monitor* a) Plan drainage systems to deal with a whole sub-catchment b) Keep drainage ways clean of impediments *v. Take action in response to Land Use Change* Planners and developers need to consider that converting a piece of land under bush to dwelling house lots results in a marked reduction in the way water enters the soil and hence greater run-off of water, with a likelihood of increased land erosion. vi. Retain windbreaks, avoid large areas of exposed soil, through the use e.g. of vegetation slips vii. Monitor and avoid areas at hazard viii. Provide cut off-drains ix. Use stabilising techniques (a costly last resort)	*Objectives ii*	*Goal I*	

NEVIS

PLAN FORMULATION SCHEDULE (cont' d) - STRATEGIES, POLICIES, PROGRAMMES

HAZARD TYPE	STRATEGIES/ POLICIES/ PROGRAMMES	OBJECTIVES	GOALS	FURTHER WORK REQUIRED/ CONSIDERATIONS
Drought	i. Develop and monitor indicators for future identification of drought, e.g. – *Meteorological/ Environmental* *a)Wilting as grass roots becomes progressively damaged by lack of soil water* b)Increase in leaf fall c).Damage (dried leaves / broken stems) to 'indicator' plant species e.g. cacti which utilize stored water in dried periods *Hydrological* d) Monitor water levels through measuring data such as rainfall, temperature, wind speed, evaporation and seepage. e)Ration water before ground water levels recede to critical points. Ii. Develop policies relative to: b) Cost of water for irrigation c) Regulation of livestock grazing and livestock population densities d) Incentives for water and soil conservation practices e) Drought Insurance f) Drought relief programmes	*Objectives ii, iv, v* Objective I	*Goal I* Goal IV	Emphasis should be placed on identifying more appropriate boundaries for water resources and drought management, through a thorough analysis of drainage basins on the island *Develop data to accurately predict the gap in time between recovery from meteorological / agricultural drought and the replenishment of water to average levels.*

SECTION V – PHASING AND IMPLEMENTATION

5.1 Phasing

The Plan identifies Strategies, Policies and Programmes for the next ten years, and would be subject to review within at least the next five years.

It is anticipated that the respective Government Ministries would develop projects based on the foregoing Strategies, Policies and Programmes, taking into account appropriate phasing periods.

5.1.1 Immediate Next Steps

A number of Strategies, Policies and Programmes have been presented for facilitating disaster mitigation. Specific projects would need to be identified towards a phased implementation of *The Plan*. The way forward for implementation of *The Plan* requires an orderly approach which may be executed in the steps listed below. It is noted that some of these steps may be carried out concurrently. The next steps may be summarised as follows:-

1. **Present** *The Plan* **to all Government Departments/Agencies.**
2. **Publicise** *The Plan***.**
3. **Prioritise the strategies, policies and programmes to be undertaken.** The National Disaster Mitigation Council which includes representation from all Government Departments/Agencies would need to set the priorities.
4. **Identify projects to be carried out based on the prioritised strategies, policies and programmes.**
5. **Prioritise the projects identified.**
6. **Identify the resources (human and material) and other requirements (e.g additional studies/research to be undertaken) which would be required for execution of the project.**
7. **Identify the Government Departments/Agencies which have responsibility for implementation of specific projects.**
8. **Identify the projects which would require collaboration among Departments/Agencies, and specify those Departments/Agencies.**
9. **Agree on an approach/system for facilitating collaboration among agencies specified in #8, above.**
10. **For each project, agree on a time-frame for expected commencement and completion of that project.**
11. **Identify milestones for ensuring that the project is on track..**
12. **Develop a '*Phased Implementation Schedule*' based on the aforementioned.**

5.2 Responsibility for Implementation

Responsibility for implementation of *The Plan* rests with the Government Departments/Agencies. In instances where (mitigation) projects are undertaken by the private sector, or where there is private sector joint participation, the Government Department/Agency under whose umbrella such activities fall, would be responsible for enabling and monitoring the implementation of that project.

It is therefore necessary for the various Departments/Agencies to schedule execution of the identified project(s) and related activities within the annual work programme and to obtain budgetary allocations for such projects.

SECTION VI – EVALUATION, MONITORING AND UPDATING

The National Emergency Management Agency under the guidance of the National Management Advisory Council is responsible for monitoring implementation of The Plan. Accordingly, a mitigation officer should be appointed to assist with such monitoring.

In order to keep the Plan current and relevant to the needs of St Kitts and Nevis, ***periodic review and evaluation of the implementation of the Plan*** with respect to - Strategies, Policies, Programmes and the related projects would be required.

A periodic reporting system should be instituted for –

a) advising the National Disaster Mitigation Council on the status of the implementation of The Plan, and
b) making recommendations for keeping The Plan up to date.

REFERENCES

BENDER O STEPHEN, 1986	Report on Natural Hazards and Settlement Development Planning in St Kitts and Nevis. *OAS/DRD St Kitts and Nevis Forestry Development and Resource Management Planning Project.*
BENTLEY ASSOCIATES (1998)	Plan To Reduce The Vulnerability Of School Buildings To Natural Hazards in St Kitts. *Organisation of American States/ United States Agency for International Development/ European Community Humanitarian Office*
COOPER V. (2001)	Flood Hazard Mapping St.Kitts & Nevis
DANIEL EDSEL B.(2001)	An Assessment of Coastal Erosion Hazards in St. Kitts and Nevis
ISLAND RESOURCES FOUNDATION	Country Environmental Profile: St.Kitts and Nevis
JACKSON IVOR (2001)	Nevis Drought Hazard Assessment and Mapping Summary Report
LANG DAVID (2001)	St Kitts Inland Erosion Report Assessment, Mapping, and Mitigation Summary Report
MATTENET EDUARDO M. LICE (2001)	Report - Hazard Vulnerability Assessment St. Kitts and Nevis
NATIONAL EMERGENCY MANAGE-MENT AGENCY (NEMA)	Hazard Vulnerability: An Assessment of the Housing Sector in St Kitts
NELSON L CARL (1989)	Protecting the Past from Natural Disasters *National Trust for Historic Preservation*

NEVIS ISLAND ADMINISTRATION (1995)	An Environmental Assessment of Nevis: Post Hurricane Luis (Highlight on Western Coast)
PHYSICAL PLANNING DIVISION ST KITTS (1999)	Hazard Mitigation and Post-Storm Redevelopment Policies
ROGERS T CASSANDRA PH.D. ATWELL LYNETTE, B.A. Dip. Town and Regional Planning	Workshop Guide – Post-Georges Disaster Mitigation Project, *Implemented by the Organisation of American States Unit of Sustainable Development and Environment for USAID- Jamaica/Caribbean Regional Programme* Workshop Report – June 13 to 15, 2000
ROGERS T CASSANDRA, PHD	Workshop Report – September 13 to 14, 2000
WAGENSEIL R. (2001)	Wind and Storm Surge Technical Report