



ORGANISATION OF EASTERN CARIBBEAN STATES



**Grenada:
Macro-Socio-Economic Assessment of the
Damage caused by Hurricane Emily
July 14th, 2005**



August 2005

ACKNOWLEDGEMENT

The Secretariat of the Organisation of Eastern Caribbean States wishes to acknowledge the significant assistance provided by Dr. Vincent Little of the Inter-American Institute for Cooperation in Agriculture (IICA); Dr. Aidan Harrigan, Director of Economic Planning of Anguilla; and, Ms. Aldean Moore, Social Policy Advisor to the Government of Montserrat, the three of whom participated as members of the ten person OECS Team.

Financial assistance was provided by the United Nations Development Programme (UNDP) for the Eastern Caribbean. The speed with which this financial assistance was provided to the OECS Secretariat is recognised with much appreciation.

Special mention is made of the support provided by the Permanent Secretaries and staff in the various ministries in Grenada. The assistance provided by various other public and private sector agencies and individuals is also acknowledged. Special mention is made of the assistance provided by Mr. Timothy Antoine, Permanent Secretary and Mr. Lennox Andrews, Deputy Permanent Secretary in the Ministry of Finance and Planning who ensured that the work of the OECS Team was made easy.

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Executive Summary

The Process

This study to undertake a Macro-economic and Social Assessment of the effects of Hurricane Emily on the performance of the Grenadian economy, only ten months after the passage of Hurricane Ivan, was requested by the Prime Minister Dr. the Hon. Keith Mitchell. Discussions on logistical details were subsequently held with the Permanent Secretary in the Ministry of Finance. In order to prepare for the conduct of the assessment, the Director of the Social and Sustainable Development Division and the Senior Communications Officer in the OECS Secretariat visited Grenada on the 17th and 18th of July. The assessment team was then assembled and mobilized by the 20th of July, six days after the hazard event.

The assessment is based on a methodological approach formulated by UN-ECLAC and refined to suit the needs of Small Island Developing States. In May of this year the OECS Secretariat, with funding provided by UNDP, sought to train additional staff from the Secretariat and staff from Member States in the use of this methodology. An interdisciplinary cadre of persons is therefore now available, within the sub-region, to undertake such assessments.

The Director of the Social and Sustainable Development Division led the OECS Assessment Team; the Technical Coordinator of the Team was the Head of the Macro and Sector Policy Unit in the Secretariat. The eleven person Team that was fielded comprised of eight persons from the OECS Secretariat, one each from Anguilla and Montserrat, and a specialist from the IICA Office in Saint Lucia. The assessment took place in Grenada over the period 26th July to 1st August 2005. Three persons from the team also undertook a two day assessment of the damages in Carriacou; in addition, one of the team members traveled to Petit Martinique to assess the damage on that island. The report was presented to the Prime Minister and Cabinet colleagues on 2nd August.

The assessment analysed and computed the direct and indirect effects of Emily on the economy. This allowed the team to project the impact of the damages on overall macro economic performance and to identify recommendations as the basis to guide the continued rehabilitation and recovery of the economic, social and environmental sectors. Every attempt was made to ensure that only the incremental damages caused by Emily were accounted for. In a number of instances the damages, especially to the infrastructure, appeared to be more than what has been accounted for in this report. These damages are, however, cumulative damages, having been sustained by Hurricane Ivan and then being exacerbated by Emily.

It was clear from the scope and scale of the damages sustained that the infrastructure (including housing and roads and bridges) and agriculture sectors had suffered the brunt of the damages. Damages to the tourism sector were not as significant as originally assumed. Site visits and interviews also revealed that:

- The damage to the infrastructure was a result of the loss of vegetation caused by Hurricane Ivan: The ten-month period between Ivan and Emily was not sufficiently long enough for the natural rehabilitation and recovery of watersheds. This in turn has resulted in heavy sedimentation of rivers, erosion and gulying of riverbanks, land slides, etc.

- While many of the primary roads still remain in good condition, a number of the secondary roads and farm roads have sustained damage which, if not mitigated, will lead to further damage of infrastructure. Similarly, if a programme for rapirian remedial works is not instituted with haste, flooding and loss of housing stock along the riverbanks are predictable events.
- Watershed management is critical if flooding, sediment loading of the rivers and nearshore waters is to be minimized..
- While the extent of hillside cultivation since Hurricane Ivan has not been ascertained, such cultivation, if not accompanied by appropriate cultural practices – contour planting, contour drainage; terracing; planting of elephant grass along contours – will lead to further degeneration of watersheds. Similarly, if comparable cultural practices are also not utilized for houses built on hill slides, more land degradation and riverbank erosion is foreseen.

The Report

The report undertakes a sector-by-sector analysis of the impact of Hurricane Emily; an assessment of overall damages is then computed. Sectors are grouped into four categories: Social, Productive, Infrastructural and Environment. The first includes the housing, health and education sectors. The second comprises agriculture, manufacturing, wholesale and retail, and tourism. The third includes electricity, water and sewerage, telecommunications, roads and drainage, coastal infrastructure, sea and airports. The environmental assessment includes, among other things, the impact of damages to watersheds on water quality and coastal resources; ecosystem and habitat damages, and implications for solid waste management - an important factor, given the tremendous amount of debris which was accumulated after Hurricane Ivan and which remains to be disposed off.

In each of the sectors, a distinction is made between direct and indirect damages. Direct damage refers to losses to assets and stocks at the time of the disaster. Indirect damage is defined as losses in flows (income and production flows following the occurrence of the disaster). Estimates of direct and indirect damages for the economy as a whole are then presented in summarized format. Their magnitude is evaluated in relation to macroeconomic aggregates. The overall computation of the damage also includes a detailed macroeconomic assessment of the situation prior to the disaster, the projected macroeconomic performance without the disaster, and estimated economic performance of the economy as a result of both the direct and indirect costs and effects associated with Hurricane Emily.

The report concludes with a presentation of guidelines for a rehabilitation programme that builds on the recommendations that had been provided by the OECS Secretariat after it undertook the assessment of damages caused by Hurricane Ivan. As was previously mentioned, of critical importance is the need to reduce vulnerability and increase resilience at both the community and national levels to any hazard event. Recovery and mitigation must be married with strategic policy interventions aimed at managing risks. A portfolio of projects aimed at facilitating the recovery process, is also included in this report. Careful attention was paid to ensure that the recommendations and the project profiles contained in this report are closely aligned with the activities and

interventions already identified in the Strategic Plan of the Agency for Reconstruction and Development and with the national budget.

The Effects

The effects of the damages are significant mainly in respect of the fiscal accounts. They amount to **12.9% of the current value of GDP**. The most important component of overall damages, losses or costs is the direct damage. In relative terms the overriding damage is concentrated in the housing sector. The natural environment was also severely impacted, and that effect is partially integrated into the damage estimates for roads and bridges and agriculture. This damage to the environment has potential medium to long term effects on infrastructure and the productive sectors if a comprehensive set of mitigative measures are not implemented in the short term.

The damage also has important implications at the social level, firstly since it has affected some sectors that are labour intensive, in particular agriculture, but also because of the compounded psycho-social impact occasioned by hurricane Emily, coming as it did only ten months after the devastation caused by hurricane Ivan. The effects of hurricane Emily will only have a minimal impact on employment if farmers, in particular, can be sufficiently motivated to restart and in some cases redouble their efforts at restoring the source of their livelihoods, but also if existing unemployed skilled labour can be rapidly retooled to service the manpower needs of the construction sector, especially in the short to medium term.

In the year in which hurricane Emily occurred (2005) overall GDP is projected to grow at a rate of approximately 12%, down from the 13% projection post-Ivan, which had captured the twin impacts of disaster-induced growth in the construction and wholesale and retail sectors, and partial recovery of tourism. Post-Emily, the construction and wholesale and retail sectors will expand a bit further, due to the additional reconstruction and recovery efforts required in the housing and road transport sectors, thereby compensating for the expected slowdown in the agricultural sector. In 2005, agriculture, the productive sector most affected by Hurricane Emily, is expected to decline by 43%, a further deterioration on the post-Ivan projected rate of decline of 36.1%.

The total damage (direct and indirect) caused by hurricane Emily is estimated to be about EC\$ 140.0 million, that is about 12.9% of the current value of GDP. The bulk is concentrated in direct damages. These account for 87% of the damage or 11.2% of GDP.

The damages are summarised below.

Sector	Direct damage	Indirect damage	Total
Agriculture	23.48	12.02	35.51
Tourism	0.74	1.1	1.84
Electricity	0.6	0.28	0.88
Water/sewage	0.52	0.24	0.76
Telecommunications and Broadcasting	0.85	0.5	1.35
Education	12.0	1.43	13.43
Transport	7.2	0	7.22
Housing	74	0.6	74.6
Health	1.72	1.04	2.76
Environment	-	1.67	1.67
Total	121.14	18.88	140.02

The Future

The impact of a second hurricane within ten (10) months of Ivan, which caused damages amounting to more than EC\$2.0 billion, will undoubtedly increase the cost of recovering the economy to a pre-Ivan level of development. The assessment presented in this report should form the basis for the international community to assist Grenada in the recovery and rehabilitation phase. It is assumed that at least \$72mil of the funds, that had been pledged for recovery and rehabilitation after Hurricane Ivan, are still forthcoming.

The passage of both Ivan and Emily unambiguously point to the need for:

- Land use and urban planning, the review of building codes and standards, and the regularization of informal settlements.
- Immediate restoration and recovery efforts of infrastructure installations which, if left unattended to, are further exacerbated by any climatic event, however small.
- Watershed rehabilitation in order to mitigate soil erosion, sediment loading of rivers and loss of water through run-offs.
- Introducing hurricane safety provisions in the rebuilding process.
- Ensuring that the social safety nets are strengthened not only through social transfers but also through sustainable livelihoods and community empowerment.
- A systematic approach to providing counseling to the thousands who are suffering post traumatic stress disorder resulting from their further loss of shelter and livelihoods by the passage of two hurricanes within a ten month period.

Limitations of the Report

This report was undertaken over a 6 day period, twelve days after Hurricane Emily swept through the tri State. The level of effort represented here is in keeping with both the amount of time available to the OECS led Assessment Team, and the baseline information available to the team. It should be pointed out that it was clear to the

Assessment Team that local counterparts too have to be trained in the methodology so that there is consistency in the baseline information.

Three of the Team members visited Carriacou, one of whom went on to visit Petit Martinique, hence the data presented in this report covers all the areas that were the worst hit of the tri-island State.

The primary objective of the Mission was to undertake a critical assessment of the impact of damages, both direct and indirect, as well as their secondary causes and effects, on the macro-economic performance of the country in the short and medium term. The assessment does not provide, for example, a quantitative analysis of the impacts on those in the informal sector and their linkages to the formal sector. Benchmark numbers with respect to those operating in the informal sector are not available, and as a result, their linkages, while described, have not been quantified. It is important however to understand that they exist.

Similarly, the methodological approach utilized to compute macro effects does not permit for a comprehensive analysis of effects in an all-encompassing way. A report such as this should not replace the need to undertake detailed socio-economic assessments of social safety nets that will be required, for example, to provide shelter and livelihoods for those whose losses are complete. In any event, such an analysis is not the objective of this report.

The report provides an overall estimate of the magnitude of the damage and states the reconstruction requirements. It quantifies the losses and projects macro performance soon after the event in an effort to ensure that the critical discussions required, relative to rebuilding the Grenadian economy, can start. It sets the basis for critical next step actions at both the international and national levels.

Preface

Hurricane Emily, a category 1 system with sustained winds of 90 mph (150 kph), impacted Grenada and its dependencies on Thursday, July 14th 2005, ten months after the passage of Hurricane Ivan, leaving another trail of damage. According to initial reports, 40 per cent of the tri-State was reported to have been impacted with at least 8.5 % of the housing stock being damaged. Reports suggest that approximately thirty-eight percent (38%) of the population has been affected and one person died as a direct result of the hurricane.

Pursuant to a request from the Prime Minister of Grenada, the OECS Secretariat fielded a multi-disciplinary team to assist the Government of Grenada undertake a macro-socio-economic assessment of the damage caused by Hurricane Emily. This Inter-Agency Team was made up of eight persons from the OECS Secretariat, one person from IICA, one provided by the Government of Montserrat and one from Anguilla. The OECS staff and the latter three other persons are part of the sub-regional cadre of persons trained in the UN-ECLAC methodology. The Team worked with local counterparts who had been assembled for coverage of each of the main sectors. Funding for the assessment was provided by UNDP. This assessment, which was undertaken from the 26th July to the 2nd of August 2005, complements the compilation of damage and needs assessments prepared by numerous other agencies.

The assessment presented in this Report includes estimates of direct and indirect damage to the economy as a whole: their magnitude was evaluated in relation to macroeconomic aggregates. The overall assessment of the damage also includes a detailed macro-economic assessment of the situation prior to the disaster, the expected situation without the disaster, and the estimated performance of the economy with the passage of the hurricane. The information presented is based on data that was available and on evidence collected through field visits and interviews.

The assessment employed was in accordance with the methodology that has been developed by UNECLAC¹ and the OECS². The focus of this methodology is on the valuation of the damage on the society, economy and environment of the affected country so that appropriate mitigation strategies can be formulated during the reconstruction phase. The recommendations for the reconstruction phase take into account an assessment of the worst affected social, economic, infrastructure and environmental sectors.

It is estimated that the magnitude of the loss, although small, has compounded the severe losses suffered as a result of Hurricane Ivan. This aggregated loss now exceeds the country's ability to address recovery and reconstruction needs on its own, particularly if the aim is to build the resilience of the country to similar events in the future, and to prevent further hardship to those communities which are already vulnerable. International cooperation is therefore considered essential, especially given the fact that

¹ See, ECLAC/IDNDR (1999), *Manual for Estimating the Socio-Economic Effects of Natural Disasters*. ECLAC (2003) *Handbook for Estimating the Socio-Economic and Environmental Effects of Disasters*. LC/MEX/G.5.LC/L.1874
ECLAC (2004) *Disaster Assessment Training Manual for SIDS*. LC/CAR/L.12.

² See, OECS (2004), *Post-Disaster Rapid Environmental Assessment – Manual with Guidelines*.

hurricane Emily struck Grenada ten months after the devastation caused by hurricane Ivan in that country. Questions of improved land use planning, watershed and coastal management, early warning, emergency response, and structural preparedness for evacuation and sheltering potentially affected populations, remain important considerations for the reconstruction process. Psycho-social trauma and its mitigation appears as an issue that requires even more urgent attention now. Additionally, the reconstruction strategy should pay special attention and priority to including sustainability and enhanced governance criteria in making decisions about and implementing social and productive investments, and on allocating resources to the reinforcement and retrofitting of vulnerable infrastructure, basic lifelines and services.

The opportunity for undertaking reconstruction with renewed values and criteria, and embarking on reforms that will strengthen the Grenadian society and government's resilience to economic, social and ecological vulnerability has been further emphatically underscored by the passage of hurricane Emily.

I. Background

1. The Mission

The OECS Mission was deployed on July 26th 2005. Mr. Timothy Antoine, Permanent Secretary in the Ministry of Finance was appointed as the focal point responsible for coordinating all logistical and technical support to the Mission Team. The Members of the Mission are identified below:

Dr. Vasantha M. Chase	OECS, Director Social and Sustainable Development Division, Team Leader
Mr. Rodinald Soomer	Head Macroeconomic and Sectoral Policy Unit (MESPU) (Technical Coordinator) Macro-Economist
Mr. Allister Mounsey	Programme Officer, Macro-economist
Mr. S. Curtis Mathurin	Economic Affairs Officer, Macro-economist
Dr. Aidan Harrigan	Director of Economic Planning - Anguilla, Macro-economist
Mr. George Alcee	Agricultural Economist, Agriculture Sector Specialist
Dr. Vincent Little	IICA, Agriculture Sector Specialist
Mr. Peter A. Murray	Programme Officer, Fisheries Sector Specialist
Ms. Valerie Isaac St. Hill	Programme Officer, Environmental Sector Specialist
Mr. David T. Popo	Programme Officer, Social Sector Specialist
Ms. Aldean Moore	Social Policy Advisor, Montserrat, Social Sector Specialist

Local counterparts provided continuous support to this effort.

2. Description of the Phenomenon and its Effects

The State of Grenada, which includes the islands of Carriacou and Petit Martinique, is located in the Caribbean Sea between latitudes 11°59' and 12°20' North and longitudes 61°36' and 61°48' West. Grenada is the largest and main island, being 18 km (11 miles) wide, 34 km (21 miles) long, and with a coastline of about 121 km (75 miles). It has an area of 312 km² (121 sq. miles) (Figure 1).



Figure 1. **Map of Grenada**

Tropical Depression #5 formed Sunday night July 10, 2005 and advisories were initiated by the National Hurricane Centre at 11pm. The forecast track from initialization by tracking models on July 10, 2005 was for a gradual turn toward the west-northwest. At 5 am on July 11, 2005 the tropical depression was upgraded to Tropical Storm Emily which slowly strengthened to become a strong tropical storm as it approached the Windward Islands on the afternoon of Wednesday July 13, 2005. Around 8:45 pm July 13, 2005 data from a United States reconnaissance aircraft taking measurements in the tropical storm found that Emily had become a very strong category one Hurricane with sustained winds of 90 miles per hour (150 km/hr).

Despite 11 advisories in the first three days to this effect, Emily did not turn until late Wednesday night July 13, 2005. The track brought the centre of Emily, then a tropical storm, about 125 miles south of Barbados, 90 miles northeast of Trinidad At 11 pm AST the centre of Hurricane Emily was located near latitude 11.9 north; longitude 61.1 west or about 45 miles (70 km) east-southeast of Grenada. Emily was moving toward the west at about 18 mph (30 kph). At that time Emily's maximum sustained winds were near 90 mph (150 kph) with higher gusts. Hurricane force winds extended outward up to 25 miles (35 km) from the Centre and tropical storm force winds extended outward up to 115 miles (185 km). The storm (figure 2) maintained that profile, with only a minimal reduction in central pressure, through the early hours of July 14 as it crossed Grenada.

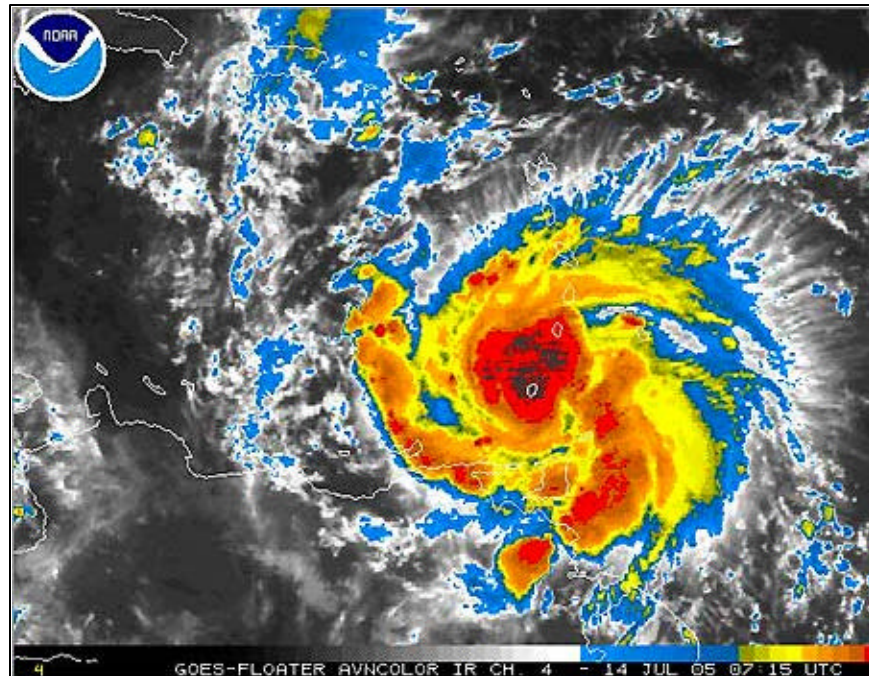
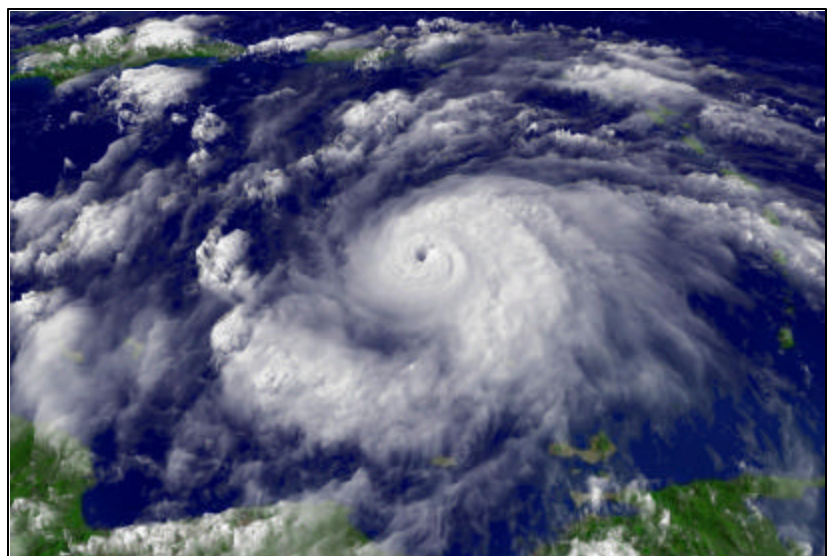


Figure 2. Infrared photograph of Hurricane Emily, 3:15 am July 14, 2005
 Source: NOAA website

By 5 am AST the centre of Emily was located near latitude 12.3 north; longitude 62.3 west or about 45 miles (70 km) west-northwest of Grenada. Emily was at that time moving toward the west-northwest near 18 mph (30 kph) with maximum sustained winds near 90 mph (150 kph) with higher gusts and hurricane force winds extending outward up to 30 miles (45 km) from the centre (figure 3) and tropical storm force winds extending outward to 115 miles (185 km). Estimated minimum central pressure was still 991mb (29.26 in). Emily was expected to produce total rain accumulations of 3 to 6 inches with possible isolated amounts of 12 inches over mountainous terrain. Coastal storm surge flooding of 2 to 4 feet above normal tide levels were also expected near and to the north of the path of the centre.

Figure 3. Hurricane Emily 05:15 am
 July 14, 2005
 Source: NOAA website



The forecast track at 11am Thursday July 14, 2005 was for Emily to pass south of Jamaica as a Category Three Hurricane Saturday morning. Figure 4 shows the eventual path taken by Hurricane Emily.

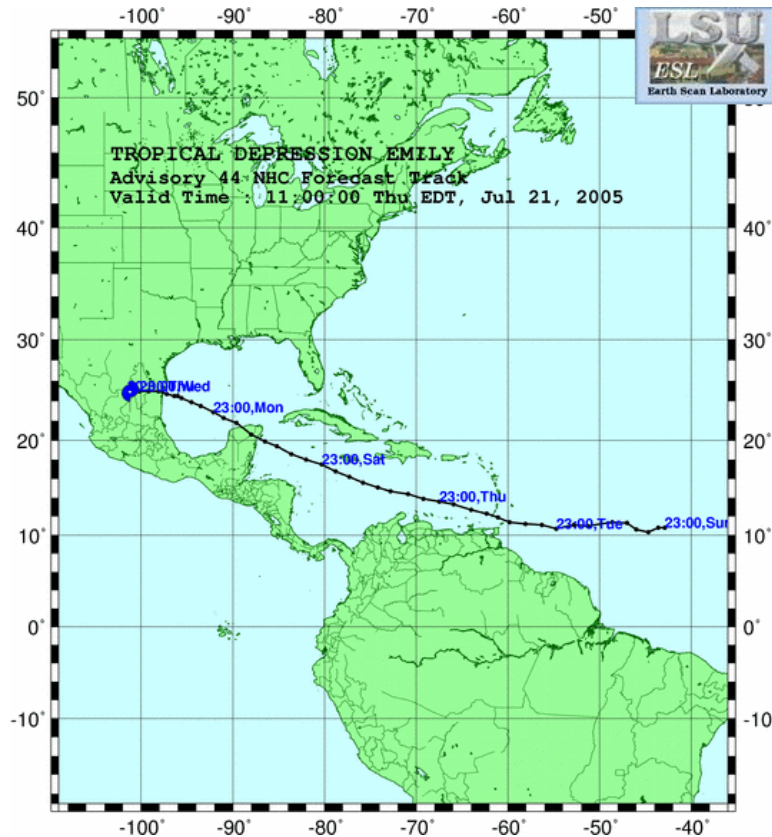


Figure 4. **NHC track of Hurricane Emily from 11 July to 25 July, 2005 at 2:35 pm**
 Source: National Hurricane Center Website

Emily impacted Barbados, Trinidad and Tobago, St. Vincent and the Grenadines and Grenada.

In Grenada, significant damage to housing stock resulted from the passage of Hurricane Emily, with the worst observed being in the parishes of St. Andrew's, St. Patrick's, Carriacou (figure 5), Petit Martinique and St. George's. This took the form of roofing being blown off houses (both concrete and wood) or damaged (table 1), concrete walls being knocked down, as well as shops and homes destroyed. In the capital, St. George's, winds tore the roof from the operating room of a new hospital built with help from the Cuban government and destroyed the entire roof of the only hospital on Carriacou, forcing the evacuation of patients. Two police stations and two homes for the elderly also lost their roofs, homes were damaged, streets were flooded and crops were destroyed.



Figure 5. **Damaged house in Carriacou**
Photo Credit OECS Secretariat

Table 1. Reported Damage Due To The Passage Of Hurricane Emily

NUMBER OF HOUSES DAMAGED BY PARISH	
St. George's	285
St. Andrew's	1153
St. Patrick's	499
St. David's	126
St. John's	151
St. Mark's	77
Carriacou & Petit Martinique	350
TOTAL	2641

Source Government Reports

Damage also included landslides (which contributed to blockage of, and damage to, farm access roads), flooding, road breakages, damage to bridges, and downing of a few utility poles and power lines.

Rainfall measured at the Point Salines International Airport (PSIA) indicated a total amount of 73.1 mm between the hours of midnight and 10 am on July 14, 2005. This translates to an average rainfall rate of 7.3 mm/hour during that ten-hour period compared to 42.7 mm/hour for Hurricane Ivan. Given that rainfall intensities are often greater than 50 mm/hour, and intensities up to 132 mm/hour have been reported for Grenada (CCA, 1991), very little rain fell during this event.

Notwithstanding the apparent low rate of rainfall recorded for Hurricane Emily at PSIA, one of the more destructive effects of the event was the widespread occurrence of landslides, including fresh land slippage in the uninhabited mountainous interior and along roadways, particularly in the northern parishes, which significantly impacted infrastructure. The main contributing factors were the increased level of hillside farming, increased construction on steep slopes and destruction of vegetation by Hurricane Ivan,

which exposed the ground to wind and water erosion. Much of the damage to both bridges and roads was attributed to the dumping and washing of debris into watercourses, particularly trunks and roots of trees and other vegetation uprooted or snapped by Hurricane Ivan, which clogged culverts and bridges, impeding free and normal water flow and resulting in excessive scouring, heavy loading of structures and overtopping of road surfaces.



Figure 6 Damages caused by Hurricane Emily

Photo Credit OECS Secretariat

It is estimated that Hurricane Emily affected some 38.1% of the overall population with an estimated 167 families rendered homeless (table 2, CDERA Situation Report # 6). One death was recorded; this occurred as a result of injuries sustained when the male deceased's house was destroyed by landslide.

Most damage to crops was evidenced in the parishes of St. Andrew's and St. Patrick's, while most of the livestock lost were on Carriacou and Petit Martinique.

3. Affected Population

3.1 Description of Affected Population

Grenada is comprised of seven parishes, which include the the combined parish in the islands of Carriacou and Petit Martinique; together they have a population of 102,632 persons³. Of the seven parishes which were impacted by hurricane Emily, three: St. Andrew, St. Patrick, and Carriacou and Petit Martinique were most severely affected.

The three most affected parishes consist of a total population of some 41,504 persons or 40% of the total population. In the other four parishes St. Mark, St. George, St. John and St. David, on average, some 5% of the persons in those parishes were severely affected.

Hurricane Emily took the life of one male person due to injuries sustained when his house was destroyed by a landslide.

³ Table 2 details the affected population by Parish. Worst hit were persons in St. Andrew, St. Patrick, and Carriacou

A Poverty Assessment Study conducted in 1999 indicated that some 32% of the population of Grenada were living in poverty. Of those who were defined as poor, 32% could be found in the parish of St. George's, 27% in St. Andrew's, 10% in St John's and 10% in St. David's. Table 4 presents the data for poverty estimates by parish in Grenada. The poor who lived in the parishes most affected by hurricane Emily, accounted for approximately 43.7% of all those persons who were poor across the nation. The annual expenditure of the poor was estimated to be less than EC\$3,262.00 which was considered to be the cost of meeting minimal food and other basic requirements. Approximately 13% of all individuals in the country were found to be extremely poor or indigent.

Table 2. Grenada: Comparison of Estimated Population Affected by Hurricane Ivan and Hurricane Emily

Parish	Total population ^a	Population		Population Affected by Emily	Population Affected by Ivan
		Male	Female		
Carriacou	6081	2972	3109	5,837 ^b	1216
St. Patrick	10,674	5256	5418	8,539 ^c	2135
St. Andrew's	24,749	12311	12438	19,799 ^c	23,759
St. George's	37,057	17893	19164	3,706 ^d	35,575
St. John's	8591	4314	4277	430 ^d	7732
St. Mark's	3994	1965	2029	200 ^d	779
St. David's	11,486	5770	5716	574 ^d	10,337
Totals	102,632	50481	52151	39,085	81,553

Source Various Government Documents ^a Grenada Poverty Assessment Report 1999;

^bPopulation Census 2001

^a Government of Grenada Population and Housing Census 2001

^b As estimated by 96% of those living in the hardest hit parish

^c As estimated by 80% of those living in other affected parishes

^d As estimated by 5% of those living in parishes which were not directly affected

Table 3 Poverty Estimates by Parish – Grenada

Parish	Total population ^b	% of population	As a % of the poor population ^a
St. George's	37,057	36.1	31.7
St. John's	8591	8.4	10.0
St. Mark's	3994	3.9	4.8
St. Patrick	10,674	10.4	14.0
St. Andrew's	24,749	24.1	26.6
St. David's	11,486	11.1	9.8
Carriacou	6081	6.0	3.1
Totals	102,632	100	100

Source: Grenada Poverty Assessment Report 1999; ^bPopulation Census 2001

Disasters associated with natural events are fundamentally an issue of development and there are close links between poverty, low-income populations, and communities being disproportionately affected by natural hazards. The effect of Hurricane Emily further exacerbated the situation of the poor as many had not recovered from the ravages of Hurricane Ivan ten months before.

Carriacou, the main affected parish had the second lowest percentage of poor. This is contributed to by a large number of Grenadians who have returned home for their retirement, in addition, to the diversified nature of the economy, which comprises fishing, mixed farming and tourism. The unemployment rate is 4.2%, representing the lowest in the country. The majority of residents participate in the formal economy.

The poor comprise 24% and 10.4% of the total population of St. Andrew and St. Patrick respectively. The principal export crop nutmeg was concentrated in these parishes, which were severely damaged by both Hurricanes Ivan and Emily. Farmers planted short term cash crops to cushion the blows from Hurricane Ivan. These crops were destroyed by Hurricane Emily and some farmers have considered shifting from agriculture to other economic activity.

Table 4 Summary of Persons in shelters by Parish

Parish	Homeless Families	Original # of persons in shelters	People in shelters night of July 15
St. George's	8	1192	72
St. Andrew's	87	2521	279
St. Patrick's	50	238	178
St. David's	10	10	18
St. John's	2	195	75
St. Mark's	10	125	50
Carriacou & Petit Martinique	N/A	N/A	N/A
TOTAL	167	4,281	672

Source: Agency for Reconstruction and Development Situation Report # 6 and OECS consultations with Government officials

In the wake of Emily, many persons in the affected parishes found themselves without shelter, food and belongings. It was reported that 167 families, a total of 4,311 persons, were without homes and required relocation to shelters. Unfortunately many locations designated as shelters were already damaged by hurricane Ivan. Persons were forced to seek shelter with neighbours or to stay in partially destroyed buildings. In the case of Carriacou, residents evacuated the shelter the day following the disaster and sought refuge with friends and relatives. However, one day after the event, the numbers residing in shelters had been reduced to approximately 672 persons. The details of homeless families and persons in shelters are shown in table 3. In addressing the homelessness and health risks associated with the destruction of toilet facilities, the government of Grenada installed one hundred latrine fittings in St. Patrick and Carriacou.

After two weeks, water was gradually being restored. In the parish of St. Patrick, access to water had been increased from 30% to 75%. The entire population was without access to electricity, immediately after the event, barring the few who had personal generators. Electricity has been restored to a small section of the country through the assistance of local and regional crews provided by CARICOM Member States through CARILEC. After two weeks, approximately 50% of those persons with usual access to telecommunications services were without. Services to sections of St. Georges have been restored.

3.2. Vulnerability of Women and Children

The cost of ignoring a gender analysis in the disaster management process is potentially counter productive to the development process. It can result in overlooked damage and losses, misdiagnosed needs and misapplied priorities. Moreover, it can also exacerbate poverty and inequity and will likely intensify vulnerabilities⁵. The cumulative damage and effects of Hurricanes Ivan and Emily within the last ten months, poignantly show the differential impact of disasters on women. It points as well to the social dimension of the level of resilience in the OECS region, which is low especially in respect of natural disasters. In measuring this level of resilience, it is necessary and critical to move beyond mere economic indicators, such as, GDP per capita, Gross International Reserves and Economic Diversification. Hurricane Emily has once again highlighted that other factors such as the limited resource capability of the disadvantaged and inadequate social safety nets need to be considered in the recovery and rebuilding processes after the occurrence of a natural disaster. Resource capability has been noted in strengthening the levels of resilience in developing countries.⁶ The IADB Disaster Risk Management Indicators⁷ should be adopted as a reference point for identifying and monitoring the vulnerability of women and children.

⁵ Delaney and Shrader (2000) cited in ECLAC/UNIFEM (2005). Grenada: Gender Impact Assessment of Hurricane Ivan-Making The Invisible Visible.

⁶ OECS Human Development Report (2002). Building Competitiveness In The Face of Vulnerability.

⁷ Inter-American Development Bank (2005). Indicators of Disaster Risk and Risk management: Summary Report for World Conference on Disaster Reduction.

Table 5 presents a number of key issues for examination in undertaking a gender analysis of a natural disaster. Essential to undertaking such an analysis is the availability of data that is disaggregated by sex and age so that the differentials between women and men can be made clear.

Table 5 Key Issues In Gender And Disasters⁸

Phase	Issues
Pre-Disaster	Vulnerability Risk Perception
Emergency Transition (Rehabilitation and recovery)	Coping strategies Needs Social Composition Creation of new Vulnerabilities
Reconstruction	Priorities New Gender Roles New Gender Relationships

Kambon (2005) presents an application of the framework of Delaney and Shrader, in Table 2, based on observations and data collected as part of the macro socio-economic impact of natural disasters in the Caribbean in the latter part of 2004 and early 2005.

**Table 6
Examples Of Gender Differences In Response To Natural Disaster: Based On A Review Of The Social Impact Of Disasters In The Caribbean Following The 2004 Hurricane Season⁹**

Issues	Female	Male
Pre Disaster		
Differing Vulnerabilities		
- biological	Reproductive health needs	No special restrictions
- social	Restricted skill base	Mobile skills
- cultural	Exclusion from home construction	Exclusion from child care responsibilities
- attitudinal (risk perception)	Low level of risk tolerance	High level of risk tolerance
Emergency		
Differing coping mechanisms	Suffer higher incidence of depression (crying and suicide ideation); Organizing community sing-a-longs and story telling;	Alcoholism, gambling and dysfunctional behaviour; Rescuing villagers and clearing roads ;
Transition (rehabilitation and recovery)	Weak access to wage earning possibilities; Women prepared one-pot meals for the community; Devoted more time to community and reproductive work.	Easier access to wages/income; Men engaged in 'marooning' teams for house rebuilding; Spend more time in productive work; abandonment of families and domestic and/or other responsibilities.
Reconstruction		

⁸ Source: Delaney & Shrader (2000) cited in ECLAC/UNIFEM (2005). Grenada: Gender Impact Assessment of Hurricane Ivan-Making The Invisible Visible

⁹ Source: Kambon, 2005 cited in ECLAC/UNIFEM (2005). Grenada: Gender Impact Assessment of Hurricane Ivan-Making The Invisible Visible.

Differing priorities	Priorities for shelter, economic activity, food security, and health care;	Priorities for agriculture, infrastructural development and economic activity;
Differing access to resources;	Women slower to return to labour market; Reconstruction programmes that embark on development without the inclusion of gender analysis tools;	Men easy access to the labour market; Reconstruction programmes in construction and agricultural development that favour male participation;
Differing access to power in the public sphere	Women's lack of involvement in governance mechanisms.	Gender neutral governance mechanisms that don't recognize changing gender roles and relationships, and favour male participation.

Source Kambon 2005

Male headed households account for some 52% of the households in Grenada and females 48%, but among the poor the situation is reversed, female headship accounts for 52% of the households. A significant proportion [approximately 30-40%] of all households in the OECS region are headed by single females.¹⁰ The employment situation is precarious in the best of times. The rate for male unemployment is 15% and 13% for females. Labour force participation rate of women is significantly lower in Grenada than other OECS countries. Approximately 68% of males and 38% of females participate in the labour force¹¹. The difficult situation of poor female headed households in the aftermath of hurricane Emily is evident in the numbers of females and their children who had to be housed with relatives and friends.

Further evidence is in the case¹² of one partially employed domestic helper in Carriacou who is the mother of six children between the ages of 14 and 3 months. Her post disaster situation was characterized with despair and intense anxiety. She lost the entire roof of her 2-bedroom wooden house and suffered complete damage to her small retail grocery shop (15 x 10) that was managed by her mother and herself. She indicated that the children are at her house during the day; the children except the 14 year old sleep with their grandmother who provides supper. She only receives financial support from one of the fathers of her children and is worried over how she will repair her roof and rebuild her shop, as she has no insurance coverage.

Additionally, women are very often left with the responsibility for elderly relatives. Grenada has one of the highest total dependency ratios in the OECS region (94.8%) and a relatively high elderly dependency ratio of 31.8%¹³. Persons over 65 years of age account for 16.3% of the population.

The rebuilding process for single-headed female households poses some serious challenges, as they have to rely almost completely on external assistance. There is therefore the urgent need to design post disaster sustainable livelihood strategies to help in the recovery of these vulnerable women and children.

Children are also vulnerable in the aftermath of a disaster when the heightened stresses of recovery can negatively impact on parenting. One single-headed female whose house

¹⁰ OECS Human Development Report (2002). Building Competitiveness In The Face of Vulnerability.

¹¹ Grenada Census Report (2001).

¹² Based on discussions between the OECS team specialist and female headed household.

¹³ Poverty Assessment Report, Grenada, 1999

was destroyed by hurricane Emily, left her sixth-months baby in the care of her 13 year old daughter, while she went looking for assistance.¹⁴

Following a natural disaster, the one sector which usually experiences a boom, is the construction sector. In Grenada, after Hurricane Ivan, the construction sector is the sector in which the easy mobility of men from agriculture or tourism was demonstrated to be possible. The same was not possible for women. There are, however, efforts afoot to retool women so that they can become participants in the sector. This will take both time and changes in cultural attitudes so that women can be more accepted in the construction sector.¹⁵

The lack of participation of women in the construction sector may even be slowing the rebuilding efforts and increasing the burden of the State, as the pool of labour needed to kick start and sustain the economy is being drawn from one pool of workers, male participants in the labour force. This may result in the need for social protection, among those who are unable to sustain themselves¹⁶. With the expected negative fallout on the productive sectors of the economy, due to both hurricane Ivan and Emily, larger numbers of women and men can be expected to seek their livelihoods in the informal sector. The ECLAC/UNIFEM report recognizes that provision of support services to female heads of households, in the form of day care for their children, will become necessary, not only to allow the mother time to secure a livelihood, but to ensure the safety and reduced vulnerability of the children who would have to be left without supervision and care in her absence.

3.3. Psycho Social Trauma

Similar to Ivan, the trauma of hurricane Emily brought on a demand for trained psychosocial counselors to offer support to victims of the hurricane.¹⁷ Some of the trauma the residents of Carriacou and Petit Martinique suffered included anxiousness, nervousness, heart palpitations, insomnia, frustration, and disappointment.¹⁸

The Agency for Reconstruction and Development (ARD), accompanied by social workers from the Ministry in Carriacou and Petit Martinique visited families and individuals whose homes were damaged or destroyed in order to ascertain the mood of the community. According to the ARD, the mood of the residents can be characterized as “shaken but determined”. The ARD has since provided stress debriefings with the residents of Carriacou and Petit Martinique. Interviews with individuals and families by the OECS Mission to Grenada and Carriacou and Petit Martinique, supported the view by the ARD that the central response of the people to the damage and effects of Emily was their sense of ‘self empowerment’ and ‘self directedness’ to rebuild their community.

¹⁴ Based on discussions between the OECS team specialist and female headed household.

¹⁵ ECLAC/UNIFEM (2005). Grenada: Gender Impact Assessment of Hurricane Ivan-Making The Invisible Visible.

¹⁶ ECLAC/UNIFEM (2005). Grenada: Gender Impact Assessment of Hurricane Ivan-Making The Invisible Visible.

¹⁷ OECS Discussions with the Director of Social Recovery at the ARD.

¹⁸ Source: Report on the Visit to Carriacou and Petit Martinique by the Social Recovery Unit of the ARD.

One of the concerns coming out of the Emily disaster situation is that there was no effective structure or mechanism to assist children during the vacation period. Hurricane Emily arrived during the summer school vacation. The school structure is a natural micro-focal point for socializing children in managing psychosocial impacts. Anecdotal reports indicate that children are still overwhelmingly traumatized by ordinary rainfalls and, that the reproductive role of women in the household has increased with respect to the domestic maintenance of these children. The disaster situation caused by Emily did not enable any significant social change to the traditionally socially constructed gendered roles. The men were seen to be “liming” on the block while the women continued to maintain their domestic responsibilities.

Members of the OECS assessment team in Carriacou spoke with a number of women household heads whose houses were damaged and destroyed and, whose post disaster situation was characterized by despair and intense anxiety. The Grenada (Carriacou) Emergency Housing Committee gives only a grant of EC\$1000 to assist in repairs. This situation typifies the severity of the challenges that beset the lower income single female-headed households in the recovery and reconstruction phases of a disaster situation. In addition, given their limited market capacities and, the associated transition costs toward rebuilding the micro-business enterprises that were damaged, it may be necessary from a policy and from a social protection standpoint to provide these households with some direct business recovery support.

That female-headed households or single female-headed households need to be explicitly targeted as a group of vulnerable persons is borne out by the data¹⁹ collected up until 19 December 2004 by the UNECLAC study on the gender impact assessment of Hurricane Ivan. The report says that up to that period, 2070 persons had pre-qualified for emergency housing, and of these, “single parents with children living with them” comprised the largest category (823 out of 2070 or 37 per cent). Significantly, all persons in that category are listed as single mothers/unemployed women. As a group, female-headed households are economically and socially disadvantaged and this economic and social vulnerability is frequently exacerbated during a disaster. The recovery period for these women is usually much longer as is proving to be the case in Grenada. The UNECLAC report indicated that many female heads of households had lost their jobs as domestic employees or in the services sector or could no longer earn in the informal sector. The Ministry of Social Development, the Housing Authority within that Ministry and NERO also reported that female heads of households were the ones experiencing the most severe hardship and were the persons primarily seeking assistance²⁰.

Many societies create, out of necessity, family or community bonds to respond to individual, family or community disasters. In Grenada, after the Ivan disaster, the family and community were the first to respond to and often initiated their own rehabilitation

¹⁹ UNDP, ECLAC 2004. Grenada: A Gender Impact Assessment Of Hurricane Ivan – Making The Invisible Visible

²⁰ UNDP, ECLAC 2004. Grenada: A Gender Impact Assessment Of Hurricane Ivan – Making The Invisible Visible

and recovery mechanisms.²¹ In the Emily disaster situation, the response at the community and individual level once again revealed the functionality of the role of local social capital in the various cycles of disaster management in Carriacou and Petite Martinique. The challenge however still remains for the residents of Grenada and the government to create capacities to mitigate the consequences of natural or human-induced risks to their lives and livelihoods.

Vulnerability is closely associated with social processes such as the susceptibility or lack of resilience of the population. The experiences of both Ivan and Emily point to the need for disaster managers and policy makers to identify indicators of “Exposure and Susceptibility”²² as part of the social processes to reduce the psycho-social impact of natural disasters. Other indicators of “Socio-economic Fragility”²³ also need to be developed to reflect the predisposition of a society when faced with disaster phenomena as has been the case with Grenada, Carriacou and Petite Martinique. The assessment of the psycho-social trauma on the affected populations should therefore speak to the levels of, *inter alia*, poverty, social inequalities, and inflation.

4. Emergency Actions

4.1 Government Actions

As part of its preparedness planning for the 2005 Hurricane Season, the National Disaster Management Agency (NaDMA) conducted a review of the country’s National Disaster Plan. This was a follow-up to the implementation of a “lessons learned”²⁴ evaluation exercise by the OECS Secretariat after Hurricane Ivan, and the subsequent establishment of the country’s Risk Reduction policy which was undertaken in collaboration with UNDP-Barbados and the Caribbean Development Bank’s Disaster Mitigation Desk. This period of planning also resulted in the design and establishment of disaster preparedness instruments and measures such as the Notification Procedures, operationalization and training of the 18 District Disaster Committees, and the conduct of regular technical planning meetings of the National Telecommunications Committee²⁵. On July 12, the Prime Minister of Grenada addressed the nation followed by press interviews with the National Disaster Coordinator.

During the emergency response phase, the National Emergency Advisory Council convened briefing meetings with chairpersons of the respective subcommittees of the Council. In addition, further briefing meetings were held at the district level with the

²¹ Review of national, regional, and international agency experiences in the aftermath of Hurricane Ivan in Grenada: A Case Study for Effective Pre-Disaster Planning And Post-Disaster Management.

²² Source: IADB Indicators of Disaster Risk Management. The indicators that best represent this index are livelihoods status, population susceptibility, human activities, and assets.

²³ Source: IADB Disaster Risk Indicators that include human poverty index, social disparity using Gini index, unemployment as % of total labour force, inflation, food prices, and dependents as proportion of working age population.

²⁴ Requested by the Government of Grenada and conducted in March 2005 by the OECS Secretariat in collaboration with USAID/PADCO.

²⁵ OECS discussions with the CDERA/CIDA-IVAN Consultant who is currently providing emergency planning advice to NaDMA.

district disaster committees, and at the community level. This three-tier approach to emergency response activation facilitated the coordination of emergency response assistance in Grenada, Carriacou and Petit Martinique. There were a series of press releases providing timely information to various publics on government actions and collaboration with regional and international agencies, and what needed to be done by the general public with respect to evacuation and other response activities. As a result of the Pan American Health Organisation (PAHO) requested assistance from the Caribbean Environmental Health Institute (CEHI), an Environmental Health Assessment was conducted during the period July 16-17, 2005.

The Emergency Operations Centre (EOC) was activated and continually received situation reports from the national and district levels disaster management mechanisms. These situations reports were subsequently elaborated by the EOC and then circulated to regional response agencies for the uptake of technical assistance. The emergency response activities for Emily were better coordinated in comparison with Ivan indicating that some of the measures recommended post Ivan have been incorporated into the National Disaster Planning process.²⁶ A review of the operations of the EOC will be conducted to further strengthen the emergency response mechanism.

4.2 International Cooperation

On Thursday, July 14th, 2005 at approximately 10:00 am the Eastern Caribbean Donor Group met at the United Nations House in Barbados and was informed that Grenada had declared a Level Two Disaster., which ment that they could cope largely using there own resources though requiring some external assistance. As a result there was no need for the Rapid Needs Assessment Team. Be that as it may, some donors did respond, and rather rapidly too.

Notwithstanding, PAHO/WHO organized a reconnaissance team of advisors to study the effects of Emily on the health status of Grenada and Carriacou and to undertake a health needs assessment in response to the damage cause by the Hurricane. PAHO also requested assistance from the Caribbean Environmental Health Institute (CEHI) to conduct an Environmental Health Assessment of the most affected areas. CEHI's mission began on July 16th, 2005 with a trip to Grenada followed by a site visit to Carriacou on July 17th 2005

On 15th July 2005 UNDP reported that it's Grenada-based team of dsaster mitigation and reconstruction experts had concluded its initial damage assessment visit to a number of areas including the parish of St. George, St. John's, St. Mark's and the two northern parishes of St. Patrick's and St. Andrew's.

International Federation of Red Cross (IFRC) Societies launched an emergency appeal on Friday July 15th for Hurricanes Dennis and Emily and in response to the effects of Hurricane Emily in Grenada; IFRC's Pan-American Disaster Response Unit (PADRU) in Panama dispatched an airlift of relief supplies to the island on Saturday, 16th July. The aircraft also carried items for the UNICEF office in Grenada. A second airlift was

²⁶ OECS discussions with the CDERA/CIDA-IVAN Consultant who is currently providing emergency planning advice to NaDMA.

dispatched on Monday, 19th July and a Disaster Management delegate arrived in Grenada on Saturday July 16, 2005 to support the Grenada Red Cross. OXFAM also carried out an initial assessment of the damage.

On July 16th and 17th, 2005, the OECS Secretariat fielded a two-person reconnaissance team that visited some of the affected areas in Grenada. The findings of that team informed the composition of the team carrying out the current macro-socio-economic assessment that was fielded on July 26, 2005.

Expressed and committed support has to date been received from the Government of Cuba, USAID/OFDA, UNDP, UNDP/OCHA and the Consulate of Japan in Trinidad and Tobago.

II. Assessment of the Damage

This chapter contains an assessment of the damage caused by hurricane Emily to the social sector (particularly housing, education and health), infrastructure and productive sectors (particularly agriculture, including fisheries) and to the environment. An assessment was carried out of both direct and indirect damage to public and private sector assets and production, on the basis of information available during the mission.

It needs to be re-emphasised that the assessment of the damage was limited to the incremental damage caused only by Emily and not the cumulative damage resulting from a combination of the effects of both Ivan and Emily.

Direct damages or effects include the value of damage to physical assets and the cost of that element of the emergency response, in particular clean up and demolition efforts, required to partially restore the asset to its pre-event state. Damage to assets is valued in most cases at replacement cost, but incorporates some minimum element of mitigation measures or technology, required to secure the integrity of the asset, and in particular to protect it from damage that could result from future disaster events. Mitigation measures required to reduce longer term vulnerability are noted as additional costs, according to this methodology.

For the purposes of a reconstruction programme, and because reduction of vulnerability is so germane to the objective of the exercise, it was critical for the assessment to take into account the value of improved replacement, including disaster prevention and mitigation criteria, such as better technology and quality and more resistant structures. Such valuation proved tricky because of cumulative damages from Hurricane Ivan. Natural disasters provide a country with an opportunity to rebuild, taking into account the approaches to economic, social and environmental development that could simultaneously reduce its vulnerability to natural disasters.

Indirect damages or effects include losses incurred in the form of lower income or output of goods and services, caused by the interruption of the flow of production, over that period of time required to return production to normal levels. It includes those emergency outlays, in particular replacement goods and services, extended working hours and the increased cost of energy and other inputs, required to restore or replace the flow of goods and services generated via the assets that are directly damaged.

The OECS mission interviewed representatives of the government, the private sector, and international organizations, who frequently provided information and valuable suggestions for the preparation of this document.

The cost estimates in this report, unless otherwise stated are quoted in local currency.

1. Social Sectors

1.1 Housing



Figure 7 **House Damaged by Emily.**
Photo Credit: OECS Secretariat

Approximately 2,700 houses sustained some kind of damage during the passage of hurricane Emily. Of the estimated 2,700 damaged houses, 896 had their roofs damaged, while 174 were completely destroyed. The remaining damaged houses sustained either structural or minor damages. As is evident from Table 7 the hardest hit areas were St. Andrew, St. Patrick, Carriacou and St. Georges. Specific areas such as Chantimelle, Telescope, Sauteurs, Marquis, Riversally, Munich, Harvey Vale, Hillsborough and Belmont (to name a few) were severely affected. The majority of residents of the abovementioned areas had their roofs damaged, whilst others either completely lost their houses or sustained some sort of structural damage. The passage of Emily severely tested the resilience of the affected population, given that the majority of persons who suffered damage to their houses had either completed or were near completion of rebuilding after hurricane Ivan.

Table 7 Damage to Housing Stock by Parish

Parish	Total Number of Households Pre- Ivan	Total Number of Houses damaged by Ivan	Total Number of Houses damaged by Emily
St. George's	11367	11367	285
St. John's	2739	2191	151
St. Mark's	1210	847	77
St. Patrick	3210	2247	499
St. Andrew's	7140	6783	1153
St. David's	3530	3530	126
Carriacou & Petit Martinique	1926	770	350
Total	31,122	27,735	2,641

Source: OECS estimates based on official sources and consultation with government and local officials.

The cost of damage as a result of Emily's passage to the housing stock is estimated to be EC\$64.39 million (Table 8). Of that total cost (EC\$ 64.39 million), 99.07% (or EC\$ 63.797 million) represents direct effects as opposed to 0.93% representing indirect impact, mainly in the form of lost revenue due to damage to rented premises and home based businesses, particularly in Carriacou. The majority of houses damaged during Emily's passage were owner-occupied dwellings/houses.

Whilst the total cost of damage to the housing sector is estimated to be EC\$64.39 million, this cost does not represent repairs and replacements to similar conditions (i.e. pre-Ivan and pre-Emily). Thus, reconstruction cost with some mitigation and improvement to the housing stock to reduce its vulnerability, amounts to EC\$74.174 million, as can be seen in Table 9.

Table 8 Cost of Direct Damage to Housing Stock

	Thousands of EC Dollars
Total	64,394,205.00
<u>Direct effects</u>	63,797,385.00
i. Repair of damaged houses	50,340,225.00
ii. Replacement of lost houses	13,457,160.00
Imported component ^a	51,037,908.00
Indirect effects	
i. lost income from rent ^b	596,820.00

^{a/} imported component calculated at 80% of direct effects

^{b/} based on the cost of an average two bedroom flat – rate EC\$1,000.00 for a period one year.

Source: OECS estimates based on official sources and consultation with government and local officials.

Interestingly, the present stock of houses that are currently being built by the National Housing Authority to replace those houses damaged by Ivan, endured the winds and fury of Emily. It is hoped that with enforced building codes and standards that the vulnerability of the newly built housing stock will be lessened.

Table 9 Cost of Replacing Housing Stock²⁷

	Thousands of EC Dollars
<u>Total</u>	74,174,422.35
<u>Direct effects</u>	
i. Repair of damaged houses	55,374,247.50
ii. Replacement of lost houses	16,283,163.60
iii. Cost of furnishings	2,517,011.25
Imported component ^a	59,339,537.88

^a/imported component calculated at 80%

Source: OECS estimates based on official sources and consultation with government and local officials.



Figure 8: Home Constructed by the National Housing Authority House (Thrifty House) after the passage of Hurricane Ivan
Photo Credit: OECS Secretariat

The reconstruction effort cannot be implemented without regard to the socio-economic situation of the peoples and communities affected. The 1999 CDB funded Country

²⁷ Some, with mitigation

Poverty Assessment for Grenada found that, for example, the two parishes most severely affected by Hurricane Emily, St. Andrew's and St. Patrick, accounted for 25.6% and 12.0% respectively of the measured poverty in Grenada. Furthermore, of the unemployed poor in Grenada, 11.8% were found in St. Andrew's and 31.4% in St. Patrick's. A 2004 joint Caribbean Development Bank, UK Department for International Development and European Development Fund study of Social Protection and Poverty Reduction in Grenada supported the findings of the 1999 Poverty Assessment and stated, as regards protection from Natural Hazards to which the poor are extremely vulnerable, that care must be taken to ensure that housing can withstand the storms and hurricanes which affect the Caribbean which such high frequency.

Consequently, reconstruction and replacement of homes cannot be geared simply to replacing damaged houses to their previous standards, but should instead be geared at providing a higher standard of housing capable of withstanding fairly strong hurricanes. This of course raises the question of affordability. Given that the individuals and communities most affected have been documented as forming part of Grenada's poor, and within that grouping the unemployed poor, housing reconstruction and replacement should ideally be funded from grant funds. The effect of natural hazards such as hurricanes serves to severely setback efforts at poverty alleviation and eradication. To the extent that their effects can be mitigated by observation of proper building codes and practices, the Hurricane Emily reconstruction effort should be built around such a preventative approach.

1.2 Education

The estimated value of damage to the education sector is \$EC14.2 million , as detailed Table 10. There were no damages to public libraries, and only two historical sites were affected by the disaster, namely St. Patrick Anglican and St. George Museum. Hurricane Emily interrupted three social development programmes, at an estimated indirect cost of EC \$157,000, as shown in Table 11.

Information was not received on any damages to community centres. However, it was observed that community centres in the affected parishes were already damaged by hurricane Ivan. In the parishes of St. Andrew and St. Patrick, schools and churches were utilized as community centres. These buildings had already been affected by hurricane Ivan. The church and school buildings are of utmost importance to the communities and play central roles in social development. A wide variety of community services is provided in these buildings such as literacy classes, community meetings, and recreational activity. The damages to these buildings will thus further reduce communities' progress in building social capital.



Figure 9 Damaged sustained by a school in Carriacou
Photo Credit OECS Secretariat

A total of twenty-one schools with some, 6,854 students have been affected, in the aftermath of hurricane Emily. The estimated cost of damage is EC \$ 13,433,225 as shown in Table 11. St. Andrew had the highest number of affected schools, followed by St. Patrick, mainly at the primary level. Five schools were destroyed by the disaster, two in St. David, two in St. Andrew and one in St. John. The cost of reconstruction is estimated at EC \$10,268,855. Students attending the primary schools in St Andrew will have to travel four miles to the nearest primary school, since it is not envisaged that the schools will be ready for the new academic year in September. Cruchu Roman Catholic Primary School in St. David had structural damages to the outer wall²⁸ and roof estimated at EC \$1,759,800.00. Only one affected school, Westerhall Secondary in St. George, is being used as a shelter,

²⁸ The outerwall is made of chipped wood panelling. This structure is vulnerable and deteriorated as a result of the effects of Hurricanes Ivan and Emily. It was difficult to separate the damages from both Hurricanes.

Table 10 Public Schools Affected By Hurricane Emily: Cost Of Repair And Reconstruction By Selected Parishes

Parish	Schools										
	Pre-primary			Primary			Secondary			Tertiary	
	No	Repair	Recon	No	Repair	Recon	No	Repair	Recon	No	Repair
St. Patrick	1	212,000		3	256,100		2	766,800			
St. David				1		1,759,800	2	243,840	2,845,100		
St. John							1		2,375,105		
St. George's							1	116,160			
St. Andrew's				6	973,640	3,188,850	2	18,150			
Carriacou				1	35,000					1	215,000
Totals	1	212,000		11	1,264,740	4,948,650	8	134,310	5,220,205	1	215,000

Source: OECS estimate based on official sources and consultations with Government officials

Table 11 Summary of Effects on the Education Sector and Public Buildings

Item	Direct	Indirect	Cost EC Dollars
School	11,994,905	1,271,320	13,266,225
Historical Site	8000	2000	10,000
Social Development		157,000	157,000
Total	12,002,905	1,430,320	13,433,225

Source: OECS estimate based on official sources and consultations with Government officials

1.3 Health

The OECS team considered three essential tasks during the damage assessment of the health sector: rescue, treatment and subsequent care of trauma victims who may have suffered the direct effects of Emily (detailed under the psycho-social section of this report); the prevention and avoidance of effects that may adversely affect public health; and damage to health facilities.

The damage to the major public hospitals, medical stations and homes for the elderly have been estimated at \$EC1.6 million dollars following the passage of hurricane Emily. The situation at the 100-bed Richmond Home for the Elderly continues to be critical. The building was previously severely impacted by Hurricane Ivan. The repaired roof after Ivan did not withstand the impact of Hurricane Emily as one-third of the northern side of the roof was extensively damaged, resulting in flooding and service disruption.²⁹

²⁹ PAHO: Hurricane Emily-Health Situation Report in Grenada and Carriacou.

The same reports indicate that the St. George's General Hospital sustained extensive damage to windows resulting in flooding in sections of the building. At the St. George's Hospital, because of the impact of extensive flooding on the female medical ward, the patients had to be relocated. None of the health centers sustained damage; however, Hurricane Emily damaged two medical stations. Mt. Rich station in St. Patrick's lost its roof and Mt. Carmel in St. Andrew also sustained damage.

In Carriacou, the 32-bed Princes Royal Hospital had its roof extensively damaged, including loss of galvanized sheeting and damage to wooden structures. The Senior Citizens Home at Top Hill was seriously damaged with excessive flooding resulting in minor damage to some sections of the floors. The Home has fundamental structural issues that were compounded by the passage of Hurricane Emily. The cost of damage to the senior citizens institutions is estimated at approximately EC\$2.0 million.

The Health Sector also incurred indirect costs. Vector control in Carriacou is deemed the most critical of public health concerns. The flooding at the landfill and the limited access to it due to the damaged roads, has resulted in increased mosquito breeding and dumping of solid waste outside the entrance of the landfill. As a result of inadequate manpower and equipment, the government had to provide unforeseen assistance in the form of equipment, chemicals, and human resources. An aggregate of the direct and indirect costs to the Ministry of Health was estimated at \$EC 2.76 million dollars as presented in table 12.

Table 12 Impact of Hurricane Emily on the Health Sector

Component	Damage		
	Total	Direct	Indirect
<u>Infrastructure</u>	2,402,460		
-hospitals		145,000 ³⁰	90,000
-Medical Stations		128,080	43,540 ³¹
-Laboratories/blood banks			
-Home for elderly		1,296,640	699,200 ³²
<u>Equipment/Furniture</u>			
-Medical instruments			
-Furniture & basic materials	150,000	150,000	
-Supplies			
<u>Unforeseen</u>			
expenses/income			
-Emergency treatment			
- Epidemiological surveillance	6,000		6,000
-Increased costs in recurrent expenses ³³ (Vector control ³⁴)	92,000		92,000
-Pyscho-social control	110,000		110,000 ³⁵
Total	2,760,460	1,719,720	1,040,740

Source: OECS estimate based on official sources and consultations with Government officials

2. Productive Sectors

2.1 Agriculture³⁶, Livestock and Fisheries Sector

Overview

The Agriculture Sector in Grenada, despite its unfortunate situation continues to play a significant role in the economic and social development of the country providing employment, generating foreign exchange earnings, contributing to food security and ensuring a sustainable environment through good management practices. The sector remains highly vulnerable to physical climatic conditions and has suffered the ravages of

³⁰ damage to window

³¹ Value: costs for treatment (1) person=total expenses divided by # patients seen.

³² Costs of treatment for (1) person per month x total # patients x set back mths for repairs

³³ This includes disruption allowance for technical assistance from Grenada to

Carriacou=EC\$3,000 for 10 working days; overtime pay for additional 4 foggers/sprayers imported from Grenada to Carriacou=\$42 pd x 10days; overtime pay for driver=\$60 x 10 working days; increased use of fuel to start-up fogging machine=5gals@EC8; and fuel costs for use of imported vehicle from Grenada for the technical supervisor=\$55@EC8 x 3 fillings.

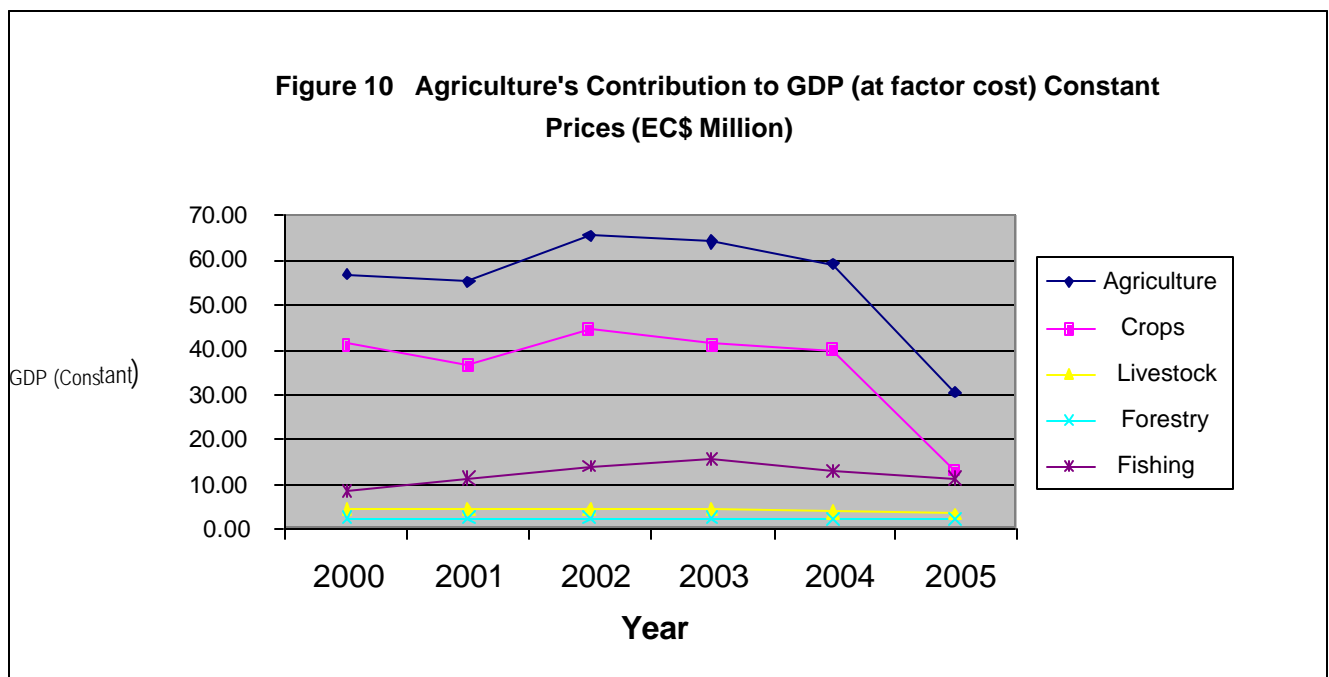
³⁴ Increased costs for water testing, drain cleaning, fogging, household sanitation,

³⁵ This cost is for summer period. Additional costs for counseling because of resource constraints due to school vacation and unavailability of counselors. Costs for next 6 month=EC\$90,000 to include psychiatrists

³⁶ Agriculture used in text defines livestock and fisheries.

two hurricanes within ten months. Hurricane Ivan in September 2004 inflicted severe damage to the agriculture sector, which was expected to expand by 4% within the same year and by 12% in 2005.

The sector, though declining continues to play a significant role in the overall social and economic development of the country. The sector remains a leading contributor to GDP at factor cost, constant prices, contributing over EC\$ 50 million to GDP in 2004, the very year that Ivan struck. (See Figure 10 below).



Source: ECCB National Accounts Data.

The graphical presentation above shows the contribution of agriculture to GDP over the past five years 2000 to 2004 with a projected value in 2005 after the destructive effect of Ivan in September 2004. The graph suggests that the crop sub-sector is the dominant sub-sector and that any change in this sub-sector would have a greater overall effect on economic activity in agriculture as the relationship appears to be close to linear.

The projected contribution of agriculture to GDP of EC\$ 30.33 million in 2005 would plunge further downward with the passage of Emily. This has implications for the country's balance of payments since Grenada would have to import much of its food requirements, a trend that was beginning to be reversed over the past few months since Ivan.

According to the Grenada Marketing Board local supply was approaching national demand requirements and the importation of bananas had ceased since local supply was adequate. The anticipated imports for this crop to meet local demand since Emily is 800 boxes a week over the next six months. Other crop commodities expected to be imported include sweet potatoes, dasheen, tannia, eddoes, plantain, oranges, limes and vegetables especially lettuce and cabbage.

It is clear from the above that agriculture must be positioned to reverse this trend in the short to medium run to achieve sustained economic and social development and to address issues of rural development.

Description, Analysis And Estimation Of The Damage

The damage to the agriculture sector caused by hurricane Emily on July 14, 2005 cannot be described as being widespread and devastating as Hurricane Ivan in September 2004. However, Emily disrupted a critical path of recovery in the agriculture sector causing damage to farms stretching from the southeastern end of the island to the north including areas in the interior including St. Andrews, St. Johns (Belvedere) and St. Patrick. Carriacou and Petit Martinique were not spared the wrath of Emily having suffered direct and indirect damage.

The nature of the damage observed included the snapping and toppling of banana fields, the loss of fruit and blossoms in tree crops, flooding and heavy siltation of vegetable farms in the low lying areas and landslides, river erosion and its concomitant effect on farm roads, bridges and drains and the loss of infrastructure and livestock.

Table 13 Summary of Direct and Indirect Damage in Eastern Caribbean Dollars

Damage	Direct	Indirect	Total
Crops ³⁷	4,801,597	1,749,945	6,551,542
Livestock	223,376	145,075	368,451
Fisheries	398,000	435,312	833,312
Farm roads ³⁸	16,917,200	-	16,917,200
Forestry	524,600	-	524,600
Farm soil loss	620,163	9,691,320	10,311,483
TOTAL	23,484,936	12,021,652	35,506,588

Source: OECS estimate based on field visits, official sources and consultations with Government officials

Crops

The crop sub-sector in Grenada is the most important sub-sector in agriculture. Despite the contraction in the agriculture sector in 2004 by 7.3% compared with a 2.4% decline in 2003, increases were recorded in the output of nutmeg (13.5%) and cocoa (23.7%) in the first eight months of 2004. In the wake of Ivan there was significant destruction of the crop sub sector. Efforts to attain pre Ivan production levels were in progress and

³⁷ This crop damage includes the cost of the loss of secondary flows as a result of inaccessibility to farms caused by destruction to farm roads. It must also be pointed out that those farms which would have been most impacted because of inaccessibility were the banana farms; in this instance, however, the hurricane had already toppled most of the crop.

³⁸ The damage to farms roads did not prevent accessibility to all farms. In some instances farmers were able to access their farms through dirt tracks while in other cases, the roads were motorable once the debris was cleared.

showing signs of recovery of the production base; hurricane Emily inflicted further damage to a previously weakened and vulnerable sub-sector.

Table 14 below presents a damage cost assessment of the crop sub-sector and offers a level of comparison between hurricanes Ivan and Emily by crop commodity.

A reassessment of the damage to the nutmeg industry in the aftermath of hurricane Ivan revealed a 70% loss contrary to the 90% previously estimated. The remaining 30%, which represents 3600 acres, was expected to yield approximately 2,880,000 lbs of green nutmeg in 2005. The passage of hurricane Emily resulted in the damage of 11.6 acres of the crop. The nature of the damage ranged from the toppling of trees to the loss of mature nutmeg and set blossoms.

Table 14 Damage Cost Assessment of Hurricane Emily on Crop Sub- Sector

Crops	Ivan Situation				Emily Situation			
	Pre-Ivan acres	Acres equivalent destroyed	Pre- Emily acres	% damaged	Acres equivalent	Direct Cost	Indirect Cost	Total
Nutmeg/Mace	12,000	8,400	3,600	0.32	11.6	810,000	93,465	903,465
Cocoa	6,602	4,496	2,106	5.5	115.8	1,474,000	385,000	1,859,000
Bananas	350	350	195	80%	156	669,760	308,880	978,640
Citrus	120	18.5	101.5	2%	2.0	7,200	312,100	319,300
Other fruits	240	192	58	20%	11.6	192,531	232,000	424,531
Vegetables & herbs	114.5	114.5	96.5	60%	57.9	1,513,293	289,500	1,802,793
Roots & tubers	282	66.47	215	20%	43	134,813	129,000	263,813
Total	19,708.5	13,637.47	6372	187.82	397.9	4,801,597	1,749,945	6,551,542

Source: OECS estimate based on field visits, official sources and consultations with Government officials

The bearing cocoa fields before the passage of Emily totaled 2,106 acres compared to 6,602 acres prior to Ivan. Of this, 5.5% representing 115.8 acres was recorded as damaged in the aftermath of Emily. The damage to the industry includes the toppling of trees, destruction of the apical part of the stem, leaf tissue desiccation caused by the high winds, mature pod and flower drop, the destruction of infrastructure at Mount Horne and the nurseries at Boulogne, Ashden, Maran and the germplasm bank at Mount Horne. The damage to the cocoa sub-sector is expected to affect the yield of the November crop.

The banana industry, which was enjoying a level of recovery since Ivan, suffered an 80% loss. Most of the mature plants, some bearing bunches, snapped or toppled while the followers suffered severe laceration to the leaves

The citrus industry accounts for 40% of all fruits grown in Grenada. During the passage of Emily the industry suffered 2 % damage resulting in the direct loss of some fruit ready for harvest and the expected reduction in yield caused by the impact of the high winds on the flowers and fruit set.

The other fruits like papaya, golden apples, mango, sapodilla, and avocado, which occupied 58 acres of land before Emily suffered 20% damage. The damage suffered was primarily the loss of fruits both mature and young, loss of blossoms, buds and flowers and toppling, which was more common in papaya.

Another category, which includes tomatoes, lettuce, brassicas, curcubits, corn and others, suffered 60% loss mainly due to flooding, erosion of top soil and laceration of leaves. Many of the vegetable farms were flooded, some being the recipient of high deposits of silt as the rivers overflowed their banks.

Approximately 20% of the roots and tubers (yams, dasheen, tannia, sweet potato etc) were estimated to have suffered serious damage. Yam production, which received significant assistance for its resuscitation since Ivan, suffered from the erosion of mounds and surrounding topsoil and the wringing and laceration of leaves.

Farmland

One of the most significant effects of hurricane Emily on the Ivan attenuated agriculture sector, in terms of both its short and long run implications, is the **loss of the productive capacity of soils through excessive erosion and loss of top soil**. The heavy rains, which accompanied Emily, resulted in flooding that not only destroyed farmlands but ruined agricultural lands by depositing heavy layers of silt and a diverse range of undesirable materials.

The farmlands mainly affected are located along the productive riverbed areas in Bacolet, Corinth, and La Sagguesse in St. David and Paradise and River Antoine in St. Andrew.

In the estimation of total farmland loss, a value was assigned to the damage on the basis of what the land would have produced over ten years based on the average productivity levels of the affected area. The value of damage to land temporarily affected by flood deposits as in Grenville and Paradise and River Antoine in St. Andrew was developed on the basis of the cost of clearing an acre of land and to perform the requisite activities to return the land to its productive status. The base estimates were obtained from the Planning Unit of the Ministry of Agriculture.

The implicit assumption here is that the cost of removing the silt, the debris and other material deposited is justified by crop profitability. However, before these lands can be productively utilized considerable expense must be incurred in clearing, maintaining a fine tilth and leveling.

Total cost of the damage to farmlands was estimated at EC\$ 10,311, 483 with direct cost estimated at EC\$ 620,163 and indirect losses at EC\$ 9691,320. The banana and vegetable sub-sectors suffered the most because major cultivations are located in the low-lying valley areas along the rivers.

The indirect losses include decrease in production of the various commodities throughout the recovery period resulting from the direct damage of Emily as well as the cost of works required to mitigate a similar unforeseen occurrence in the future. The mitigation programme to be developed and implemented includes critical soil

conservation practices such as terracing, contouring, strip cropping and the use of special cover crops, construction of diversion ditches as well as dredging of the heavily silted riverbeds and the construction of levees. The costs of the dredging and the construction of levees are not included in the mitigation cost (indirect cost).

Table15 Estimate of Farmland Production Losses for Main Agricultural Crops

Crop	Total land loss		Temporary loss of land		Total direct cost	Indirect cost	Total cost
	Acreage(Acres)	Direct Cost (EC\$)	Acreage	Direct Cost (EC\$)			
Nutmeg/Mace	3	17,100	1	1275	18,375	294,000	312,375
Cocoa	3	36,600	1	1275	37,875	606,000	643,875
Banana	6	180,000	15	19,125	199,125	3,186,000	3,385,125
Sugar cane	2	40,000	1.5	1913	41,913	628,695	670,608
Other fruits	4	60,000	2	2,550	62,550	1,000,800	1,063,350
Vegetables	5	93,750	75	95,625	189,375	2,840,625	3,030,000
Roots and tubers	4	48,000	18	22,950	70,950	1,135,200	1,206,150
Total	27	475,450	113.5	144,713	620,163	9,691,320	10,311,483

Source: OECS estimate based on official sources and consultations with Government officials

Forestry

Hurricane Ivan affected ninety percent (90%) of the forest lands and watersheds, which once supported an ecosystem where much flora and fauna benefited directly or indirectly. The 72 watersheds on the island were devastated, stripped of vegetation reducing canopy cover and exposing the forest and watersheds to a more direct impact of precipitation. The increased runoff and excessive flooding recorded with the passage of Emily is a corollary of the earlier occurrence of hurricane Ivan. The floods ravaged acres of agricultural land resulting in total loss in some areas as in river Antoine, forging its way eroding river banks and also appearing to be a threat to housing in the low lying areas, a condition not witnessed in Grenada in the distant past.

The mitigation of this situation calls for the employment of resources to engage in a strict reforestation and forest management program to include the stabilization of slopes and riverbanks on the island. The urgent development of a nursery facility to produce the relevant plant species for reforestation and agro-forestry will contribute towards facilitating the conservation of the forest and watershed areas for future generations.

An assessment of the damages to the forest resources as a result of Emily is outlined in the table below.

Table16 Estimate of Damages to Forest Resources

Damage category	Direct Cost EC\$
5.25 miles of forest road damages at Annandale, Mt. Hartman, Panama, Mt. Gazo, Les Advocate, and St. Margaret's	369,600
Road slides	115,000
Blockage to bridges, rivers and dams	40,000
Total	524,600

Source: OECS estimate based on official sources and consultations with Government officials

Livestock

The livestock industry in Grenada has always been considered by many to be a high priority sub-sector. However, the industry has not received the requisite attention to ensure growth and development and to contribute meaningfully to economic activity in agriculture. As a result the sub-sector is relatively under-developed and its potential particularly for impacting positively on import reduction has not been fully exploited. In fact the recognized potential of the industry in Grenada suggests that it can play a significant role in the import reduction efforts of the country, given the enabling environment and necessary support.

Most of the livestock products imported into Grenada are sourced from the USA, Canada, Brazil and Trinidad and Tobago. The Grenada Ministry of Agriculture data, 2003 shows that the country imports approximately 9.6 million kilograms of meat products valued at EC\$23.25 million of, which chicken meat imports account for 69.5% in volume and 57.8% in value.

Unlike hurricane Ivan, which impacted heavily on the livestock sub-sector resulting in total damage amounting to EC\$ 9.34 million, the impact of hurricane Emily on the industry was not so severe. Total cost of the damage as presented in Table 17 is estimated at EC\$ 328,3375, with direct cost estimated at EC\$ 183,300 and indirect losses at EC\$ 145,075.

Because of the nature of the hurricane, there was very little loss in the livestock population. However, livestock infrastructure such as housing and fencing and to a lesser extent equipment was impacted upon. The heavy rains, which accompanied the hurricane, also resulted in the destruction of access roads and a loss of topsoil through erosion. These two factors have affected and will continue in the short run to impact on the availability of forage for livestock thus resulting in some indirect losses.

The poultry industry suffered the most damage, EC\$ 165,190, accounting for 50.3% of the total cost of damage to livestock. Details of the damages to the livestock industry are presented in Table 17 below.

Table17 Estimated Total Damage to the Livestock Industry

Type of Livestock	Ivan situation		Emily Situation		Direct damage cost					
	Animal population (No.)	No. of animals lost	Total cost of damage (EC\$)	Animal population (No.)	Animal loss (No.)	Livestock	Housing/equipment	Total direct	Indirect losses	Total cost
Cattle	2948	-	132,400	2990	-	-	4,360	4,360	9,255	13615
Sheep	9397	2,406	1,885,269	7,056	39	6330	53,503	59,833	18,615	78,448
Goat	5,317	340	264,156	5,673	33	6,055	37,428	43,483	11,280	54,763
Pig	5899	1,765	2,867,902	4,216	22	2,455	37,905	40,360	12,125	52,485
Broiler	-	-	1,091,888	-	30	3,460	40,000	43,460	42,500	85,960
Layer	-	-	3,096,566	-	20	4,305	27,575	31,880	51,300	83,180
Total	-	-	9,333,181	-	-	10,175	173,125	223,376	145,075	368,451

Source: OECS estimate based on official sources and consultations with Government officials

Fisheries

The fisheries sub-sector suffered some damage to its fleet and infrastructure. One 32 Ft Fiberglass longliner in St. Mark's broke its anchor and drifted away. Fish markets in Gouyave, Victoria, Duequense and Sauteurs had damage to their communications systems while the fish market at Sauteurs also experienced some roof damage. One wooden fishing/sailing sloop in Carriacou and one wooden fish-trading vessel in Petit Martinique sustained hull damages. The Channel 86 repeater with UHF & VHF antennas in Carriacou was also damaged. The total loss to the fisheries sector as a result of Hurricane Emily is estimated to be EC\$833,312, of which \$398,000 was due to direct damage and \$435,312 due to indirect losses, the latter being in the main the result of loss of income by 19 fishers who had the vessels on which they work being out of commission, for an anticipated six months, due to Emily.

Table 18 Estimated Total Damage to the Fisheries Industry

Parish	Direct losses (EC\$)			Indirect losses (EC\$)			Total Losses (EC\$)
	Vessels	Infrastructure	Total direct damage	Income loss due to damage	Income loss due to non-fishing	Total indirect losses	
St. John	-	4,000	4,000	-	85,576	85,576	89,576
St. George	-	-	-	-	81,320	81,320	81,320
St. David	-	-	-	-	9,728	9,728	9,728
St. Patrick	-	39,000	39,000	-	22,800	22,800	61,800
St. Mark	290,000	8,000	298,000	36,000	25,992	61,992	359,992
St. Andrew	7,000	-	7,000	16,800	45,752	62,552	69,552
Carriacou and Petite Martinique	32,000	18,000	50,000	51,000	60,344	111,344	161,344
Total	329,000	69,000	398,000	103,800	331,512	435,312	\$833,312

Source: OECS estimate based on official sources and consultations with Government officials

Farm roads

The impact of the heavy rains, which accompanied Emily, resulted in landslides, the blockage of farm access roads and actual damage to roads. In certain areas remedial work needs to commence almost immediately so that farmers can access their farms to continue with the productive activity, which was progressing positively prior to Emily.

Table 17 below highlights the damage to the road infrastructure by road and cost. The estimates were obtained from the Engineer, Farm Roads Unit, Ministry of Agriculture.

Table 19 Estimated Total Damage to farm Access Roads

Road	Parish	Length (miles)	Cost EC\$
Norman hill	St. Patricks	2.0	376,500
Mt. Reuil	St. Patricks	0.5	300,000
Mt.Rodney	St. Patricks	0.35	210,000
Barique	St. Patricks	1.0	355,000
L'Etage	St. Patricks	1.0	295,000
River Antoine	St. Patricks	0.8	300,000
Non Pariel/Waltham	St. Marks	1.5	285,000
Bon joux	St. Marks	0.5	192,000
Mt. Stanhope	St. Marks	1.0	318,000
Castle hill	St. Marks	0.5	185,000
Mt.Cini	St. Marks	3.0	265,000
Maran/Bopland	St. Johns	1.0	353,000
Chadeau	St. Johns	0.3	165,000
Mt. Nesbit	St. Johns	1.0	250,000
Plaisance Estate	St. Johns	0.6	335,700
Mt. D'or	St. Georges	0.5	150,000
Annandale	St. Georges	1.0	155,000
Madigras	St. Georges	0.75	210,000
Morne Delice	St. Davids	1.25	335,000
La Pastora	St. Davids	1.5	670,000
Mon Repose	St. Davids	1.0	340,000
Bardia	St. Davids	0.75	265,000
Morne Tranquille	St. Davids	1.25	680,000
Luth bur	St. Andrews	2.25	675,000
Claboney	St. Andrews	1.50	235,000
Springs	St. Andrews	3.0	485,000
Grand Fond	St. Andrews	1.25	375,000
Boulogne	St. Andrews	2.0	675,000
Blaize	St. Andrews	1.0	295,000
Pyrenes	St. Andrews	1.0	425,000
Windsor	St. Andrews	4.0	2,000,000
Belvidere	St. Andrews	3.5	1,850,000
Plaisance	St. Andrew	1.25	450,000
Mt. Pleasant	St. Andrew	1.0	292,000
Spring Garden	St. Andrews	1.25	145,000
Dry River/Guapo	St. Andrews	1.25	215,000
Mt. St. John	St. Andrews	2.50	375,000
Conference/Bamboo	St. Andrew	1.20	325,000
Sincerity	St. Andrews	1.0	235,000
La Force/Windsor	St. Andrews	2.0	680,000
Richmond	St. Andrews	1.0	195,000
	Total	55.0	16,917,200

Source: OECS estimate based on official sources and consultations with Government officials

The loss of revenue from farms which were inaccessible because of damage to farm roads has been captured in Table 13 above.

2.2 Tourism

2.2.1 General Overview³⁹

Given the extensiveness of the damage to Grenada's tourism assets inflicted by hurricane Ivan in September 2004, the report on the Macro-Socio-Economic Assessment of the damages caused by Hurricane Ivan, September 7, 2004, prepared by the OECS Secretariat, provides a detailed overview of the performance of the island's tourism sector. The point of departure for the impact assessment of hurricane Emily is therefore a brief update on the performance and recovery of the sector post-hurricane Ivan.

Assessments in the aftermath of hurricane Ivan indicated that a number of accommodation properties including many of the relatively larger hotels with sixty (60) rooms and over were severely damaged, resulting in a reduction in room stock on the island from 1,738 at the end of August 2004 to 860 at the end of December, 2004. This near 50% decrease in accommodation capacity has had serious effects on stay over arrivals into Grenada. (It should be noted that stay over arrivals account for 88% of total visitor expenditure; cruise ship and yacht tourist expenditure represent 8% and 3% of total expenditure respectively).

Preliminary data covering the period January to April 2005 places stay over visitor arrivals at 31,331 compared to 49,550 for the same period in 2004, a decline of 37%. All major source markets except Germany experienced declines – USA (29%); UK (65%); Caribbean (32%); Canada (42%). Visitor expenditure for the four month period declined by 41%, from approximately EC\$ 177 million to EC\$ 104 million. This relative decline in performance is anticipated to continue into the third quarter of 2005, but at a slower pace, attenuated by the steady recovery of market-ready room stock. Conversely growth has been recorded in the cruise category. Over the period January to April 2005, cruise passengers visiting the island totaled approximately 185,000, compared to an estimated 145,000 for the same period in 2004, an increase of 28%.

Grenada's hotel accommodation stock was at 860 rooms at the end of December 2004, or about 50% of the pre-hurricane Ivan room count of 1738. By July 2005, the number of rooms on the market had recovered to 1230, or 71% of the pre-Ivan stock. This number is projected to grow to 1340 by October 2005, just ahead of the next winter/high tourism season. It is projected that Grenada will return to its pre-Ivan room stock levels by the middle of 2006. Given that the island's tourism sector suffered minimal direct damage as a result of the passage of hurricane Emily, that projected recovery path is expected to remain unchanged.

³⁹ Source of Data in this section: Grenada Board of Tourism Annual Statistical Report 2004 and Statistical Overview First Four Months 2005

The Tourist Accommodation Sub-sector

The direct damage sustained by the tourist accommodation sector as a whole was not substantial. However, in some cases, the physical destruction sustained by the properties on Grenada, Carriacou and Petit Martinique, which reported damages, was significant. Only one of the impacted properties was able to continue operations following the passage of Hurricane Emily.

a) Direct damages

The specific direct damages were reported to:

- Roofs, ceilings and floors.

Damages to roofs, ceilings and floors included the removal of roofs and the peeling of the aluminum sheeting covering the roofs and protecting the furniture and equipment in the rooms from weather conditions. Wooden floors covered by tiles were warped causing tiles to lift and break.

- Electrical wiring and installations.

The damage to roofs affected the functioning of the electrical wiring and telephone and television cable wiring.

- Room appliances and accommodation equipment.

The damage and loss of part or entire roofs left the room equipment (air conditioning, televisions, fans, lamps) and furniture including refrigerators, stoves and other small cooking appliances vulnerable to the heavy rains of Hurricane Emily.

Table 20 below lists properties reporting damage: the tourist accommodations, their geographical location, room capacity of the accommodation and the number of rooms that were reported damaged. The information here presented was obtained through field work of the mission and direct interviews with owners or managers.

Table 20: Sample Of The Extent Of The Damage To The Tourism Sector

Name	Category	Geographical location	Capacity	Number of rooms damaged
Silver Beach Hotel	Hotel	Hillsborough	8 rooms 4 cottages (2 apartments each)	3 cottages seriously damaged and non-functional
Caribbee Country House	Hotel	Prospect	8 rooms 1 restaurant	6 rooms completely destroyed, 1 seriously damaged and non-functional Restaurant completely destroyed
Melodies House	Guest House	Petit Martinique	10 rooms	All rooms damaged
Cabier Vision	Guest House	St Andrew	9 rooms	6 rooms damaged
Grand View Inn	Apts/Cottages/Villas	Morne Rouge	54 rooms	4 rooms damaged

Source: OECS estimate based on site visits and interviews

b) Indirect damages

All but one of the hotels registered indirect damages. The indirect damage refers mainly to the interruption of income flows or income foregone due to the loss in capacity (i.e., occupancy) resulting from the natural disasters. Indirect damage considers the rate of room occupancy, the realised room rate, and the time during the year in which the disaster occurred. Hurricane Emily impacted four months prior to the high tourist season. Estimations of the period for which the rooms are not available are also accounted for. Loss of revenue from other services such as gift shops and food and beverage are also estimated.

On Carriacou, a third tourist apartment accommodation, including a gift shop and a restaurant, suffered indirect losses. These losses were associated with the owner's family having to move into the guest accommodations due to damage to the family home.

Only two of the establishments interviewed indicated that they would be fully operational within six to eight months. The others expected to be operational within three to four months and therefore in time for the high tourism season.

Hurricane Emily resulted in a significant amount of debris and solid waste generated from destruction to buildings, trees and other organic material. All of the affected tourism establishments incurred costs for the collection and disposal of the waste

Table 21 below summarises the estimated direct and indirect costs.

Table 21 Summary of Direct and Indirect Damage

Sector	Direct EC\$	Costs	Indirect Costs EC\$	Total Direct and Indirect costs
<u>Tourism</u>	738,725		1,091,769	1,830,494

Source OECS Calculations

2.3 The Manufacturing Sector

The manufacturing sector in Grenada is relatively small, accounting for approximately 6.0 per cent of GDP. The sector is dominated by the production of beverage and tobacco; garments; grain mill products and bakery products; and chemicals and paints.

Since 2001, the sector registered declines averaging 4.5% in each year to 2004, and activity in the sector was projected to remain stagnant in 2005. This was influenced by

fluctuations in output of major industrial products, particularly chemicals and paints and grain mill products and bakery products.

The sector experienced negligible direct damage with the passage of hurricane Emily. Indirect impacts with respect to sales and revenue are also expected to be insignificant. Therefore in the post-Emily period, that is considering the out-turn for 2005 into the medium term, the sector is expected to experience negative growth in 2005 and to recover in 2006 at roughly the same pace as under the pre-event scenario.

2.4 The Wholesale and Retail Sector

The wholesale and retail trade which accounts for approximately 10 per cent of GDP, largely comprises a large variety of traders in foodstuff, clothing and accessories, and books and stationery. Development in the sector is generally influenced by the performance of the other economic sectors and, except in 2001 when overall economic activity declined, the wholesale and retail trade sector has been recording growth. In 2004, the sector was estimated to grow by 8.0 per cent and was projected to grow at an average rate of 7.0 per cent between 2005 and 2007. That average growth rate will increase slightly, post Emily.

Given the projected growth in construction, the wholesale and retail sector will be positively affected by the growth in demand from construction activity, as well as by the efforts to resuscitate the other major economic sectors of tourism and agriculture. The wholesale and retail sector suffered negligible direct and indirect damage from hurricane Emily, except for the few cases, particularly in Carriacou, where the sector experienced some “collateral” impact as a result of the disruption of cottage industry activities affected by damage inflicted on the housing sector. That indirect impact was included in the damage estimates recorded under housing

3. Infrastructure

3.1 Public Utilities

Electricity

Grenada’s electricity is provided by the privately owned Grenada Electricity Services Ltd. (GRENLEC), from its power station located in Queen’s Park, St. George’s. GRENLEC’s present generating capacity is 43 megawatts, with a peak load of 25 megawatts. As a result of hurricane Ivan, it is estimated that 80% of GRENLEC’s distribution system had been damaged, while the main generating system had been left essentially intact.

A damage assessment subsequent to hurricane Emily was carried out by GRENLEC for Carriacou and Petit Martinique. This assessment confirmed relatively minor damage, with most occurring to the East feeder in Carriacou, servicing the areas of Belair, Top Hill, Mt. Pleasant, Grand Bay, Mt. Royal and Mt. Desire. Power was restored to the sites most affected in Petit Martinique within nine hours the day immediately following the event. Power was fully restored to all customers by the day after.

The initial time frame set for complete restoration was three weeks; however with the assistance of two linesmen the adjusted restoration period was compressed to two weeks. The total restoration effort required 3168 manhours of labour, accommodation for one linesman, and a ten day boat charter, all at an estimated cost of EC\$ 40,000. This is one measure of indirect damage. Total loss of revenue over the two week period for Carriacou and Petit Martinique, is estimated at EC\$ 100,000. Direct damage was estimated at EC\$ 250,000.

For Grenada, where damage to the distribution system was minor, direct costs of restoration are estimated at EC\$ 350,000, while associated loss of revenue (indirect damage) is estimated at EC\$ 180,000⁴⁰.

The indirect damage assessment carried out for the electricity utility notes that the monthly revenues for GRENLEC are approximately EC\$8.5 million; 50% of the revenues come from St. George's, Grand Anse and Grenville, where damage was minimal.

Water Supply and Sewerage

The National Water and Sewerage Authority (NAWASA) survey of the effects of Hurricane Emily on the water production, storage and distribution system yielded broken water mains and distribution lines, the silting up of dams and the blockage of roads to dams. The damage was concentrated around the following areas: Peggy's Whim in St. Patrick's where \$300,000 worth of damage was sustained in terms of the silting up of the dam and broken transmission lines leading from the dam; Spring Gardens in St. Andrew's where \$180,000 worth of damage was done to transmission and distribution lines; Petit Etang in St. David's where \$98,000 worth of damage was done to transmission lines; Mt. Horne in St. Andrew's where \$85,000 worth of damage was done in terms of silting up of dam and breaks in the transmission line; and Tufton Hall in St. Mark's where \$47,000 of damage occurred. In total NAWASA has estimated direct damages of \$522,600 to the water production/storage/distribution system in St. George's, St. David's, St. Andrew's, St. Patrick's, St. Mark's and St. John's.

NAWASA has further calculated indirect losses of \$233,026 to the water system centred on revenue losses, trucking water to areas where the water supply has been interrupted and increased overheads in terms of overtime pay and other costs to restore services to normal.

Total losses to the water production, storage and distribution system as a result of Hurricane Emily are therefore calculated at \$755,626, as shown in Table 22 below.

⁴⁰ These are very rough estimates; no official damage estimates for Grenada were available at the time of completion of this assessment report.

Table 22 Damage Assessment Water Sector - Direct and Indirect Losses

Direct Losses			
PARISH	TREATMENT PLANT	DAMAGE ASSESSMENT	REHABILITATION COST
ST. GEORGE'S	Annandale	Dislocated 8" raw water mains. Dislodged concrete pillars	\$15,000.00
	Vendomme Bon Accord Radix	Broken 4" force and distribution main.	\$5,000.00
		Siltation of dam	\$1,000.00
		Siltation of Dam	\$800.00
ST. DAVID'S	Petit Etang	Major brakes on transmission line. Extensive rehabilitation work	\$98,000.00
		Major breakage of 5" line. Erosion on road to dam.	\$6,500.00
	Les Avocats		
ST. ANDREW'S	Mirabeau	Major damage on 8" line. Concrete columns to be built	\$35,000.00
	Spring Gardens	Major damage on 6" line. Relay 1,500ft of 6" line and pillars.	\$180,000
	Mt. Horne	Major damage and loss of 6" trans. Line Concrete pillars to be constructed Major dam cleaning	\$85,000.00
ST. PATRICK'S	Peggy's Whim	Major cleaning on both dams	
		Major relocation of 2000 ft. of 8" trans. Line with associated concrete works.	\$300,000.00
ST. MARK'S	Tufton Hall	Major siltation of dam. Spring transmission line under river dislodged Distribution line breakage in several areas	
		Re-routing 800 ft. of distribution line from spring	\$47,000.00
	Fountain	Major concrete works Minor pipeline repairs and major dam cleaning	\$2,000.00
ST. JOHN'S	Clozier Dougladston	Minor distribution line repairs	\$800.00
		Major siltations of both dams	
	Grand Roy Concord	Pipeline re-routing with concrete pillars Accommodation for Mt. Granby dam switch over	\$38,000.00
		Siltation of Dam Repairs to sluice gate	\$1,000.00
		Major siltation of dam Transmission line rapture at dam apron Re-alignment of 6" distribution line	\$15,000.00
Indirect Losses			\$522,600.00
		Estimated Revenue Loss	\$162,324.54
		Trucking	\$50,000.00
		Additional Overhead	\$20,701.30
Total Losses			\$755,625.24

Source: NAWASA

Telecommunications and Broadcasting

Initial assessments of damage sustained to telecommunications infrastructure revealed that many customer premises in Carriacou were out of power, leading to some revenue losses for business customers; drop wires at Carriacou were broken from the distribution points; many poles in the north of Grenada were downed due to mudslides, resulting in fallen cables and that two breaks on the main optical network resulted in some loss of traffic. However, in this latter case, an automatic traffic reroute facility enabled the core of the mobile network to remain operational. While mobile antennas were not damaged, some realignment is required.

Restoration costs, an element of direct damage are valued at EC\$ 850,000. This estimate is based on the actual value of restoration works provided by the dominant telecommunications provider, adjusted to account for damage sustained to the infrastructure of other service providers. Indirect damages, in the form of fuel running costs of standby generator plants and lost revenue due to service interruptions was estimated at EC\$ 500,000, given losses revealed from the initial assessment, reports (to date of this damage impact assessment) of over 1000 fixed line faults, and the fact that assessments, particularly of mobile services are still ongoing.

Roads and Drainage

Land Slippage

Given the extent of the rainfall associated with Hurricane Emily, one of the more destructive effects of the event was the widespread occurrence of landslides, including fresh land slippage in the uninhabited mountainous interior and along roadways, particularly in the northern parishes, which significantly impacted infrastructure. The main contributing factors were the increased level of hillside farming increased construction on steep slopes and destruction of vegetation by Hurricane Ivan, which exposed the ground to wind and water erosion. A list was provided of all sites at which significant landslides and deposition of debris had occurred, together with the emergency costs of clearing and cleaning. These costs were the first recorded component of direct damage to transport infrastructure.

Damage to Roads and Bridges

The list of landslide affected road sites was used as a rough guide to identifying and visiting roads, bridges and slopes that were known to and were likely to have sustained significant structural damage, some of which had only become evident after slides and debris were cleared away. The main affected areas were captured in this assessment via extensive site visits and follow up interviews with senior officials of the Ministry of Works.

It was noted that much of the damage to both bridges and roads was attributed to the dumping and washing of debris into watercourses, particularly trunks and roots of trees and other vegetation uprooted or snapped by Hurricane Ivan, which clogged culverts and bridges, impeding free and normal water flow and resulting in excessive scouring, heavy loading of structures and overtopping of road surfaces.



Figure 11 Land Slippage at Balthazar requiring Retaining Wall
Photo Credit Public Relations Officer, Ministry of Works, Grenada



Figure 12 Debris obstructing Watercourse at Mt. Carmel
Photo Credit Public Relations Officer, Ministry of Works, Grenada

Direct damage estimates were based on approximate lengths of road and/or stabilization works damaged or required to restore the infrastructure to its pre-Emily state, and the average unit costs of restoration or mitigation works per square metre or per cubic metre, provided by road inspectors. In the majority of cases, it was easily possible to

distinguish between damage caused by Hurricanes Ivan and Emily. Where the observed effects were combined, the incremental impact of Emily was estimated by apportioning a percentage of the cost of rehabilitation and mitigation to Emily, based on the advice of technical staff of the Ministry of Works.

In many cases, it was inherently impractical to do a pure costing of restoration of the road condition to the pre-event state. This is because much of the damage was as a result of landslides or scouring, which resulted in the undermining of roads and/or the creation of unstable slopes. Remediation would therefore require replacing denuded natural surfaces with hard engineering protective works (new or extended reinforced concrete retaining walls or gabion walls) which serve to replace eroded banks and slopes as well as mitigate future damage and the risk of structural failure. In a few cases however, beyond the immediate restoration and protection solution, longer-term risk mitigation solutions were identified, including road realignment.

Table 23 Summary of Direct Road Infrastructure Damage by Parish

Zone	Cost (EC \$)	o/w Imported	Value of Imports	Additional Long Term Costs
<i>North St. George</i>	\$527,800.00	\$42.44	\$224,000.00	
<i>South St. George</i>	\$35,100.00	\$0.00	\$0.00	
<i>St. David</i>	\$104,000.00	\$0.00	\$0.00	
<i>St. Johns</i>	\$998,400.00	\$36.56	\$365,000.00	\$80,000.00
<i>St. Mark</i>	\$1,532,700.00	\$38.04	\$583,000.00	\$147,000.00
<i>St. Patrick</i>	\$994,500.00	\$34.79	\$346,000.00	
<i>St. Andrew</i>	\$2,941,900.00	\$41.13	\$1,210,000.00	
<i>St. Pauls</i>	\$83,200.00	\$61.54	\$51,200.00	
<i>Carriacou</i>	\$5,200.00	\$0.00	\$0.00	\$200,000.00
Total Direct Damage	\$7,222,800.00		\$2,779,200.00	\$427,000.00
Total Direct Damage Inc. Long term Solutions	\$7,649,800.00			

Source: OECS and Government officials', field visits

The damage estimates shown in Table 23 above include clearing of slides and water borne debris, restoration works to damaged road surfaces, slope stabilisation and protection by erection of new and extension of existing reinforced concrete and gabion retaining walls, construction of new concrete drains, river training and some related river dredging. It should however be noted that the need for extensive dredging of river courses, which has been compounded by hurricane Emily, has not been costed in this assessment, nor has it been costed within the assessments on agriculture or the environment. The time available to the OECS assessment team did not allow for a meaningful valuation of the incremental impact of hurricane Emily on the level of silting of the numerous watercourses around the island.



Figure 13 St. Paul's Land Slippage and Road Failure
Photo Credit Public Relations Officer, Ministry of Works, Grenada

In the case of bridges, where structures were not destroyed they were severely weakened and their integrity therefore compromised. Some cases, for example the Pearls Seamoon Bridge, warranted demolition and reconstruction, while others required strengthening of walls and abutments.



Figure 14 Damage to Approach and Structure of Pearls Seamoon Bridge
Photo Credit Public Relations Officer, Ministry of Works, Grenada

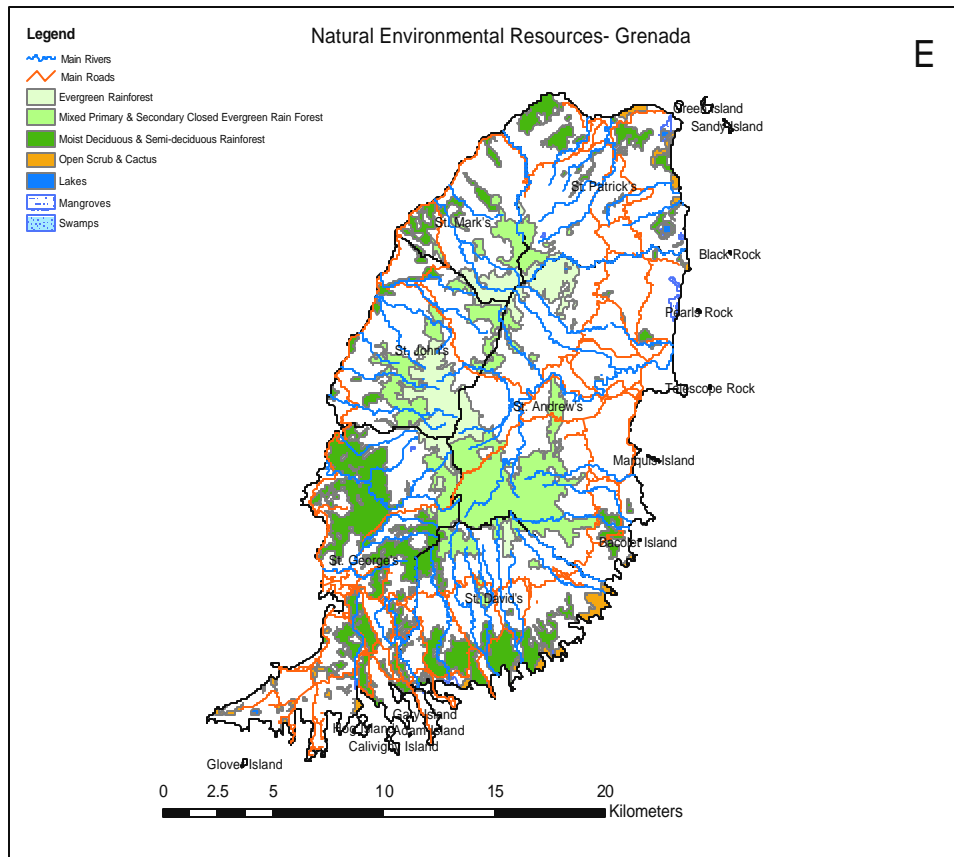
It should be noted that clearing and cleaning costs include an element of indirect damage, to the extent that staff of the Ministry of Works would have had to work extended hours to oversee these emergency works. However, this would be minimal since small contractors providing both equipment and labour undertake these works. Indirect costs associated with temporary inaccessibility were also insignificant since most slides were cleared within three to five days, with a few cases requiring one to two weeks of work. In the few cases of existing roads that remained impassable up to the time of this damage assessment, there were adequate road diversions in the immediate vicinity of the affected site, thereby minimizing inconvenience and additional time costs for road users. In the single case of a washed away Bailey Bridge, a community of approximately 40 low income households suffered the loss of convenient pedestrian access.

Very little accompanying damage to nearby infrastructure (including utility poles) was noted for areas affected by landslides. However, in a few cases, both low and middle income houses are left at risk of structural failure or collapse should there be subsequent sustained heavy rainfall. These instances of potential loss of life or property, together with cases of severe threat to the structural integrity of roads and bridges, would influence the setting of priorities for remedial and reconstruction works.

4. Effects on the Environment

4.1 The Environmental Baseline

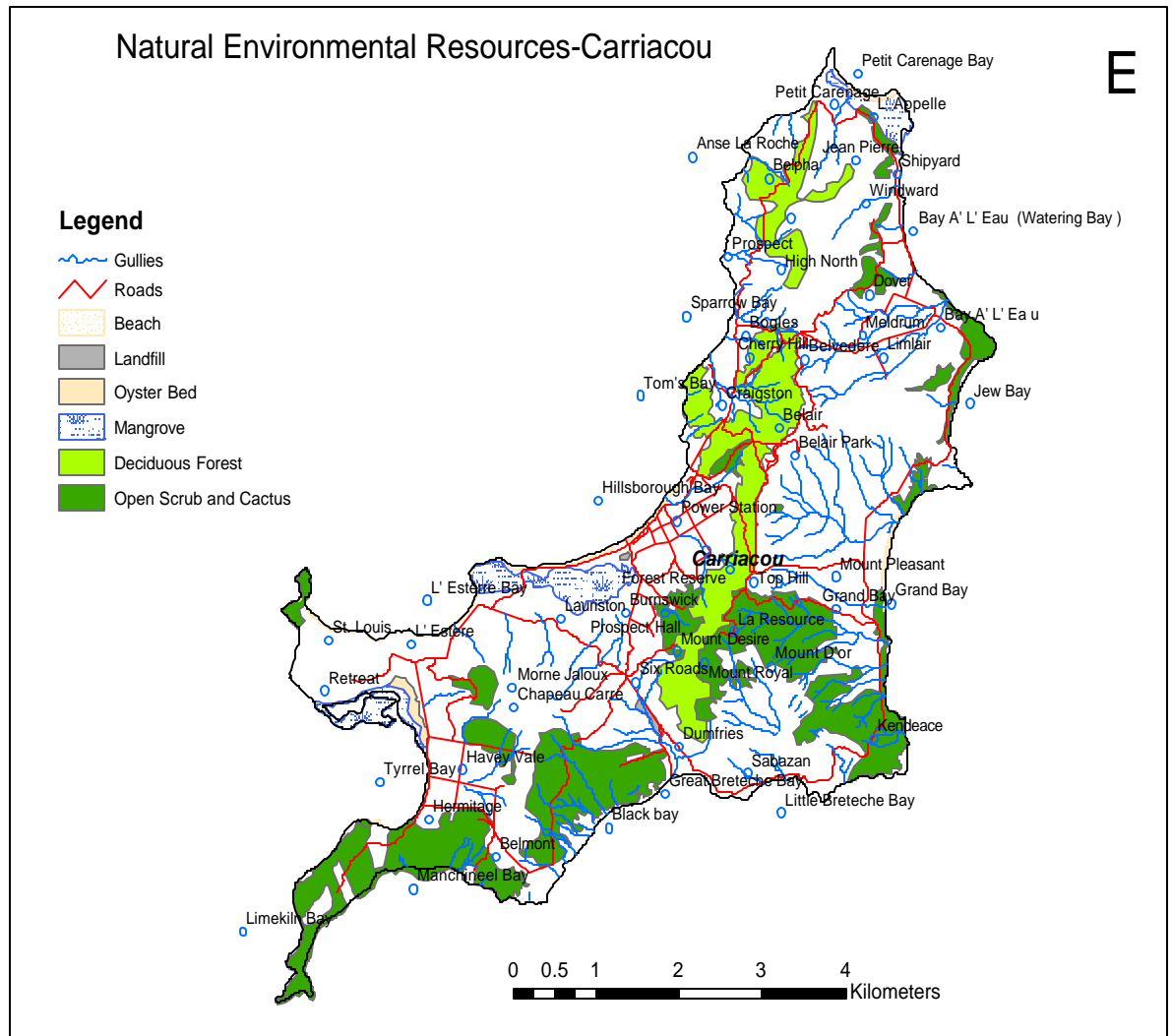
Grenada's natural and environmental resources can be identified to be coral reefs, mangrove, forests, beaches, wildlife, and fisheries. Following the passage of Hurricane



Source: Land Use Division, Ministry of Agriculture

Ivan in September 2004, Grenada's biodiversity has been drastically reduced⁴¹. Since then there has been some indication of natural regeneration of forest vegetation. The natural resources of Carriacou and Petit Martinique which were unaffected by Hurricane Ivan, consists of coral reefs, beaches, mangrove forests, oyster beds, sheltered bays, and forests. In Carriacou, 136 hectares of forest is protected at High North. Mangrove woodlands exist along the north and south coasts of Carriacou, with the more extensive system occurring at Tyrrel Bay

⁴¹ Grenada: Macro-Socio-Economic Assessment of the damages caused by Hurricane Ivan September 7, 2004, report provides a detailed background to the national environmental baseline, prior to hurricane Ivan (September 7th, 2004).



Source: Land Use Division, Ministry of Agriculture

Hurricane Emily's impact on Grenada's environmental resources was manifested primarily through landslides in the northeastern part of the island, which resulted in a number of roads being blocked. Obstructions in waterways, i.e. rivers and drains by various elements of solid wastes, and other organic debris, such as tree trunks contributed to flooding in this section of the island. Severe erosion, siltation and damage to mangrove and forest areas were also primary effects.

Soil, Debris and Solid Waste Disposal

Much of the cleared materials from both the landslides and clearing of the waterways have been dumped into the rivers, along roadways and other inappropriate areas. There was also evidence of illegal dumping of bulky waste (mainly wood, pieces of zinc and other types of roofing) along roadsides, riverbanks and around other ecosystems, e.g. mangrove environments.

**Figure 15 Roadside Dumping Of
Roofing Material**



Photo Credit OECS

**Figure 16 Erosion At
Dumfries Landfill**



Photo Credit OECS

Figure 17 Debris Blockage



Figure 18 Landslide



Photo Credit Grenada Department of Environment

The access road to the landfill site at Dumfries in Carriacou suffered extensive damage, from flooding which cut gullies and, in some cases, washed away large areas of the earth roadway caused this. The absence of a maintained drainage infrastructure along the roadway contributed to the uncontrolled flow of water rendering the road unusable for a number of days post hurricane Emily. Some areas of the landfill within 1000 meters of the coastline were also washed away. There is concern that refuse washed

away from the landfill was transported to the coastal environment resulting in visual pollution.

The damage at the Dumfries landfill operations and the remediation measures to be undertaken, are important in the context of eco-tourism, due to the presence of the Lime Kiln, which is a historical site situated less than 200 meters from the landfill. The tourism master plan and developmental plan for Carriacou and Petit Martinique makes explicit reference to the development of such historical assets.

Erosion and Water Quality Degradation

The heavy rainfall from Hurricane Emily, compounded by insufficient forest canopy caused by the destruction of forestry resources by Hurricane Ivan, resulted in high rates of run-off and soil erosion. Severe erosion was evident along riverbanks, particularly River Antoine where significant tracts of land along the riverbank used for agricultural purposes and housing in low-lying areas have been washed away. Increased siltation of waterways had adverse effects on water quality in streams and rivers. Sediment plumes were also noticeable in Soubise and Marquis along the beach.

Mangrove Degradation

On Carriacou approximately 25% of Lauriston's 28 hectares of White mangrove (*Laguncularia racemosa*) suffered significant damage. Toward the interior near to the Lauriston airstrip, there are a number of broken and felled mangrove trees. High rates of evaporation facilitated by exposure of ground area can result in a "drying" out of some areas, especially if drought conditions obtain, which Carriacou is usually subjected to, or if tidal movements are impeded. This situation can negatively impact nutrient flows and the unrestricted movement of species. The affected trees will therefore need to be cut and removed to facilitate the normal flows within the mangrove environment and encourage natural regeneration.

Another concern noted was the potential negative impacts on the marine resources. Mangrove environments play a role in the production and transfer of nutrients for the benefit of both plant and animal marine species. Moreover, mangrove environments are spawning grounds and function as nurseries for resources such as the local Salmon and other fish, mollusks and crustaceans.

If replanting of mangrove seedlings becomes necessary at some stage, the indirect costs associated with this would include a nursery infrastructure with extended care for the juvenile plants. Adopting a "do nothing" approach to the present situation may compromise the functioning of the ecosystem.

Figure 19 Mangrove Damage at Lauriston



Photo Credit OECS

Forests⁴²

Approximately three acres of forested area including Mahogany, and Red and White Cedar, in Belair, Carriacou was damaged due to uprooting of trees, broken branches and shedding of leaves. Shedding was also noticeable at Chapeau Carre and at Dumfries where stands of Mahogany, Red and White Cedar, and Mauby are being cultivated by the Agricultural Division, Ministry of Carriacou and Petite Martinique Affairs. There was also damage to fencing used to keep out “free ranging” foraging animals. The Agricultural Division plans to reforest the area.

Table 24 Goods and Services Provided by Ecosystems in Grenada

Ecosystem	Goods	Services
Forest ecosystems	Timber (furniture, boat building) Fuel wood Drinking water Non-timber products (fruit, plant medicines, wildlife) Genetic resources	Maintain array of watershed functions (infiltration, purification, stabilisation) Remove air pollutants, emit oxygen Cycle nutrients Maintain biodiversity Sequester atmospheric carbon Moderate weather extremes and impacts Generate soil Provide aesthetic enjoyment and recreation
Agro-ecosystems	Food crops Crop genetic resources	Maintain limited watershed functions (infiltration, partial soil protection) Provide habitats for birds, pollinators, soil organisms, etc. important to agriculture Build soil organic matter Sequester atmospheric carbon
Freshwater ecosystems	Drinking and irrigation water Fresh water fisheries Genetic resources	Dilute and carry away waste Cycle nutrients Maintain biodiversity Provide aquatic habitat

⁴² Forestry was also discussed in the section on agriculture. In that section, however reference was made to the damages caused infrastructure to leading into the forest reserves.

Coastal ecosystems	Fisheries Seaweeds (sea moss) Wood for charcoal Genetic resources	Provide transportation corridor Provide for aesthetic enjoyment and recreation Moderate storm impacts (mangroves, barrier reefs) Provide wildlife (marine and terrestrial habitat) Maintain biodiversity Dilute waters
Reef Fisheries	Minor	Provide for aesthetic enjoyment and recreation The habitat for reef fisheries received minor damage. There is, however, a reported increase in spear fishing of reef fisheries after the hurricane.

Source: OECS summary of various technical documents

Table 25 Summary Of Environmental Impacts

Location	Affected Ecosystem /Issue
<u>Grenada</u> Baltazar, Munich, Moyah, Simon, Town of Grenville, Richmond, Simon Bridge, Durnfermline Bridge, Lesterre Bridge, Progress Park Road, Moyah Bridge	Land Slides, Flooding, Bridge infrastructure damages, Erosion, Soil creep,
<u>Carriacou</u> L'Esterre, Lauriston Belair, Chapeau Carre, Dumfries	Damage to Mangroves Damage to Forest vegetation

4.2 Valuing the Environmental Damage

The purpose of assessing the quantum of damages is to identify the magnitude of the impact on environmental resources and services and on the economy as a whole. Full economic loss and remediation cost are two means by which damage may be valued. It has been difficult to quantify the economic loss or the impact of the damage to the natural/environmental resources and services on the national economy. Remediation costs are based on the nature of the work to be undertaken to restore the environmental assets. Remediation cost (e.g. labour, equipment) was used to quantify the indirect damages in Table 26 below.

The main direct environmental impacts included impacts to forestry and mangrove resources. Indirect environmental damages consist of costs associated with clearing and disposal of soils displaced by the landslides and solid wastes and reforestation activities. Table 26 includes solid wastes indirect damages for Grenada, Carriacou and Petite Martinique obtained from the Ministry of Communication and Works. Reforestation costs are only for Carriacou and were obtained from the Department of Agriculture in the Ministry of Carriacou and Petite Martinique Affairs.

There are some areas, for example, mangrove resources, where the environmental impacts are uncertain and which will require ongoing environmental monitoring.

Table 26 Summary of Indirect Damage

Sector	Direct damage EC\$	Indirect damage EC\$
Forestry Reforestation		40,000
Solid Waste Collection and removal		1,630,000
Total Indirect Costs		1,670,000

Source: OECS and Government of Grenada Calculations

III MACROECONOMIC EFFECTS

This chapter comprises four sections. The first section presents an estimation of the summary of damages (direct and indirect) and an evaluation and interpretation of the results. The second section describes the macroeconomic trends in the previous year (i.e., the year prior to the disaster). The third section analyses the short run (2005) and medium run (2006-2007) expected performance of the economy without the disaster. The final section provides a macroeconomic assessment of the disaster. The second, third and fourth sections survey the overall economic trends of the economy, fiscal policy, the external sector and the financial system to the extent that is permitted by the availability of data. The last section also gives a detailed analysis of the expected performance of the main economic sectors. In addition the fourth section considers the effect of the disaster on the evolution of prices and the level of employment.

All estimations were carried out on the basis of official data and also on information provided by private sector organisations.

The effects of the damages are significant mainly in respect of the fiscal accounts. The damages amount to 12.9% of the current value of GDP. The most important component of overall damages, losses or costs is the direct damage. In relative terms the overriding damage is concentrated in the housing sector. The natural environment was also severely impacted, and that effect is partially integrated into the damage estimates for roads and bridges and agriculture. This damage to the environment has potential medium to long term effects on infrastructure and the productive sectors if a comprehensive set of mitigative measures are not implemented in the short term.

As well, the damage has important implications at the social level firstly since it has affected some sectors that are labour intensive, in particular agriculture, but also because of the compounded psycho-social impact occasioned by hurricane Emily, coming as it did only ten months after the devastation caused by hurricane Ivan. The effects of hurricane Emily will only have a minimal impact on employment if farmers in particular can be sufficiently motivated to restart and in some cases redouble their efforts at restoring the source of their livelihoods, but also if existing unemployed skilled labour can be rapidly retooled to service the manpower needs of the construction sector, especially in the short to medium term.

In the year in which hurricane Emily occurred (2005) overall GDP is projected to grow at a rate of approximately 12%, down from the 13% projection post-Ivan, which had captured the twin impacts of disaster-induced growth in the construction and wholesale and retail sectors, and partial recovery of tourism. Post-Emily, the construction sector will expand a bit further, due to the additional reconstruction and recovery efforts required in the housing and road transport sectors. In 2005, agriculture, the productive sector most affected by Hurricane Emily, is expected to decline by 43%, a further deterioration on the post-Ivan projected rate of decline of 36.1%.

Nowwithstanding the stand-alone modest effects of hurricane Emily, this event has compounded the challenge of recovery from hurricane Ivan in a manner in which the damage assessment methodology would not fully capture. In particular, **a broader range of rehabilitation interventions must now be placed on the critical path to economic and social recovery. Large scale interventions in the housing,**

agriculture, road transport and environmental sectors must now all be undertaken simultaneously, in order to restore the natural and infrastructural productive bases of the economy, as well as to urgently reduce vulnerability levels and social distress. The urgency of these interventions place a huge premium on the need to firmly secure substantial amounts of grant funding in a short time frame, and to enhance institutional capacity at all levels to rapidly and effectively design and implement remedial initiatives across all economic and social sectors in the short term. In addition to the economic safety valves that have been identified to cushion the downturn in specific sectors (for example short term crops in agriculture, cruise tourism and the construction sector itself) there is now an even more urgent need to revisit the scope and adequacy of social safety nets.

1. Summary of damages

The total damage of hurricane Emily is estimated to be about EC\$ 140.0million, that is about 12.9% of the current value of GDP. The bulk is concentrated in direct damages. These account for 87% of the damage or 11.2% of GDP.

The results highlight the fact that, as described in this report, most of the damage was concentrated in housing, social infrastructure, and agriculture.

Sector	Direct damage	Indirect damage	Total
Agriculture	23.48	12.02	35.51
Tourism	0.74	1.1	1.84
Electricity	0.6	0.28	0.88
Water/sewage	0.52	0.24	0.76
Telecommunications and Broadcasting	0.85	0.5	1.35
Education	12.0	1.43	13.43
Transport	7.2	0	7.22
Housing	74	0.6	74.6
Health	1.72	1.04	2.76
Environment	-	1.67	1.67
Total	121.14	18.88	140.02

Table 27 Summary of direct and indirect damages Millions of Eastern Caribbean Dollars

Source: OECS Calculations

2. The Pre-disaster Situation

2.1a General trends

Since 1980, Grenada has undergone two phases of economic growth. The first one lasted from 1980 until 1987. The second one began in 1993 and was interrupted by the effects of the September 11th events. Following two years of negative growth (-4.3%

and -0.4% in 2002 and 2003 respectively) the economy clearly recovered in 2003 and expanded at a rate of 5.7% (the highest among the OECS and also among CARICOM economies).

From the early 1990's to 2003 growth was mainly propelled by the construction sector and the tourism industry. During this period construction registered growth averaging 5.3 per cent per annum; in 2003 its contribution to GDP reached 9.8%. Construction activity responded mainly to the initiative of the private sector and public capital expenditures.

The tourism industry, as reflected by the hotel and restaurant sector, also recorded similar growth rates averaging 5.1 per cent per annum.

The manufacturing sector has also been fairly buoyant in Grenada during this period recording growth averaging 5.1 per cent per annum. The experience of the agricultural sector has been less encouraging as real output on average declined by 0.1 per cent per annum in that sector.

The increase in aggregate output and in particular the dynamism of the construction sector translated into a higher import demand for goods. This led, in conjunction with the contraction in the production of traditional export crops, to a widening of the merchandise trade deficit through the period.

2.1b The Impact of Hurricane Ivan

Hurricane Ivan, a Category 5 Hurricane, which impacted Grenada in September 2004 upset all calculations as it relates to economic performance for 2004 and the medium term (2005-2007). Total damages (direct and indirect losses) to the Grenadian economy were calculated at \$2.4 billion, which represents more than twice the value of 2003 current GDP. Most of the direct damage was concentrated in infrastructure and in particular in housing, with 89% of the housing stock damaged in some form of the other, and with a major proportion suffering severe structural damage. The damage to housing was calculated at 1.4 times the current value of GDP. The damage to agriculture was calculated at 10% of GDP. In terms of tourism, including the important yachting sub-sector, direct damages to this vital sector were estimated at 41% of GDP. Damages to other important sectors included education (20% of GDP), electricity (9% of GDP) and telecommunications (14% of GDP). In addition to GDP, the impacts of Hurricane Ivan reverberate to other macroeconomic variables such the Government's fiscal accounts and the balance of payments accounts. Based on the experience with major hurricanes to have affected the Caribbean in more recent times, Hurricane Luis in 1995 and Hurricane Lenny in 1999, it will take the Grenadian economy at least three years to recover from the impact of Hurricane Ivan.

2.2 Fiscal policy

Despite the impact of Hurricane Ivan in September, the overall fiscal deficit for 2004 declined in relation to the previous year, moving from \$57.5m (6.0% of GDP) in 2003 to \$24.2m (2.5% of GDP) at the end of 2004. This improvement, which resulted from a 47.3

% reduction in capital expenditure, was more than offset by the deterioration in the current account.

The reduction in capital expenditure followed the completion of major capital projects undertaken by the government over the previous three years. The deterioration in the current account balance from a surplus of \$38.5m (4.0 % of GDP) to a deficit of \$11.2m (1.2 % of GDP) was the result of a 7.0 % contraction in current revenue and a 9.4 per cent expansion in current expenditure.

The contraction in current revenue was mainly attributed to lower revenue from taxes particularly from taxes on international trade due to 3.0 per cent decline in economic activity resulting from the impact of hurricane Ivan. The increase in current expenditure was mainly due to a 13.2 per cent increase in personal emoluments.

Public Sector debt, excluding guaranteed debt, moved from EC\$984.0 million (82.1% of GDP) in 2003 to \$1293.1m (110% of GDP) in 2004.

2.3 The balance of payments

Owing to an increase in current transfers (or an improvement in the current account), Grenada's balance of payments situation for 2004 was recorded to have improved over 2003, given that a surplus of EC\$104.13 million was recorded in contrast to a prior situation of deficit of EC\$34.59 million. The response to Grenada's distress call in the wake of hurricane Ivan's devastation resulted in an increase in the flow of aid, consequently increasing current transfers. The increase in current transfers recorded, represented a 276.29% increase in current transfers (for 2004 compared to 2003) or an increase from EC\$98.5 million to EC\$370.65 million (38.61% of GDP).

On the financial account the surplus was estimated to have decreased by 51.67% or to EC\$129.29 million. This contraction on the financial account was mainly attributable to the decline in direct investment and portfolio investment of 51.37% (or EC\$113.9 million) and 15.97% (or EC\$11.83 million) respectively.

2.4 Developments in the financial system

Total monetary liabilities of the banking system increased by 17.7% to EC\$1,448.4 million during 2004 compared with growth of 8.0% in 2003. The growth in M2 was influenced by insurance inflows to compensate for property damage caused by hurricane Ivan.

During 2004, domestic credit shrank by 6.6% to E.C.\$926.6 million. A decline of 43.3% in net credit to the central government was the main contributing factor to the decline in domestic credit. In contrast to a reduction in central government net borrowing, credit issues to household and businesses increased by 6.0 % and 8.3 % respectively, partly as result of increase demand for credit in the aftermath of hurricane Ivan.

The counterpart to the expansion in M2 was the 57.5 per cent increase in net foreign assets. This outcome in part reflected growth in commercial banks' foreign assets (72.6 per cent) and was mainly associated with inflows of insurance proceeds and grants.

Grenada's imputed share of ECCB reserves increased by 46.2% reflecting a balance of payment surplus of \$104.1m.

3. The Short And Medium Term Run Expected Performance Of The Economy

without the disaster 2005-2007

3.1 Overall trends

Based on projections prior to the impact of Hurricane Emily, the economy was estimated to grow by 11.91%, in real terms in 2005, inclusive of the impact of Hurricane Ivan. This growth was expected to be fuelled mainly by developments in the construction and wholesale and retail sectors, with real growth rates of 80% and 35% respectively, as the post Hurricane Ivan rehabilitation and reconstruction activities continued apace. Output in agriculture and tourism was expected to decrease by 36.1% and 20% respectively, as the impacts of Hurricane Ivan continued from 2004. In the case of tourism, several important tourism establishments are yet to come back on stream. Overall, declining activity in sectors such as agriculture and tourism was expected to be partially, if not fully counter-balanced by robust growth in sectors such as construction and wholesale and retail trade.

Over the medium term (2006 to 2007) prior to Hurricane Emily, the economy was projected to grow at an overall average rate of 6.58%, in real terms. In 2006 the economy was expected to grow at approximately 1.2%, in real terms, as the post-Hurricane Ivan rehabilitation and reconstruction boom petered out. Agriculture was projected to recover somewhat, growing by 30% in real terms over the 2005 level as farmers made the successful switch from the nutmeg crop destroyed by Hurricane Ivan to faster yielding cash crops such as bananas and vegetables (for example tomatoes and peppers) and other non-traditional crops. Tourism was also projected to recover, growing by 25% in real terms over the 2005 level as the remaining establishments which were closed as a result of the impact of Hurricane Ivan in 2004 came back on stream and registered good occupancy rates. However, the robust growth rates in these two sectors were not expected to counter the fall off in construction and wholesale and retail trade, predicted at 8% and 10% respectively, in real terms. It is important to note that the percentage contribution of tourism (as measured by activity in hotels and restaurants) and agriculture to economic activity was projected to be rather less than construction and wholesale and retail trade in the post-Hurricane Ivan period.

The economy was expected to expand significantly in 2007, by as much as 11.93% in real terms fueled primarily by tourism driven by increased tourist arrivals in an industry fully recovered from Hurricane Ivan and experiencing a boost from Grenada's hosting of events associated with Cricket World Cup 2007.

3.2 Fiscal Accounts

The preliminary outlook for 2005, without the disaster, showed a current account deficit of \$3.9 million representing 0.4% of GDP and an overall deficit of \$62.5 million, equivalent to 5.8% of GDP. Current revenue was expected to grow by \$42.1 million as a result of the expansion in economic activity. However an expected increase in current expenditure in the region of 11 per cent associated with Ivan induced expenditure is projected to more than offset the expected increase in current revenue, resulting in a lower current account balance relative to the outturn in 2003. Capital expenditure was seen to be in the region of \$207.4m in comparison to \$81.9m in 2003. This growth in capital expenditure is due to rebuilding effort following hurricane Ivan. Grants totaling \$148.4m will contain the overall deficit to 5.8 % percent of GDP.

Over the medium term 2006 and 2007, the surplus on the current account is projected to be \$12.9m (1.2% of GDP) in 2006 and \$40.1m (3.2% of GDP) in 2007. The improvement in central governments current account position over the medium term will be as a result of the growth in revenue outpacing that of current expenditure. Tax revenue is projected to grow in line with nominal GDP growth of 3.1 and 12.0 per cent in 2006 and 2007 respectively.

In 2006 recurrent expenditure was forecasted to decrease by 2.5 per cent to \$338.0m, due to a forecasted 12.9 per cent reduction in expenditure on goods and services, thereby returning that line item in the neighbourhood of its pre-Ivan levels. Personal emoluments, the major component of recurrent expenditure was forecasted to remain at about the level recorded in 2005, because it is assumed that the tightening fiscal situation as reflected in the overall deficit will force the government to freeze increments and other salary increases.

In 2007 the current expenditure is expected to increase by 3.5 per cent in part as a result of growth in personal emoluments at the same rate, and growth in interest payments of 5.6 per cent.

The overall fiscal operations of the central government are forecasted to be in deficit over the medium term. The overall deficit was expected to move from EC\$62.5 million (5.8 per cent of GDP) in 2005 to \$75.8m (6.8% of GDP) and \$55.5m (4.4% of GDP) in 2006 and 2007 respectively.

Public sector debt was forecasted to increase by 15.0% over the medium run reaching 1,486.9 million EC\$ in 2007.

3.3. External Accounts

In the absence of hurricane Emily the overall balance of balance of payments was projected to have contracted significantly, from a surplus of EC\$104.13 million in 2004 to a deficit of EC\$26.48 million. This deterioration was expected to be brought about mainly as a result of the substantial current account deficit owing to losses in export earnings due to Ivan's damages. Notwithstanding that the capital and financial accounts were expected to increase from EC\$199.39 million to EC\$490.86 million, the increase was not

anticipated to be significant enough to offset the effect the current account deficit was expected to have on the overall balance of the balance of payments.

3.4 Monetary Accounts

In line with the expected expansion of the economy, the total monetary liabilities of the banking system were estimated to increase by 12.9% to EC\$1,675.5million in 2005. Domestic credit was expected to grow by 16.9% reflecting growth in credit to both the public and the private sectors for rebuilding efforts following hurricane Ivan. The net foreign assets of the banking system were projected to increase by 7.5% to EC\$670.7 million in 2005. Grenada's imputed share of the ECCB reserves was estimated to decline by \$26.5m to EC\$302.2 million to finance the forecasted deficit on the balance of payments at the end of 2005.

Over the medium term 2006 and 2007 monetary liabilities were expected to grow on average by 7.7% to \$1,934.4 million EC\$ in 2007. Domestic credit was expected to increase over the medium term, as the central government utilised the domestic banking system to finance a portion of its overall deficit.

With the anticipated growth in economic activity the expected reliance on the banking system by the private sector would also have contributed to an increase in domestic credit. The net foreign assets of the banking system are forecasted to increase over the medium term on average by 7.5% to EC\$773.2 million in 2007. Grenada's imputed share of the ECCB reserves was forecasted to increase to EC\$318.6 million by 2007.

Without Disaster					
Grenada					
Selected Economic Indicators					
	2003	2004	2005	2006	2007
<i>(annual percentage change unless otherwise stated)</i>					
National Income and Prices					
Nominal GDP at Factor Cost	7.2	(0.4)	13.0	3.1	12.0
Real GDP at Factor Cost	5.8	(3.0)	11.9	1.2	11.9
Rate of Inflation	1.1	2.5	1.0	2.5	1.6
Real GDP at Factor Cost by Selected Sectors					
Agriculture	(2.4)	(7.3)	(36.1)	30.0	10.0
Manufacturing	(2.4)	(14.6)	(18.0)	23.7	1.4
Electricity & Water	6.7	(8.7)	12.0	(3.8)	4.0
Construction	26.0	(0.8)	80.0	(8.0)	(15.0)
Wholesale and Retail	7.4	(5.2)	35.0	(10.0)	5.0
Hotels and Restaurants	13.8	(13.1)	(20.0)	25.0	35.0
Transportation	7.5	5.2	26.4	(11.3)	41.2
Communications	1.9	7.2	3.5	11.6	25.0
Banks and Insurance	8.0	2.5	3.0	(8.3)	5.9
Government Services	0.6	3.5	2.0	4.0	0.4
Other Services	2.4	(13.8)	2.0	5.0	14.5
<i>(as a percentage of GDP)</i>					
External Sector					
Current Account Balance	(31.5)	(12.7)	(47.7)	(47.6)	(39.7)
Overall Balance	(2.9)	8.8	(2.4)	(3.0)	4.0
Merchandise Trade Balance	(50.6)	(59.2)	(71.6)	(63.1)	(59.3)
Central Government					
Current Account Balance	3.2	(1.0)	(0.4)	1.2	3.2
Current Revenue	27.0	25.5	31.6	31.4	31.1
Current Expenditure	23.8	26.4	32.0	30.2	27.9
Capital Expenditure and Net Lending	13.0	8.9	19.1	14.5	10.2
Overall Fiscal Balance	(4.8)	(2.1)	(5.8)	(6.8)	(4.4)
<i>(in millions of EC Dollars, unless otherwise stated)</i>					
Memo					
Nominal GDP at Factor Cost	964.3	960.0	1,084.4	1,118.0	1,251.9
Real GDP at Factor Cost	715.6	693.9	776.6	786.0	879.8
Merchandise Imports (f.o.b)	611.4	661.5	840.4	788.7	831.0
Merchandise Exports (f.o.b)	112.9	82.0	64.2	82.7	89.0
Gross Visitor Expenditure	279.9	248.1	198.5	253.0	345.7

Table 28 Selected Economic Indicators: Without the Disaster

3.5 Assumptions

The major assumptions underlying the growth projections without the disaster are as follows.

Domestic Exports

Contraction estimated for 2005, following the impact of hurricane Ivan. For the period 2006 to 2007 growth based on anticipated recovery in the agricultural and manufacturing sectors.

Domestic Imports

For 2005 a 27 % increase is projected based on trends in the data up to May. Fall off expected in 2006 as a result of anticipated slow down in Ivan and Emily related construction activity. In 2006 and 2007 imports moved in line with the anticipated requirements of the tourism industry and construction sector.

Travel – Visitor Expenditure

A 20.0 per cent decrease in travel credit expected in 2005 followed by increases of 27.0 per cent in 2006 and 36.0 based on an anticipated growth of 25.0 per cent in stayover arrivals as a result of the cricket world cup.

Portfolio Investment – Other Profits and Dividends

Debit and credit in 2006 and 2007 was calculated using a five year moving average.

Direct Investment – Other

The 2005 credit assumes a 50 per cent increase to assist in the reconstruction of assets after Ivan and Emily; the figure was grown by the trend observed from 1998 to 2003.

Capital Grants

Grants for 2006 were calculated by taking the difference between grant commitments made after Ivan and what is projected to be received by the end of 2005. For the other years a moving average was used to arrive at the figure.

GDP by Sector

Agriculture

Agricultural production is projected to decrease from 2005 based on the impact of Ivan on the nutmeg, cocoa and banana industries. A gradual recovery of the sector is projected over the medium term.

Manufacturing

Activity in the manufacturing sector is expected to contract in 2005 with a slow recovery in the medium term.

Electricity and Water

Based on trend.

Construction

Construction is expected to grow by 80.0 per cent in 2005 then decline steadily in 2006 and 2007 as Ivan reconstruction winds down.

Hotels and Restaurants (Tourism)

The decline in 2005 is based on trends observed up to the end of May. In 2007 a 35 per cent increase is expected based on expected growth in arrivals due the cricket world cup.

Air Transport

Based on performance in hotels and restaurants.

Road Transport

Based on performance of hotels and restaurants and construction.

Sea Transport

Based on cargo landed and loaded for expected projects.

Government Services

Based on natural increase in employment of government sector and future increments.

Other Services

Growth projected.

Consumer Price Index is expected to increase by an average of 1.7 per cent in the medium term.

3.6 The Fiscal accounts

The domestic economy is expected to grow in 2005 by 5.0 per cent. Real growth of 4.9 per cent and 5.1 per cent is projected over 2006 and 2007 respectively.

Inflation, which has averaged around 1.0 percent over the last couple of years, is expected to average 2.5 per cent over the medium term.

Monetary Liabilities are projected to grow steadily during the period 2005 – 2007. The anticipated growth in monetary liabilities is expected to result in large part from the projected increase in domestic credit to the Government and the Private Sector.

Imports of goods and services are projected to grow on average at around 6.0 percent during the period 2005 –2007.

Revenue projections under the baseline scenario are based on the assumption that there are no further changes in the tax system during the period 2005 –2007. The systematic relationship between the major tax categories and their respective bases is assumed to be unitary. Expected developments in the proxy bases (Nominal GDP, Imports and Private Consumption) are used to forecast fiscal revenues.

A very conservative approach was taken with respect to recurrent expenditure projections. With the exception of interest payments, the growth in the other categories was based on: (i) expected inflation rate, (ii) the growth in nominal GDP, and; the annual average growth rate of the particular category. Interest payments were estimated using the projected increase in the stock of external and domestic debt and the average implied interest rate for the respective category.

Capital expenditure was projected at 9.5 percent of GDP over the period. Our assumption is that by cutting capital expenditure too thin, there is the risk of unfavourably affecting projects and programmes needed to spur economic growth.

4. The Post-disaster Macroeconomic Assessment

4.1 GDP Growth

Real GDP for Grenada for 2005, taking into account the spillover effects of Hurricane Ivan, was expected to grow by **11.91%** driven mainly by strong performance in the construction and wholesale and retail sectors as the reconstruction effort continued apace. The impact of Hurricane Emily, which struck Grenada on July 14, 2005 is expected to adversely affect real GDP growth which is now projected to be **11.8%** for the year. While there was significant damage to the agriculture and housing sectors as a result of Hurricane Emily, it did not adversely affect activity in major productive sectors such as construction and wholesale and retail trade. In effect therefore the decline in agriculture and some other sectors is expected to be somewhat counter-balanced by output in the construction and wholesale and retail trade sectors which are expected to experience strong positive growth.

Agriculture

Pre-Emily projections had agriculture output declining from \$59.40 million in 2004 to \$37.98 million in 2005. When the impact of Emily is taken into account agriculture is expected to decline to \$34.04 million, a decrease of 10.4% from the 2004 figure, in real terms. Within overall agriculture production, crop production bore the heaviest brunt. With the widespread destruction of nutmeg crops by Hurricane Ivan, which take as much as 5 – 7 years to reach production stage, farmers had been switching into cash crops such as bananas and vegetables like sweet peppers and tomatoes. This activity took a heavy hit as a result of Hurricane Emily.

Tourism

Pre-Emily projections had tourism output declining from \$53.53 million in 2004 to \$42.82 million in 2005 as major tourism properties such as Coyaba Hotel still have not come back on stream following the impact of Hurricane Ivan in September 2004. When the impact of Emily is taken into account, tourism is expected to further decline to \$42.15 million, a decline of 21.3% from the 2004 figure, in real terms.

Construction

Pre-Emily projections had construction output almost doubling from \$66.96 million in 2004 to \$120.53 million in 2005 due to major post Hurricane Ivan rehabilitation and reconstruction efforts in the public, private and household sectors. Hurricane Emily has caused further damage to the housing stock and the public infrastructure such as roads utilities and schools, which will require additional rehabilitation and reconstruction works. Consequently, when the impact of Emily is taken into account construction activity is expected to increase to \$122.88 million, an increase of 83.5% from the 2004 figure, in real terms.

Wholesale and Retail Trade

Pre-Emily projections had wholesale and retail trade output increasing from \$77.32 million in 2004 to \$104.40 million in 2005. When the impact of Emily is taken into account wholesale and retail trade activity is expected to increase to \$105.84 million, an increase of 36.9% from the 2004 figure, in real terms. The almost doubling of activity in construction driven by the post-Hurricane Ivan rehabilitation and reconstruction efforts has spun-off to impact the wholesale and retail sector (hardware stores, etc). The additional boost that the post-Hurricane Emily rehabilitation and reconstruction efforts will have will further drive the wholesale and retail sector. This accounts for the strong activity that this sector is projected to experience in 2005.

2006 – 2007 GDP

Real GDP growth is expected to measure 3.8% and 6.6% in 2006 and 2007, respectively. Tourism is expected to be the main driver as establishments are expected to be fully recovered from the effects of both Hurricane Ivan and Hurricane Emily by the end of 2007. One sector which is expected to benefit from the robust growth in tourism and in turn help to drive the economy in 2006 and 2007 is transport. Agriculture also looks set to make some gains as farmers continue the process of switching to faster yielding cash and non-traditional crops. Other good performers of note are expected to be manufacturing and telecommunications, as the benefits of telecommunications liberalization become more apparent. The main drivers of economic activity in 2005, construction and wholesale and retail trade are projected to return to more normal levels as the post-hurricane rehabilitation and reconstruction winds down.

4.2. Fiscal policy

For 2005, the secondary fiscal effects will include a widening of the fiscal gap. The fiscal deficit, taking into account the effects of the disaster, is projected to increase to \$75.1m EC\$ million dollars (6.9per cent of GDP). In 2006 and 2007 the deficit is expected to be \$96.9m (8.4per cent of GDP) and \$68.4m (5.5 per cent of GDP) respectively. The figures represent increases ranging in magnitude from \$12.7m to \$21.0m above the without disaster scenario.

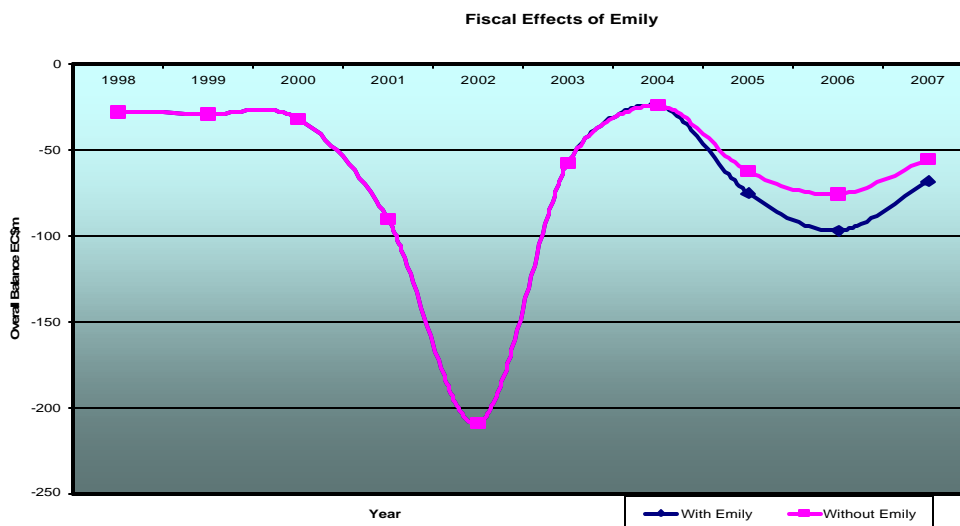
The fiscal performance will reflect an increase in expenditure due mainly to the recovery and rebuilding efforts. Capital expenditure is expected to increase due to needed rehabilitation to roads and bridges, schools and public infrastructure. In addition it is assumed that another factor driving the increase in capital expenditure will be the need to provide shelter for the many households living below the poverty line whose houses have been destroyed. It is assumed that the government will play a significant role in this endeavor.

Capital expenditures are expected to rise by an average of 11.4per cent above the amount projected for the without scenario, for the reasons stated above. No increases in grants are projected. Hence these higher capital expenditures are projected to be financed through increased borrowing.

The current revenue of the central government is expected to be roughly at about the same level as it was in the without disaster scenario despite marginal increases in GDP growth resulting from reconstruction effort.

Current expenditures are projected to be roughly in similar magnitude to the with disaster scenario, reflecting efforts at containing its growth.

Over the medium term, the fiscal deficit of the central government will be gradually reduced. The revenue base will be recovering while efforts will be made to control the level of current expenditures, particularly on goods and services. However, as a result of higher overall deficits public sector debt will rise.



4.3. Balance of payments

Subsequent to the passage of hurricane Emily the projected overall balance of payments situation for Grenada is expected to deteriorate from a deficit of EC\$26.5million to a deficit of EC\$75.28 million. This deterioration is expected to be brought about by a 9.4 per cent increase in the current account deficit, in light of the fact that increased amounts of the materials/items needed for reconstruction have to be imported.

In 2006 the overall deficit is expected to increase from EC\$33.7m (3.0 per cent of GDP) in the without disaster scenario to EC\$67.2m (5.8 per cent of GDP) in the with disaster scenario. This deterioration is attributable to an 11.9 per cent increase in the current account deficit again due increased imports associated with the reconstruction effort.

In 2007 the balance of payment is expected to be in surplus position as a result of increased in visitor arrival associated with the country's hosting of some Cricket World cup matches. In the with disaster scenario the surplus is projected to be EC\$33.3m as compared with the EC\$50.1m in without emily scenario.

4.4 Prices and employment

Prices are expected to increase slightly in the short run and moderate thereafter. Though there are complaints of shortages of construction materials, the relatively modest impact of this disaster will mitigate against large price increase.

The level of employment will be affected, especially in the agricultural sector. However this unemployment is expected to be temporary in nature, as employment levels recover with the replanting of short term crops. Some level of unemployment is also likely among rural women many of whom were self employed in cottage industries, and would have lost their place of work when their houses were either damaged or destroyed.

No significant loss of employment is envisaged for the manufacturing or the hotel and restaurant sectors.

The construction sector will remain the main driver of employment. However, the possibility of absorption of all the labour released from the other sectors is limited because of the specialised skill requirements for rehabilitation and reconstruction works.

Table 29 Selected Economic Indicators: Post Disaster

**Post-Emily
Grenada
Selected Economic Indicators**

	2003	2004	2005	2006	2007
	<i>percenta change unless o</i>				
National Income and Prices					
Nominal GDP at Factor Cost	7.2	(0.4)	13.2	6.4	8.4
Real GDP at Factor Cost	5.8	(3.0)	11.8	3.8	6.6
Rate of Inflation	1.1	2.5	1.3	2.5	1.7
Real GDP at Factor Cost by Selected Sectors					
Agriculture	(2.4)	(7.3)	(42.8)	39.8	12.8
Manufacturing	(2.4)	(14.6)	(31.7)	23.1	1.3
Electricity & Water	6.7	(8.7)	23.5	(3.7)	3.9
Construction	26.0	(0.8)	104.3	(5.3)	(17.6)
Wholesale and Retail	7.4	(5.2)	33.3	(9.0)	1.9
Hotels and Restaurants	13.8	(13.1)	(19.0)	23.9	34.9
Transportation	7.5	5.2	24.9	4.6	19.6
Communications	1.9	7.2	(42.2)	11.3	24.6
Banks and Insurance	8.0	2.5	1.9	(8.1)	5.8
Government Services	0.6	3.5	38.5	3.9	0.4
Other Services	2.4	(13.8)	4.3	4.9	14.2
	<i>'as a percentage of GDP,</i>				
External Sector					
Current Account Balance	(31.5)	(12.7)	(52.1)	(50.3)	(41.8)
Overall Balance	(2.9)	8.8	(6.9)	(5.8)	2.7
Merchandise Trade Balance	(50.6)	(59.2)	(73.4)	(63.0)	(59.3)
Central Government					
Current Account Balance	3.2	(1.0)	(0.4)	1.7	3.3
Current Revenue	27.0	25.5	31.6	30.7	31.1
Current Expenditure	23.8	26.4	31.9	29.0	27.8
Capital Expenditure and Net Lending	13.0	8.9	20.3	16.4	11.3
Overall Fiscal Balance	(4.8)	(2.1)	(6.9)	(8.4)	(5.5)
Overall Fiscal Balance (without Grants)	(12.1)	(12.0)	(20.6)	(14.7)	(7.9)
	<i>of EC Dollars,</i>				
Memo					
Nominal GDP at Factor Cost	964.3	960.0	1,086.3	1,155.7	1,252.9
Real GDP at Factor Cost	715.6	693.9	775.5	804.9	858.3
Merchandise Imports (f.o.b)	611.4	661.5	856.4	808.9	832.4
Merchandise Exports (f.o.b)	112.9	82.0	59.0	81.4	89.0
Gross Visitor Expenditure	279.9	248.1	198.5	252.1	345.7

SOURCE: Statistics Department, ECCB and OECS

IV GUIDELINES FOR RECOVERY AND REHABILITATION

1. Overall Context

The recommendations contained in the Macro-Socio-Economic Assessment that the OECS Secretariat had undertaken after the passage of Hurricane Ivan in September 2004, called for the adoption of rehabilitation and reconstruction approaches that increase the country's resilience to the economic, social and ecological vulnerabilities that exist in very small island states. The damages caused by Hurricane Emily further reinforces that call.

Grenada's vulnerability- as is typical of all small island states - is characterised by:

- High exposure to natural hazards;
- Limited land resources and difficult terrain
- Inadequate land use management because of limited suitable and flat land;
- Thin institutional capacity;
- High costs of basic infrastructure; and
- Special social vulnerabilities.

Grenada's experiences point, as well, to the social dimension of vulnerability in the OECS region. Hurricane Emily has honed in the fact that other factors, such as the limited resource capability of the disadvantaged and the inadequacy of social safety nets, need to be considered in the recovery and rebuilding processes. The cost of disregarding or even the untimely interventions in reconstructing social resilience and building social capital can be far more devastating than the erosion in economic resilience.

After the passage of Hurricane Ivan, 80% of the population was affected, and the cost of the damage was estimated to be close to twice the annual national GDP. As a result of the damage caused by hurricane Ivan, many victims that were already poor prior to the hurricane were left in conditions of extreme poverty. Many of these persons have become even more vulnerable with the passage of Emily.

2. Recommendations

Hurricane Ivan had exposed Grenada's weaknesses in land use planning, urban planning, building practices, and hazard mitigation policies. Emily merely reinforced this risk profile. Hurricane Emily and the damages it caused in Grenada has taught 3 important lessons:

- The timing of recovery and rehabilitation efforts is crucial;
- Remedial works to infrastructure damage must be undertaken as a matter of priority, immediately following a hazard event; and
- Insuring public assets and the assets of the vulnerable is necessary, even if the cost of such insurance can appear to be prohibitive in the short-term.

Much has been written about social vulnerability and the impact of disasters on those who are socially vulnerable. Grenada's experience with two hurricanes, only ten months apart, demonstrates that risk coping mechanisms are necessary for the State to reduce the impact of disasters on vulnerable groups and to ensure social cohesion. Grenada

thus needs to develop a social policy framework based on a clear understanding of how individuals and households react to risk. At the same time, the social risks have to be managed so that the social protection programmes do not compromise economic growth. Additionally, the social protection strategies must be aligned and be consistent with the income and administrative capacity of the State. The importance of Social Investment Funds is therefore underscored. Social funds serve as a good demonstration of the quick impact that can be achieved by community driven development and which has the potential to scale-up and be more responsive to those groups that have become even more vulnerable because of the two hurricanes.

The main aims of the projects proposed in this report are to attend to victims of the disaster, rebuild and improve destroyed and damaged assets, reestablish productive and export processes, and in general help to reactivate the process of economic and social development. Two broad areas are suggested for action: recovery and rehabilitation. Within those areas it is suggested that focus be placed on:

- Reinvigorating the economy;
- Generating employment; and
- Reducing social vulnerability.

The full reestablishment of normal living conditions and the county's economic and social development momentum prior to hurricanes Ivan and Emily is essential. The activities should involve:

- a. The implementation of specific projects;
- b. Replacing lost support infrastructure (buildings, roads, sewerage systems, electricity, transportation and communications networks);
- c. Replacing lost social infrastructure (schools, housing, hospitals);
- d. Re-establishing agricultural activities;
- e. Generating productive jobs;
- f. Strengthening national emergency committees; and
- g. Reducing the social vulnerability of the affected population in general and the vulnerable groups in particular.

Many of the recommendations that were proposed after the passage of Hurricane Ivan, and which remain unimplemented, still remain valid.

3. Project Profiles

The sample of project profiles outlined below are considered to be essential to the recovery and reconstruction efforts of Grenada as it seeks to respond to the additional damage caused by Hurricane Emily, ten months following the devastation of the country's economy by Hurricane Ivan.

These project profiles support the ongoing efforts of the Government Grenada and are compatible with the priority reconstruction activities underway by the ARD, particularly in the areas of housing, resuscitation of the agriculture sector (including reforestation), post trauma counselling, and the reconstruction of schools and other public buildings. The issue of managing wastes (soil/fill, debris, other solid wastes) generated as a result of natural hazards is crucial particularly since Hurricane Emily heightened the serious

problems being encountered with the collection, stockpiling and disposal of such wastes due to the large volumes being generated.

Each project profile provides basic information on aims, scope, expected results, activities and tasks to be carried out, investments to be made, expected financing, and special characteristics. The profiles present critical elements, which need to be further elaborated in definitive projects and plans of action to help to reduce social vulnerability, improve the living conditions of disaster victims, and recover the physical and economic losses stemming from the effects of Hurricane Emily.

Implementation of the proposed projects will be dependent on the country's internal capacities and budgetary considerations. Given the added negative impact on the fiscal accounts, caused by hurricane Emily, further technical and financial assistance to Grenada is required to strengthen progress made by the country to build its resilience to natural disasters through improved economic policies and the necessary structural reforms.

V. PROJECT PROFILES

Grenada	No. Agri- 1
PROJECT TITLE: ENHANCE FOOD SECURITY	

Sector: Agriculture	Subsector: Crops and livestock
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Background: Hurricane Emily destroyed much of the agriculture sector's post Ivan recovery efforts. The sector goal of achieving productivity and competitiveness continues to be essential to ensure food security and the maintenance and well being of rural livelihoods and communities. The crop sub sector remains the dominant sub-sector in agriculture, while the livestock sub-sector, given its structure, has the potential to contribute to food security and import reduction. Working towards enhancing food security in the short run would ensure economic activity and nutritional well being for the country.

Project objectives: To enhance food security and improve livelihoods of crop and livestock farmers.

Duration of the project: 1 year	National executing agency: Ministry of Agriculture
Date of initiation: Immediate	

Description of activities and tasks: The program is intended to assist the Tri-Island state to attain full recovery in the shortest time possible and to meet its food requirement needs. It would entail a rapid assessment of the food requirement needs and the organisation of production with the requisite support services.

Expected results and products:

1. Food requirement needs established;
2. National food security strategy developed;
3. Increased availability and access to food.

Total required investments: US\$ 345, 092	Special Remarks:
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Grenada	No. Agri - 2
PROJECT TITLE: STRENGTHENING THE CAPACITY AND CAPABILITY OF PRODUCTION OF PLANTING FOR THE REVITALIZATION OF THE CROP SUB-SECTOR	

Sector: Agriculture

Sub-sector: Crops

Background: Hurricane Emily compounded the poor state of the agriculture sector initiated by Ivan10 months before by causing further damage to the crop sub-sector. Given the forgoing the requirement for the replacement of plant stock, the production of seedlings and fruit trees and forestry species for reforestation requires urgent attention.

The propagation units need to be made adequately functional to perform this role so as to improve the food situation. The increased flooding and run off indicates that there is insufficient forest cover, which needs to be improved. The propagation of species to help mitigate future occurrences cannot be overemphasized.

Project objectives: To enhance food security and generate employment and incomes by strengthening national capacity to propagate and cultivate select crop commodities.

Duration of the project: 1 year	National executing agency: Ministry of Agriculture
Date of initiation: Immediate	

Description of activities and tasks:

The project involves the repairs to nursery infrastructure on the island and the procurement of selected seeds and cultivars, forest, tree crop and fruit species and the requisite pesticides, fertilizers, peat moss, etc. for propagation and immediate planting of select ed commodities island wide.

Expected results and products:

1. Adequately functioning propagation unit;
2. Required planting material available;
3. Reforestation, agro-forestry and farmer production programs adequately serviced;
4. Food security goal being positively pursued.

Total required investments: EC\$2,840,000:

- Repair to nurseries & replacement of watering system - EC\$2,120,800
- Procurement of seed & other planting material, fertilizers, pesticides, peat moss, seedling trays, manure, sprayers EC\$719,200

Special Remarks:

PROJECT PROFILES

Grenada	No. INFRA 1
PROJECT TITLE: Bridges and Roads Rehabilitation Programme	
Sector: Transport	Subsector: Roads and Bridges

Background: Roads and bridges along many sections of Grenada’s primary and secondary road network, particularly in the island’s northern parishes, were found to be structurally damaged, severely compromised or undermined by the erosive effects of swollen rivers and excessive run off, occasioned by the heavy rains associated with the passage of Hurricane Emily. The saturation of slopes, many of which had already been denuded of their vegetative cover, also resulted in widespread land slippage, which once cleared revealed significant damage to roads, bridges, retaining walls and drains. In some instances, the combined effects of heavy loading of structures by trapped debris and the resultant diversion of raging waters resulted in structural damage severe enough to warrant demolition and improved reconstruction of both roads and bridges. In a few cases, massive and/or multiple slides in concentrated areas have increased the vulnerability of homes to structural damage and possible collapse. The collective impact of these destructive effects of hurricane Emily on both the natural environment and road infrastructure has been to heighten the priority that must now be attached to the rehabilitation, stabilisation, strengthening and reconstruction of roads, bridges, natural slopes, retaining walls and gabion walls, that together will serve to protect the structural integrity of road-related infrastructure, reduce the vulnerability of that infrastructure to the risk associated with similar disasters or unusual weather events, and provide vital access for the population to goods, services, and to their farms, other businesses and residential communities that feed off the main arterial network. These works need to be undertaken as a matter of utmost urgency.

Project objectives: To urgently rehabilitate, strengthen and reconstruct roads, bridges, natural slopes, drains and associated infrastructure, along the sections of Grenada’s primary and secondary road network most affected by the passage of hurricane Emily.

Duration of the project: 1 year	National executing agency: Ministry of Works.
Date of initiation: September 2005	

Description of activities and tasks: 1. Design and build rehabilitation, reconstruction and mitigation works and measures to roads, bridges and related infrastructure that are severely damaged or at greatest risk of further structural damage or failure. 2. Implement a regular maintenance programme for roads and bridges in critical need of repair.

Expected results and products: Improved quality road infrastructure leading to reduced vehicle operating cost and time savings benefits; Significantly safer travel along the primary and secondary road network; Significant cost savings registered through avoidance of more costly capital works, consequent upon reduction of the level of deferred maintenance.

Total required investments: EC\$ 7 Million	Special Remarks: High Priority, impacting all economic and social sectors.
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Grenada	No. ENV- 1
PROJECT TITLE: PROJECT TITLE: PROTOCOL FOR THE REMOVAL AND DISPOSAL OF DEBRIS	

Sector: Environment

Subsector: Environment

Background: The removal and disposal of the soil, rubble and waste material emanating from landslides, demolition and construction is a major issue due to the associated costs and the unplanned manner in which such waste is disposed into environmentally sensitive areas. The damage caused to land and marine based ecosystems is uncalculated and undetermined. Improper disposal of waste also contributes to flooding during rainfall events.

Project objectives: To implement a planned and environmentally friendly system for the disposal of debris and other wastes and soils associated with hazardous events

Duration of the project: 1 year	National executing agency: Ministry of Communications Works; Solid Waste Management Authority; Department of Environment
Date of initiation: Immediate	

Description of activities and tasks:

1. Identification of suitable sites island wide for the safe disposal of soil and debris material;
2. Preparation of temporary/transition sites to receive soil and debris material;
3. Collection and removal of waste to the identified sites;
4. Development/application of Environmental Guidelines for removal and disposal
5. Provide training on the application of guidelines
6. Development of programme for re-use of soil and debris material

Expected results and products:

1. A clean and safe environment.
2. Creation of a reserve of material for undertaking national land reclamation and other infrastructural projects
3. Reduced damage to rivers and river ecosystems from dredging for fill material for undertaking national infrastructural projects
4. Cadre of trained persons

Total required investments: US\$700,000

Special Remarks:

Grenada	No. ENV- 2
PROJECT TITLE: WATERSHED CONSERVATION AND PROTECTION:	

Sector: Forestry, Agriculture	Subsector: Environment
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Background: Forest lands play a critical function in protecting the biodiversity, water quality and supply of the country. In Carriacou, deforestation, as a result of the wind and heavy rains of Hurricane Emily caused some areas of forest reserve to be stripped off the vegetation. Despite the growth of some vegetative cover in forested areas, on Grenada since Hurricane Ivan, Hurricane Emily resulted in significant soil erosion. This was caused by the reduced infiltration of water into the soil due to the considerably reduced forest canopy following Hurricane Ivan. The increased runoff which was recorded with the passing of Hurricane Emily resulted in significant soil erosion, flooding, heavy siltation and erosion of river banks which poses a major threat to farmlands and communities in low lying areas.

As a result, there is urgent need for the following: an active reforestation and forest management program to include the stabilization of slopes and river banks on the island, particularly River Antoine, and the development of a nursery facility to produce the relevant plant species for reforestation and agro-forestry.

Project objectives: To rehabilitate damaged forests and reduce erosion along river banks in order to:

- a. Prevent soil erosion as a result of the destruction of forest vegetation along the slopes of watersheds;
- b. Improve water quantity and water quality;
- c. Re-establish biodiversity of forest eco-systems and
- d. Stabilize slopes and river banks in areas which threaten agriculture, housing and other key infrastructure.

Duration of the project: 2 years	Date of initiation: Immediate
Date of initiation: Immediate	National executing agency: Forestry Department, and the Department of Environment

Description of activities and tasks:

- a. Collection and propagation of plant material, especially of the endemic species;
- b. Reforestation of watersheds with fast growing native species;
- d. Appropriate policy, legal and institutional frameworks for watershed and forest management, including community based approaches.
- e. River bank stabilisation and protection using engineering structures and as far as possible agro forestry species
- f. Dredge river Antoine and other rivers to remove silt and debris impeding water flow.

Expected results and products:

1. Improved forestry management including an active reforestation programme.
2. Increased forest coverage.
3. Improved water quality and quantity; increased infiltration; reduced flooding
4. Implementation of appropriate institutional, policy and legal frameworks for integrated watershed management.

Total required investments: USM\$1.75

Special remarks:

Grenada	No. ENV- 3
PROJECT TITLE: ENVIRONMENTAL AWARENESS & POST HAZARD / DISASTER CLEANUP AND REHABILITATION	

Sector: Environment	Subsector: Public Awareness
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Background: The fragility and vulnerability of island biodiversity and natural environmental infrastructure has been clearly demonstrated time and again by the occurrence of natural events such as storms and hurricanes. Flooding and slides, which are usually associated with these events, can be further devastating contributing to infrastructural damages, loss of livelihoods and economic generating assets and in some cases widespread pollution. Indiscriminate waste disposal especially in rivers, inappropriate developmental practices, and inappropriate or incomplete cleanup and rehabilitation practices further serves to contribute to the generation of slides and flooding.

Project objectives:

1. To facilitate positive behavioural change among society in general, but particularly within the private sector, targeting contractors, truckers, business operators relative to appropriate and legal waste disposal;
2. To establish and institute an appropriate coordinating mechanism that would facilitate the cooperation of agencies integral to disaster management at all stages of the event cycle, particularly to integrate environmental considerations

Duration of the project: 3 years	National executing agency: Environmental Affairs Department in collaboration with other ministries
Date of initiation: Immediate	

Description of activities and tasks:

1. Development of public awareness strategy/format to address the issues of inappropriate human practices that contributes to issues of land slides and other earth movements and flooding, with the view of curbing bad practices, while promoting good practices;
2. Public awareness through targeted consultations – e.g. contractors, truckers, CBOs, schools for example to promote and support good practice relative to proper waste disposal;
3. Development and implementation of a mechanism to track waste;
4. Public education and awareness through the use of all available media and social marketing techniques;
5. Establish coordinating mechanism and procedures.

Expected results and products:

1. Acceptable cleanup and rehabilitation of affected areas/sites.
2. Active involvement of NGOs and CBOs, Government regulators, and society in general to mitigate additional adverse effects that can result from events such as flooding.
3. Establishment and implementation of coordinating mechanism to address post event cleanup and rehabilitation issues.

Total required investments: <u>US\$ 30,000</u>

Special Remarks:

Grenada	No. SOC- 1
PROJECT TITLE: HOUSING REHABILITATION, RECONSTRUCTION, AND REFURBISHMENT (LOW INCOME HOUSHOLDS)	

Sector: Social	Sub sector: Housing
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Background: Hurricane Emily reinforced the lessons learned from Hurricane Ivan just 10 months earlier regarding the vulnerability of low income earners, living in areas and in houses unsuitable for withstanding the natural forces of tropical storms and hurricanes. Hurricane Emily caused widespread damage to a housing stock already battered by Hurricane Ivan. Approximately 2,700 houses sustained some kind of damage during the passage of Hurricane Emily (75% to 80% of which were wooden structures). Of the approximate 2,700 damaged houses, 896 had their roofs damaged, whereas 174 were completely destroyed. The remaining damaged houses sustained either structural or minor damages. Particularly affected were communities in St. Patrick's and St. Andrew's. Communities like Chantimelle, Telescope, Soubise, Marquis, Riversally, and Munich, to name a few, communities which were identified in the 1999 CDB funded Poverty Assessment and a 2004 Social Protection and Poverty Reduction Study as being among the poorest in Grenada. Furthermore, that sub-standard housing is very much a manifestation of poverty in these communities. Housing rehabilitation and reconstruction in these areas must take into consideration standards that will help reduce vulnerability to hazardous events.

Project Objectives: The objective is to address the housing situation caused by Hurricane Emily by rehabilitating damaged wooden houses and providing replacement homes for wooden houses destroyed. Given the high frequency with which tropical storms and hurricanes affect the Caribbean, Grenada included, the aim is to provide homes to the low income households affected by Hurricane Emily which can withstand up to at least category 3 hurricanes. Additionally, the sanitation aspects of these homes need to be improved. Most of the homes damaged and/or destroyed had some sort of pit latrine sanitation system.

Duration of the Project: 2 years	National Executing Agency: Grenada National Housing Authority.
Date of Initiation: September 2005	

Description of Activities and Tasks:

1. Build a new housing stock that will conform to building codes and standards, which can withstand up to at least category 3 hurricanes.
2. Determine the possibility of upgrading the existing housing stock and where possible retro-fit the existing housing stock to conform to the building codes and standards in the most economical ways possible.
3. Train contractors and persons involved in the construction sector

The project will be conducted in three phases. Each phase will contain three components as follows: (a) rehabilitation; (b) reconstruction; (c) refurbishing.

Expected Results and Products:

1. Wooden houses for low income households affected by Hurricane Emily rehabilitated, reconstructed and refurbished.
2. Rehabilitation and reconstruction implemented at a standard to withstand at the minimum a Category 3 hurricane to reduce vulnerability to future hazard events.
3. Improved sanitation systems included in the new/rehabilitated housing.

Total required investments: Inputs required for the project are labour, building materials and refurbishment (household and other essential items). **USM\$2.7**

Special remarks: The two primary risks to the successful implementation of this project within the time period planned are: the level of funding requested from the



donor community will not be forthcoming; labour and material shortages, given the heavy construction activity associated with the Hurricane Ivan rehabilitation and reconstruction effort and the need to construct infrastructure facilities for Grenada to host matches/activities for World Cup Cricket 2007.

Grenada		No. SOC- 2
PROJECT TITLE: THE CONSTRUCTION AND REHABILITATION OF ROOFS AND SUPPORTING STRUCTURES OF DAMAGED PRIMARY HEALTH CARE CENTRES		
Sector: SOCIAL		Subsector: HEALTH
<p>Background: Two medical stations were damaged by Hurricane Emily. Mt. Rich station in St. Patrick's lost its roof and Mt. Carmel in St. Andrew also sustained damage to its roof.</p> <p>Project objectives: To repair the roofs and supporting structures of primary health care institutions to ensure the resumption of essential health services to catchment areas. To replace medical equipment and supplies damaged at Mt Rich health station.</p>		
Duration of the project: 2 months	National executing agency: Ministry of Health and Ministry of Finance	
Date of initiation: Immediate		
<p>Description of activities and tasks: Restoration and replacement of damaged roof, furniture and equipment.</p>		
<p>Expected results and products: The primary health care institution restored to full working conditions by the replacement and repair of roofs, equipment and furniture.</p>		
Total required investments: EC\$278, 310	Special Remarks:	

Grenada	No. SOC- 3
PROJECT TITLE: REPAIR OF WINDOWS, DOORS AND CEILINGS OF ST. GEORGE'S HOSPITAL	

Sector: SOCIAL

Subsector: HEALTH

Background: Hurricane Emily damaged the windows, doors and ceiling of the St. George's General Hospital.

Project objective: To repair the windows, doors and ceilings destroyed by the hurricane.

Duration of the project: 2 months	National executing agency: Ministry of Health and Ministry of Finance
Date of initiation: August 2005	

Description of activities and tasks:

To replace damaged windows, repair doors and ceiling.

Expected results and products:

The windows, ceilings and door repaired.

Total required investments: EC\$300,000	Special Remarks:
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Grenada	No. SOC- 4
PROJECT TITLE: CONSTRUCTION OF ROOF OF PRINCES ROYAL HOSPITAL	

Sector: SOCIAL

Subsector: HEALTH

Background: In Carriacou, the 32-bed Princes Royal Hospital had its roof extensively damaged, including loss of galvanized sheeting and damage to wooden structures.

Project objectives: The project aims to construct a new roof in order to restore health services to the residents of Carriacou.

Duration of the project:	National executing agency: Ministry of Health and Ministry of Finance
Date of initiation: August 15th 2005.	

Description of activities and tasks:

The project aims to construct the roof of the hospital as a medical priority because it is the only general hospital providing services to Carriacou.

Expected results and products:

The construction of the roof for the Princes Royal Hospital.

Total required investments: EC\$ n/a	Special Remarks:
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Grenada	No. SOC- 5
PROJECT TITLE: CONSTRUCTION OF ROOF OF RICHMOND HOME FOR THE ELDERLY	

Sector: SOCIAL

Subsector: HEALTH

Background: The roof of the main block of the Richmond Hill Home for the Elderly was destroyed by hurricane Ivan in 2004. Hurricane Emily destroyed the section of the roof which was being repaired, in addition, to other buildings. The home has a capacity of 110 persons and is the only public home for the elderly. It currently houses 73 residents, 35 men and 38 women comprising the elderly, physically challenged and mentally challenged youth. There were 53 residents occupying the affected section of the building, who were relocated to another section of the building. This has resulted in an overcrowded dormitory housing men, and women with diverse needs.

Project objectives:

To replace the roof and reinforce the building in order to reduce vulnerability to natural disasters.

Duration of the project: 4 months	National executing agency: Ministry of Health, Ministry of Finance
Date of initiation: Immediately	

Description of activities and tasks:

The project aims to improve the building and infrastructure by replacing the roof and reinforcing the outer walls.

Expected results and products:

The construction of the roof for the Richmond Hill Home and strengthening of outer walls.

Total required investments: EC\$ 1,296,949	Special Remarks:
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- Develop the necessary mechanisms and structures to establish a counseling unit.
 - Offer counselling services at Health Stations and Centres.

Expected results and products:

Situational Diagnosis, increased awareness of crisis reactions, increased coping skills, and decreased risk for mental illness and dysfunctional behaviour associated with trauma and the establishment of a counselling unit.

Total required investments: EC\$110,000

Special Remarks:

Grenada	No. SOC- 7
PROJECT TITLE: PSYCHO-SOCIAL REHABILITATION FOR CHILDREN	

Sector: SOCIAL	Subsector: PSYCHO-SOCIAL
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Background:
 Disasters affect children in different ways, yet the psycho-social impact often remains invisible in studies. Children are vulnerable in the aftermath of a disaster when the heightened stresses of recovery can negatively impact parenting. It was perceived in the affected area that children “bounce back” shortly after the hurricane. Notwithstanding, children often internalize the events and carry with them the fear unless some opportunity is created for them to address and manage these feelings. The summer holidays has made it difficult to address the psycho-social needs of children.

- Project objectives:**
- To assess the psychological impact of disaster on children
 - Develop an integrated plan for psycho-social rehabilitation of children who have experienced all forms of trauma.
 - Create public awareness on the psycο-social impact of disasters on children.

Duration of the project: 24 months	National executing agency: Ministry of Social Development, Agency for Reconstruction and Development
Date of initiation: September 2005	

- Description of activities and tasks:**
- Adopt recommendations from the Dolly 2005 report and continue to support the implementation of activities identified post hurricane Ivan.
- Develop programmes on disaster preparedness for children with some focus on using the school as a vehicle to train children in disaster management.
 - Support existing psycho-social programmes such as the UNICEF *Back to Happiness* programme.
 - Skills-building and training of teachers, caregivers, and parents in assessment of post-traumatic stress.
 - A media programme which helps children to address the feelings of distress and anxiety normally associated with a critical event such as a hurricane and which helps them to validate and develop coping mechanisms for the management of the events.
 - Develop a cadre of peer counsellors to provide support to affected children.

- Expected results and products:**
- Workshops at national and district levels.
 - Poster competition for children.
 - Electronic and Print Media Campaign
 - Establish Peer Counsellors Association

Total required investments: EC\$250,000

Special Remarks: The project proposal should identify additional investments or resources for the importation of counsellors to strengthen existing pool of counsellors.

Grenada	No. SOC- 8
PROJECT TITLE: CONSTRUCTION OF PRIMARY SCHOOL IN ST. ANDREW	

Sector: SOCIAL

Subsector: EDUCATION

Background:

Two primary schools were destroyed by hurricane Emily, St. Giles Primary and Holy Cross Primary. Both schools are approximately one mile apart in distance. The property of St. Giles Primary is owned by the Anglican Church and Holy Cross primary is owned by the Roman Catholic Church. The school population of St, Giles is 126, 63 boys and 63 girls while the population of Holy Cross has 177 students, 111 boys and 66 girls. Students attending these primary schools in St Andrew will travel four miles to the nearest primary school.

Project objectives:

- Construct one primary school to replace Holy Cross Primary School and St. Giles School which fosters the educational advancement for the communities of Munich and Mt Carmel.
- To provide children with a means to continue their education.
- Review the catchment communities of the existing school boundaries.

Duration of the project: 1 YEAR	National executing agency: Ministry of Education and Ministry of Finance
Date of initiation: Immediately	

Description of activities and tasks:

- Contracting of services of the required technical experts.
- Procure school materials, equipment and furnishings damaged by the hurricane.
- Develop consultation with Church and wider community in the selection of project site and design of building.

Expected results and products:

- Construction of primary school.
- Replacement of school materials, equipment and furnishings.

**Total required investments:
EC\$ 2,755,650**

Special Remarks:

Grenada	No. SOC- 9
PROJECT TITLE: REHABILITATION OF EDUCATIONAL FACILITIES	

Sector: SOCIAL	Subsector: EDUCATION
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Background:

Damage to the education sector is second to the housing sector in its severity. The schools affected in the parishes were: St. Andrew 8, St. Patrick 6, St. John 1, St. David 3, St. George's 1, and Carriacou 2. A total of twenty-one schools with some, 6,854 students, have been affected, in the aftermath of hurricane Emily. Some five schools were destroyed and a total of 1,761 students are being deprived from attending school; 875 boys and 886 girls. St. Andrew had the highest number of affected schools, followed by St. Patrick. The majority of schools affected were at the primary level, a total of 11. The education sector is recognized as one of the driving forces of Grenada's poverty reduction strategy, providing knowledge and skills to transform the economy and society.

Project objectives:

- Reconstruct and Repair of existing structures, including reinforcement, in order to reduce vulnerability to natural disasters.
- To provide children with a means to continue their education.
- Review the government's Strategic plan for Educational enhancement and Development in view of the disaster.
- Review the catchment communities of the existing school boundaries.

Duration of the project: 1 YEAR	National executing agency: Ministry of Education and Ministry of Finance
Date of initiation: Immediately	

Description of activities and tasks:

- Contracting of services of the required technical experts.
- Procure school materials, equipment and furnishings damaged by the hurricane.

Expected results and products:

- Restoration and construction of Schools at all levels.
- Replacement of school materials, equipment and furnishings.
- Restoration of science labs.

Total required investments: EC\$ 11, 504, 015
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Special Remarks:



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