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MACRO SOCIO-ECONOMIC ASSESSMENT OF THE DAMAGE AND LOSSES CAUSED BY HURRICANE DEAN

In collaboration with the Inter-American Institute for Cooperation on Agriculture (IICA).

PREFACE

This report was prepared at the request of the Government of Belize following the passage of Hurricane Dean on the 21 August 2007. The implications of the impact of Hurricane Dean posed a need, apart from the immediate humanitarian response, for a rapid assessment of the social and economic impact.

The assessment was conducted using the Economic Commission for Latin America and the Caribbean (ECLAC) Damage and Loss Assessment (DALA). A limited sustainable livelihood approach explored the vulnerability context of the affected groups and is situated within the wider macroeconomic framework of the country.

This assessment will complement and expand on the emergency and humanitarian needs identified previously by the Government of Belize. The result of such an assessment provides a quantitative approximation of the overall damage to the economy and its impact on the affected population.

Mission components

The ECLAC mission was supported by the United Nations Development Programme (UNDP) Belize Office and the Inter-American Institute for Cooperation on Agriculture (IICA). The mission was undertaken 7- 12 November 2007.

Baseline data for the conduct of the macro socio economic assessment are drawn from among official government data sets including: the Population Census 2000, the Poverty Assessment Report 2002, and relevant data sets from the Government Central Statistical Offices, Ministry of Finance, and Ministry of Planning and Central Bank of Belize.

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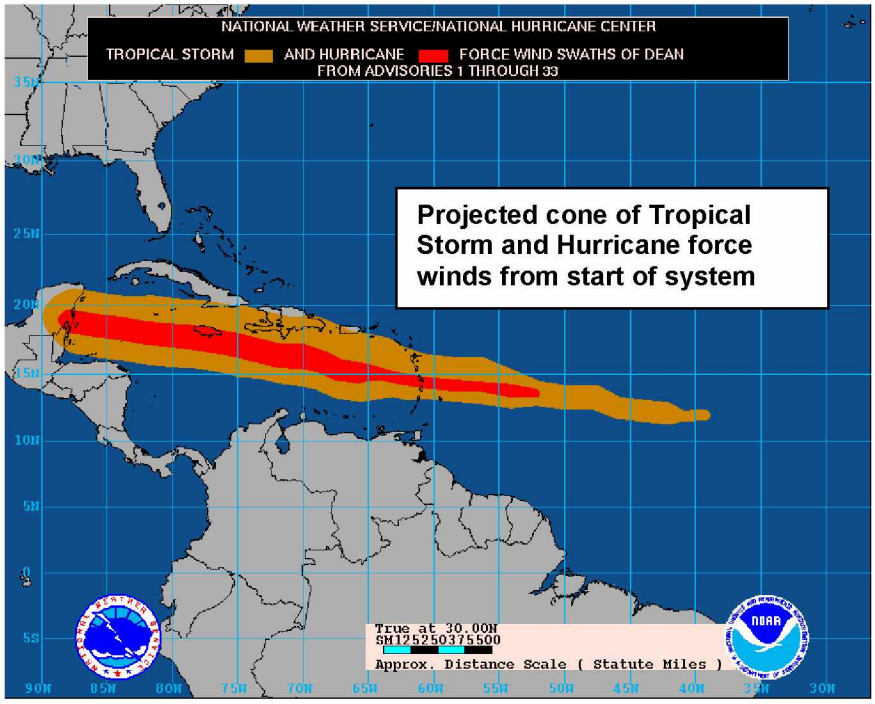
I. BACKGROUND

A. Description of the event

On Monday 13August the fourth depression of the 2007 hurricane season formed in the far eastern Atlantic Ocean. At 11:00AM EDT, the centre of this depression was located near to latitude 12.0° north and longitude 31.6° west, or about 520 miles west-southwest of the Cape Verde Islands (2000 miles east of the Lesser Antilles). At this stage, the depression was moving in a westerly direction at a speed of 21 mph, a motion that was expected to continue for the next 24 hours. Maximum sustained winds were near 35 mph, with higher gusts being observed. Strengthening of the depression was forecast by the National Hurricane Center (NHC), with the expectation that it could become a tropical storm over the next 24 hours. The minimum central pressure was estimated at that time to be 1005 MB or 29.68 inches of mercury.

Between the 13 and 20 August 2007, the hurricane tracked on a WNW trajectory moving across the Caribbean south of Jamaica and towards the Yucatan Peninsula (map 1).

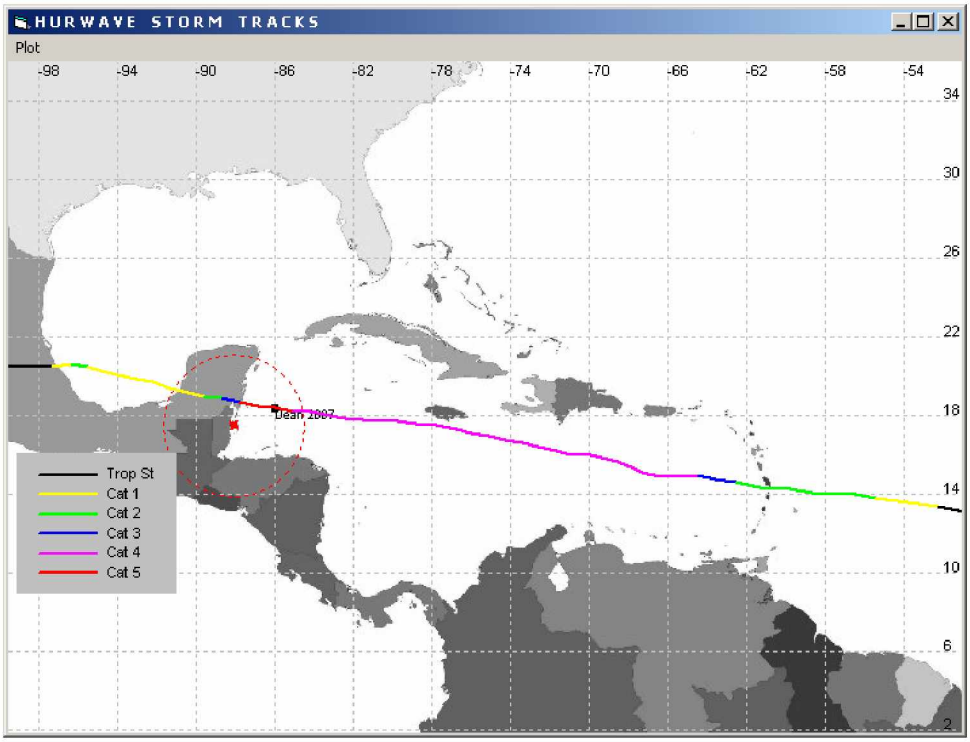
MAP 1: CONE OF TROPICAL STORM AND HURRICANE FORCE WINDS



Source: NOAA

On Monday 20 August, the hurricane forecaster on duty at the NHC in Miami informed the Acting Chief Meteorologist that the storm was expected to make landfall about 30 miles north of Chetumal, Mexico sometime between midnight and 3:00am on Tuesday 21 August. Further, Hurricane Dean was expected to become a Category 5 hurricane with wind speeds of up to 161 mph before making landfall (see map 2 showing track of hurricane with changing intensities).

MAP 2: TRACK OF HURRICANE DEAN SHOWING INTENSITY CHANGES

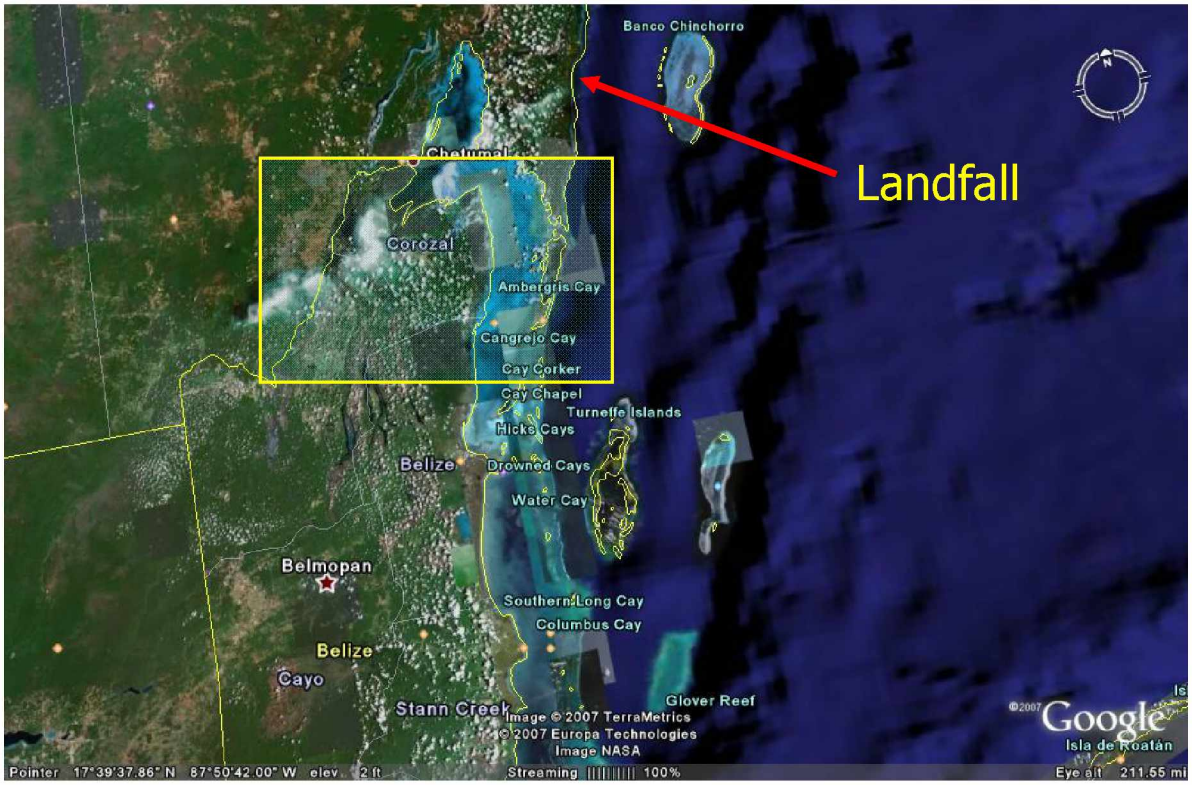


It was believed by the forecasters that hurricane force winds would affect only the northern sections of Belize. Based on this, hurricane warnings were issued for the northern part of Belize. Later briefing with the NHC indicated that the official track was being shifted approximately 5-10 miles to the south. As a result of this, the Government of Belize extended its warning to cover the entire coast of the country.

The outer feeder bands of the hurricane were experienced along the northern coastlines of Belize between 1:00pm and 2:00pm with showers and lightning. By 9:00pm that night Hurricane Dean was a Category 5 hurricane with maximum sustained winds of 160 mph. At that time, it was approximately 150 miles due east of Corozal town.

Based on local tracking that was done by the national meteorological service of Belize, it was ascertained that Hurricane Dean made landfall as a Category 5 hurricane at approximately 1:45am (0745 UTC) on Tuesday 21 August 2007. The landfall location was some 43 miles northeast of Corozal Town and near to Majahual, a coastal community in the state of Quintana Roo, Mexico (see map 3). Just before landfall, Hurricane Dean's central pressure deepened rapidly to 906 mb, and the maximum sustained winds rose to between 155-165 mph.

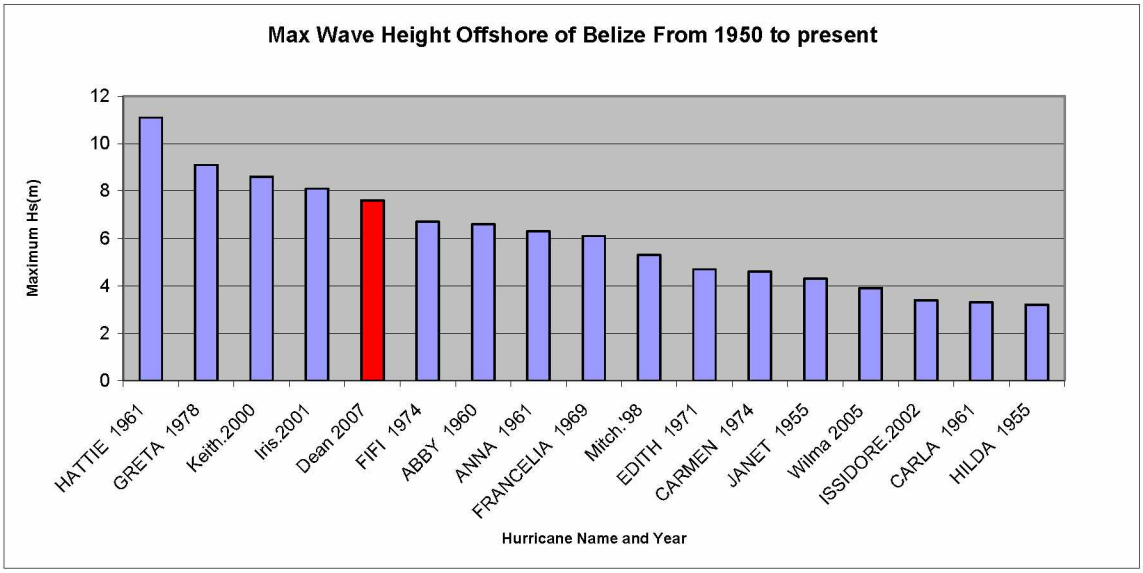
MAP 3: GOOGLE IMAGE SHOWING AFFECTED AREA



Because of the relatively rapid forward speed of this hurricane, the accumulated quantities of rainfall were less than would have been associated with a slower moving system. Nevertheless, the northern Belizean towns of Corozal and Orange Walk experienced a significant amount of wind damage. It was reported that the hurricane was a very intense yet compact system, which at landfall had hurricane force winds extending outwards some 35 miles. Tropical storm force winds by contrast extended outwards (to the southwest) about 105 miles.

As is to be expected, the outer cays offshore Belize would have been exposed to relatively high waves. It is only because of the barrier reef system why these incoming waves would not have been more devastating. A rapid analysis of the historical wave heights offshore Belize reveal that considering all hurricanes that have affected Belize since 1950, Hurricane Dean had the fifth highest wave heights offshore the coastline of Belize (see figure 1). Of the hurricanes examined, Hurricane Hattie produced the highest waves relative to the coastline of Belize.

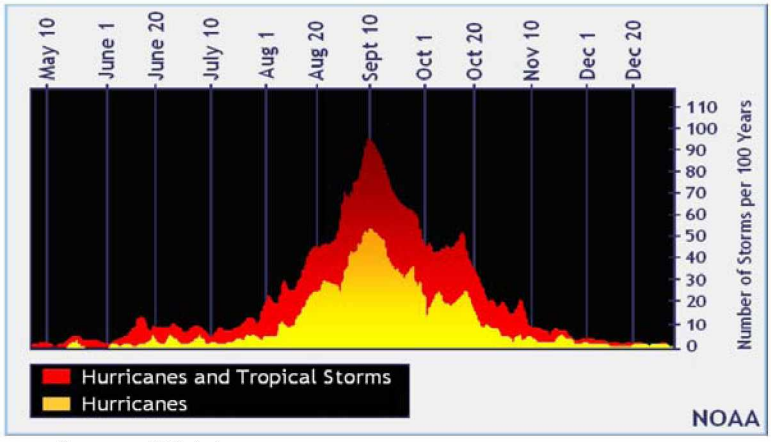
FIGURE 1: MAXIMUM WAVE HEIGHTS OFFSHORE BELIZE – 1950 TO THE PRESENT



Source: NOAA

From the perspective of the regional occurrence of hurricanes, it is interesting to note that a review of hurricane frequency of occurrence as a function of seasonality, documented by the National Oceanic and Atmospheric Administration (NOAA), gives an indication of the historical occurrences of hurricanes throughout the season within the Caribbean basin. These historical records indicate that there is an expectation of one hurricane every three years in the middle of August (figure 2). Generally, however, it now appears that the rate of occurrence of more intense hurricanes is on the increase. Research carried out within the region (*Long Term Variability of Hurricane Trends*, Smith, Warner, Banton, 2002) has indicated that there has been an increase in both the number of hurricanes occurring on an annual basis and in the intensity of these hurricanes. It is unknown whether or not these are due to climate change effects.

FIGURE 2: SEASONAL HISTORICAL OCCURRENCES OF TROPICAL STORMS AND HURRICANES



Source: NOAA

B. Emergency actions

The regional response mechanism that tracks and responds to the emergency phase of disasters was put on "standby' on 14 August before the hurricane impacted Belize. In light of developments, the Caribbean Disaster Emergency Response Agency (CDERA) Coordinating Unit developed an operational plan for a worst case scenario in Belize. The National Emergency Management Organisation (NEMO) in Belize declared phase I (Hurricane Watch) on 17 August. During this phase, persons living in the most vulnerable areas in the projected path of the hurricane moved voluntarily to safer zones. After phase III was declared on 20 August, these evacuations increased, especially from the Cayes and Belize City.

The authorities in Belize developed a critical needs list that included basic requirements for the emergency relief and response phase of the disaster. Important items on the list included disinfectants, roofing materials, fuel, blankets, plywood sheets and pvc pipes.

The Ministry of Health in collaboration with the Pan American Health Organization/World Health Organization (PAHO/WHO) conducted a rapid health assessment to gauge the impact on the affected population, public health needs and interventions that were required, especially in the most vulnerable areas. The Ministry of Health activated its Health Management Plan (HMP) on 17 August to procure health supplies, dispatch supplies to affected areas, evacuate neonatal and critically affected patients and to establish emergency off-site services in the most vulnerable communities. In the health sector, the total outlay on post event supplies amounted to BZ$765,407.50.

Offers of financial and technical support, especially during the relief and emergency operations came from the Governments of Brazil, Cuba and Mexico.

II. VULNERABILITY AND HURRICANE DEAN

A. Sustainable Livelihoods Approach (SLA)

This assessment applied a limited Sustainable Livelihoods Approach (SLA)[1] to the process. The SLA is based on two concepts, sustainability and livelihoods. Livelihoods refer to the capabilities, assets and activities required for a means of living. It is understood that for livelihoods to be considered sustainable, they should demonstrate:

(a) Resilience in the face of external shocks and stresses;

(b) Capacity to maintain the long-term productivity of natural resources; and

(c) Ability not to undermine the livelihoods of, or compromise the livelihood options open to others.

The goal of the SLA is to eradicate poverty through six objectives. These are:

(a) Improved access and management to natural resources;

(b) Improved access to high-quality education, technology, nutrition and health;

(c) A more supportive and cohesive social environment;

(d) Improved access to infrastructure;

(e) Improved access to financial resources; and

(f) A policy and institutional environment to promote multiple livelihood strategies and equitable access to competitive markets.

The disaster assessment using the SLA sought to ascertain:

(a) Where were the affected communities located;

(b) Which households were affected (how many and to what extent);

(c) What were the damage and losses suffered by each household with regard to their assets;

(d) How were their income-earning activities affected;

(e) What would it take to get them back up and running;

[1] The Sustainable Livelihoods Approach (SLA) was developed by the Department for International Development (DFID), for further information see www.livelihoods.org.

(f) What assistance was required to build resilience and reduce future risk; and

(g) What would it take to make the livelihoods of the affected households sustainable.

The unit of analysis for the SLA is the household. To ensure a rigorous undertaking, sound household data disaggregated by the basic demographic characteristics of age, sex of the head of the household, family structure, education levels, health status, livelihoods/income streams and expenditures are required. The sources of baseline data are the country's most recent population and housing census, the Survey of Living Conditions (SLC), the Core Welfare Indicators Questionnaire (CWIQ) and the most recent agriculture survey. The livelihoods analysis seeks to gain an accurate and realistic understanding of the strengths (assets or capital endowments) of households and how these assets are converted into positive livelihood outcomes.

In undertaking a rapid assessment of livelihoods, as needs to be done following a natural disaster, the methodology involves key informant interviews and group interviews which seek to ascertain the processes of the primary, secondary and tertiary income-earning activities of the households in the affected areas; and the structures, contributors and beneficiaries of the household's current livelihoods. Such an assessment seeks also to understand how each activity has been affected by the recent disaster. Finally, a gender analysis is applied to understand the differential impact of the disaster on the livelihoods of men and women. From such a comprehensive analysis, recommendations that will support sustainable livelihoods follow.

B. The vulnerability context

1. Introduction

Belize, the only English-speaking country in Central America, is bordered to the north by Mexico, to the west and south by Guatemala, and to the east by the Caribbean Sea. Even though Belize is bordered by Latin American countries, it is considered to possess many similarities to Caribbean Community (CARICOM) member States with respect to culture, politics and economy.

Belize is divided into six administrative districts: in the north are the Corozal and Orange Walk Districts; in the west is the Cayo District; in the east is the Belize District; and in the south are the Stann Creek and Toledo Districts.

The pattern of a plural society might be one of the best descriptors of Belizean society, with its diverse ethnic groups, varied religious beliefs and distinct customs. The 2000 Population Census, indicated the ethnic groups of Belize as the Mestizo, who comprised 48 per cent of the population and are of mixed heritage – being descendants of Spanish colonists and indigenous peoples; Creole comprised 25 per cent the population and of mixed African and European descendants; the Maya who comprised 11 per cent of the population and include Mopan Maya, Ketchi Maya and Yucatec Maya. The rest of the population is comprised of Garifuna, 6 per cent of the population, who are descendants of indigenous peoples and African Maroons; the Mennonite (4 per cent) descendants of German migrants; and the East Indian and

other (3 per cent). In regard to religious affiliation the population comprises Roman Catholic (49.6 per cent), Pentecostal (7.4 per cent), Anglican (5.3 per cent), and Seventh Day Adventist (5.2 per cent).[2]

2. The affected population

The population of Belize, according to the Statistical Institute of Belize Mid-year 2007 Population Estimates, comprises 311,480 persons, some 29 per cent of which live in the two districts that were most affected by Hurricane Dean - that of Corozal and Orange Walk. To a lesser extent, a smaller proportion of the population of the District of Belize were also affected as damage was evident to Ambergris Caye and Caye Caulker.

Data from table 1 suggests that the total population affected, some 37,700 persons account for 12 per cent of the national population. However, in the district of Corozal some 9,704 persons or 27 per cent of the population was affected and in Orange Walk, a similar proportion amounting to 12,658, were affected.

TABLE 1: POPULATION AFFECTED BY HURRICANE DEAN BY DISTRICT AND SELECTED CHARACTERISTICS OF THE POPULATION

	Total Pop	%	Severely Affected Pop	%	Affected Pop Agricultural Sector	Affected Pop Tourism Sector	Total Affected Pop
Country Total	311,480	100	6,140	2%	20,878	10,685	37,703
District	**Total**	**%**	**total**	**%**			
Corozal	36,365	11.7	3905	10.74	9,091	613	9704
Corozal Town	9,110	2.9	745	8.18			
Corozal Rural	27,255	8.8	3,160	11.59			
Orange Walk	47,145	15.1	2,235	4.74	11,786	872	12,658
Belize	93,215	29.9					
San Pedro Town	10,445	3.4				9,200	

Source: Belize mid year population estimates by region and sex and ECLAC estimates based on official GoB data.

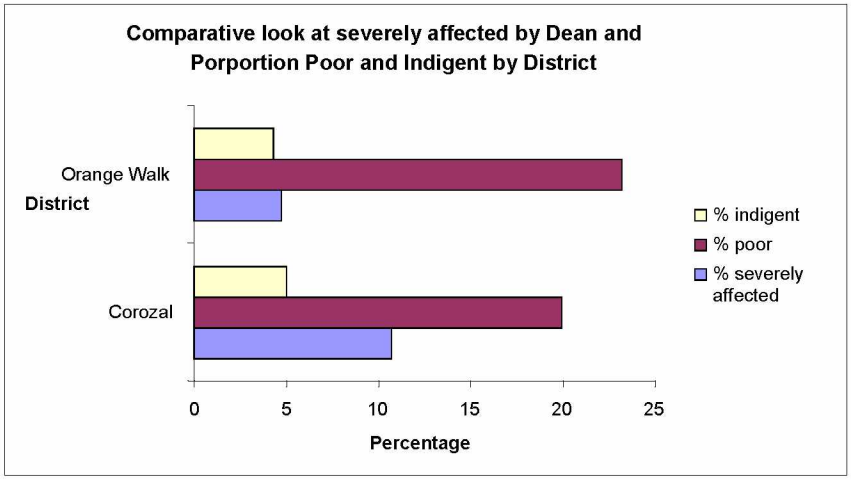
3. Severely affected population

The number of persons severely affected by Hurricane Dean is estimated to be 6,140 persons – or 11 per cent of the total population of Corozal and 5 per cent of the population of Orange Walk. The severely affected are those who were in the direct path of the hurricane and lost homes and livelihoods which sustained them, within or adjacent to their dwellings. When those persons who lost livelihoods due to the impact on the agricultural sector, some 20,000 persons and the tourism sector, another 10,000 persons are taken into account, it is possible to arrive at a figure of the entire population that was impacted by Hurricane Dean as presented in table 1.

[2] Belize 2000 Population and Housing Census

Corozal and Orange Walk combined, contained 41 per cent of the country's poor and 9 per cent of the country's indigent. Figure 3 illustrates the proportion of population that was severely affected by the impact of Dean. It is interesting to note that in the case of Orange Walk, the proportion of those severely affected almost equals the proportion of those defined as indigent, reinforcing the notion that it is often the poorest and most vulnerable that are most affected by natural disasters. In Corozal, where the impact was more widespread, the proportion of those severely affected is equal to the proportion of the population defined as indigent, in addition to a proportion of the group categorized as poor.

FIGURE 3: SEVERELY AFFECTED POPULATION AS A CONSEQUENCE OF HURRICANE DEAN



Source: ECLAC estimates based on official GoB data

Data collected suggest that a large proportion of those persons whose homes were completely destroyed, possessed homes which could not withstand the onslaught of hurricane winds, having been made of sticks and palmetto. Others which had the roofs partially blown off either had roofs of packed cardboard or corrugated zinc or sheet metal.

The population of the two most affected districts are comprised in the main of Mestizo which is reported in the 2000 Census as making up the largest ethnic group in Corozal, and Orange Walk, 76 and 77 per cent, respectively. These two districts also have the largest proportion of Spanish speaking population, both just over 80 per cent.

According to the NEMO Damage Assessment and Needs Analysis Report of 3 September 2007, a total of 87 shelters opened countrywide and accommodated approximately 11,379

persons. The breakdown of those accommodated in shelters by district appears in table 2. The data suggest that some of the population in the affected districts were accommodated in shelters.

TABLE 2: NUMBER OF PERSONS IN SHELTERS BY DISTRICTS

Districts	Population	Number of shelters	Number of persons registered in shelters	Percentage
Cayo[1]	73,325		1,878	
Corozal	36,365		5,200	
Orange Walk	47,145		1323	
Belize District [1]	93,215		2978	
Totals	**250,050**	**87**	**11,379**	**5%**

[1] Many persons who were housed in shelters were from among those evacuated from Ambergris Caye and Caye Caulker.

Source: ECLAC estimates based on official GOB data.

4. Human and social capital

Human and social capital together may be said to represent the knowledge, health and capacity to labour, which individuals possess and which allow for the development of sustainable communities within a society. It also expresses the notion of bonding, trust and networking which communities utilize to strengthen and support its members and in turn support sustainable livelihoods within communities.

In the case of Belize, the government suggests that through its National Poverty Elimination strategy (2007-2011), it will equip poor people to make best use of the opportunities that are expected from government policies, for economic growth and development. It further suggests that such opportunities will strengthen human capabilities. The strategy places particular emphasis, therefore, on improving the access for poor people to adequate educational and health services. It emphasizes that such access should result in reductions in child mortality, improvements to maternal health and progress in combating Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome (HIV/AIDS), malaria and other debilitating diseases. The risks posed by Hurricane Dean to the health status of the population, were well contained through the rapid health assessment which was conducted and the dispatch of mobile health services to affected communities. The Ministry of Health was able to report that following Dean, there was no outbreak of epidemic as a result of the hurricane, no outbreaks of waterborne disease/Cholera or vector borne diseases and illness were confined to minor ailments.

Belize's social capital evinces strengths and weakness. The strengths can be observed in the fact that many people were able to stay at the homes of immediate and extended family following the impact of Dean. This demonstrates the strength of the bonds which still exist in communities as many persons chose not to go to designated shelters and stayed with family members instead. On the other hand, because Belize is comprised of a large migrant population, with 15 per cent[3] of the population having been born outside of the country, levels of trust in the prevailing order of society may not be as strong as it should be, resulting in persons not trusting

[3] Belize Population Census 2000. The Census Report suggests that for various reasons, such as language barriers or fear of non-legal status , these figures may be underestimated.

the system to work in their best interest. Another factor has to do with the capacity of the population to be able to access the information being made available regarding support services, as anecdotal evidence collected following Dean suggested that some families seemed excluded from the assistance programmes simply because of their literacy levels and/or their inability to understand fully the messages being delivered.

In either case more has to be done to build and strengthen social capital which acts as the first safeguard in the event of disasters.

5. Vulnerability of women and children

The 2002 Poverty Assessment Report indicated that women comprise some 26.8 per cent of all heads of households in Belize. Although the report indicated that on average there were no differences in household size and composition between the male and female heads of households, female-headed households traditionally have an increased burden of care than their male counterparts, due to their inability to earn similar incomes, and the necessity to meet similar household needs with fewer resources. In addition, where access to modern time-saving household appliances are scarce, as is usually the case among poor households, female heads of households who are solely responsible for meeting the material and reproductive (care and nurturing) needs of their household are often without the time for self development or leisure. It has been suggested that women food producers in the Caribbean worked an average 14- to 18-hour day, devoting half of their time to reproductive activities and the other half to productive activities.

Data presented in table 3, suggest that as much as 65 and 45 per cent of the households in the two districts under review draw water from either a vat or well. It can also be ascertained that as much as 23 and 17 per cent of the households use fire wood as fuel in the Districts of Corozal and Orange Walk, respectively. Both activities, collection of water and firewood, are time-consuming activities which would increase the burden of already poor female heads of households.

TABLE 3: SELECTED CHARACTERISTICS OF HOUSEHOLDS WITH ACCESS TO THE USE OF PIPED WATER, COOKING FUEL AND ELECTRICITY BY AFFECTED DISTRICT

District	Number of HH	Water not piped (vat, well)	Percentage	Use of wood as cooking fuel	Percentage	Electricity for Lighting	Percentage
Corozal	6722	4,340	65	1566	23	5751	86
Orange Walk	7879	3568	45	1343	17	6353	81
Source: Belize AOS 2006							

An Inter-American Institute for Cooperation on Agriculture (IICA) study on women food producers in Latin America and the Caribbean suggested that women food producers make a major contribution to rural economies and the economic and social well-being of their families. Much of their work, however, is carried out on small farms and goes either unremunerated or unrecorded in labour force statistics.

It is no wonder then that although the official statistics of Belize indicate that only 30 per cent of females nationally are economically active, anecdotal evidence suggests that many women are engaged in the informal economy, as food producers, either in support of their families, or as contributors to their household income. Those who gained income through back yard gardens were sorely affected by the destruction of fruit trees and short-term crops caused by Hurricane Dean. Many of these women also used the produce gained from the backyard gardens for family subsistence. Others who were involved in food preparation and sales predominantly to male workers in the agricultural sector also suffered due to the disruption to this sector.

Approximately 200 women's livelihoods in the formal economy were disrupted due to the impact of Hurricane Dean on the papaya industry, as many worked as packers and a small number worked in the field. Another small group, who were among the 190 workers, whose jobs were disrupted due to damage to the Corozal Free Zone, caused both by the hurricane and a subsequent fire, had also held jobs in formal economy.

It was reported that many women expressed concern and anxiety for the quick return to normalcy in their family situation. By this they meant the quick return of their male partners to livelihood earning possibilities. Such action, they indicated, would reduce the chance of men turning to the abuse of alcohol and other deviant behaviours. Many expressed the view that such behaviours would put both women and their children at risk of violence and further depravation, following the disaster. Table 4, which presents data from the recently concluded but not yet published Multiple Indicator Cluster Survey (MICS), suggests that a significant percentage of women, as much as 6 per cent in Corozal and 3 per cent in Orange Walk, believe that men are justified in beating their wives. Although the proportions in Corozal and Orange Walk may be small in comparison to Districts such as Toledo, where the proportion of women who expressed such beliefs is as high as 25 per cent, the data still provides some indication that such fears, which were expressed by some women, may be justified.

TABLE 4: PERCENTAGE OF WOMEN AGED 15-49 YEARS WHO BELIEVE A HUSBAND IS JUSTIFIED IN BEATING HIS WIFE/PARTNER

District	When she goes out without telling him	When she neglects the children	When she argues with him	When she refuses sex with him	When she burns the food	For any of these reasons*	
Corozal	1.65	11.65	1.65	1.28	1.50	14	252
Orange Walk	2.40	4.33	2.89	0.49	0.00	8	245
Belize	0.78	4.92	0.63	1.21	0.88	6	507
Cayo	3.27	7.36	2.90	1.79	1.70	10	355
Stann Creek	6.00	12.56	9.38	3.96	2.04	18	178
Toledo	9.60	19.18	13.67	11.60	10.94	34	138
Source: Unpublished Government of Belize MICS data sets							

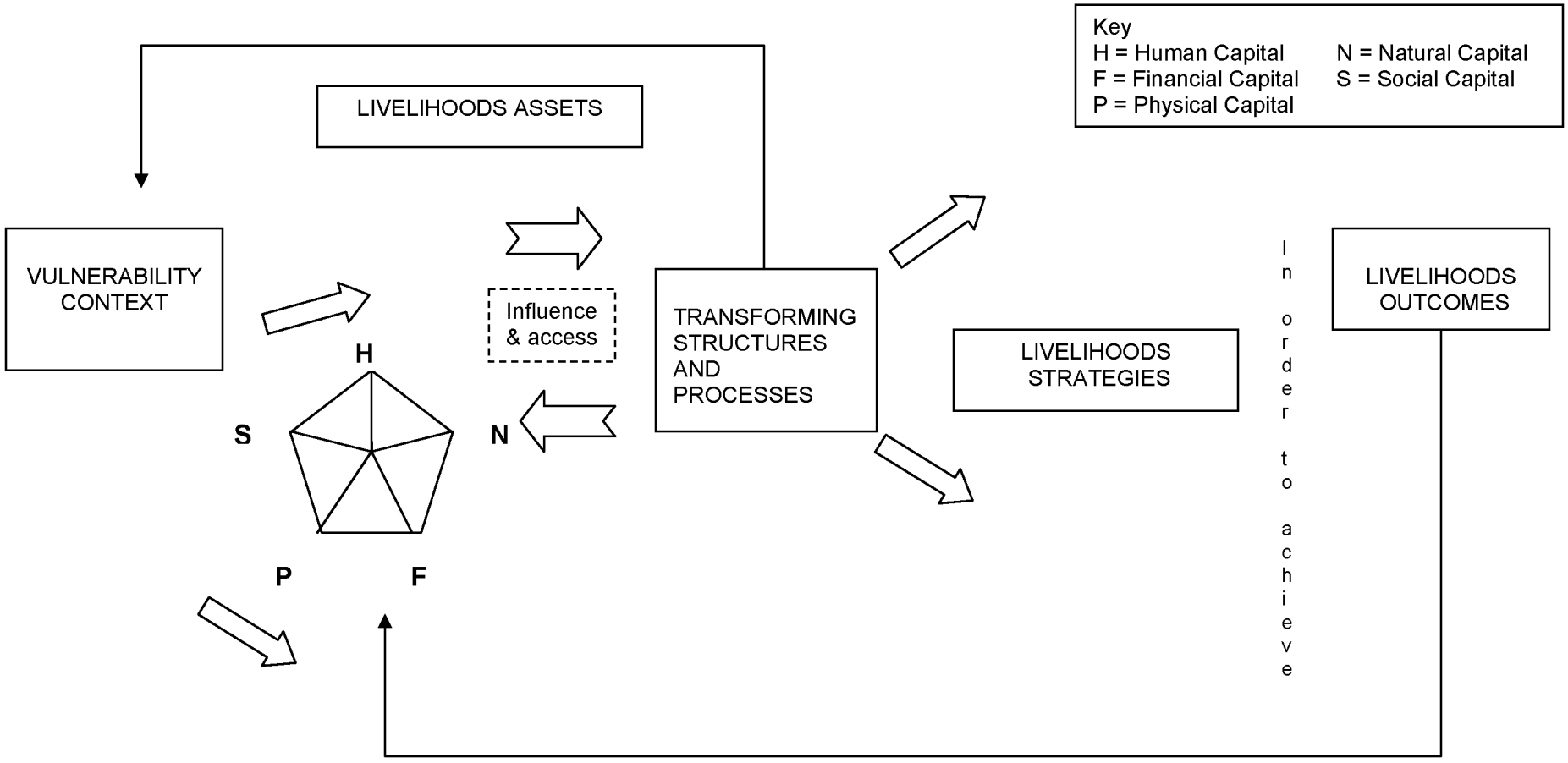
As much as 22 per cent of poor children under 14 years of age were living with their mother only. The Poverty Assessment Report also identified a group of children without either parent, and those accounted for some 4.5 per cent of all poor children. The study concluded that two out of every five children did not have their basic food and non-food needs met. It further suggested that 11 per cent of children in Belize were economically active and 6 per cent were engaged in child labour. It is possible to assume that Hurricane Dean would exacerbate the

susceptibility of those children in Corozal and Orange Walk, who were already in precarious living situations. Urgent attention to issues of food security in the coming months following Hurricane Dean would be essential in light of the already delicate livelihood circumstances of many families

Box 1: Highlights of Susceptibility to the Impact of Hurricane Dean

- Poverty and its attendant ills;
- Rural areas are vulnerable to electricity outages and impacts to main grid;
- Limited training and general education of the population dependent on agriculture;
- Limited financial resources for investment and recovery in the agricultural sector;
- Limited capacity to diversify the economy;
- Too strong reliance on one commodity (e.g. sugar cane);
- High burden of care, of female heads of households with limited resources;
- Inadequate micro lending facilities which target rural women;
- Water supply in the rural area without reliable back-up capacity;
- Belize City remains extremely vulnerable to storm surge; and
- Critical infrastructure requires categorizing and hazard mapping to develop plans and policies for vulnerability reduction for Belize City.

Figure 4: Sustainable Livelihoods Framework



III. ANALYSIS OF THE AGRICULTURE SECTOR

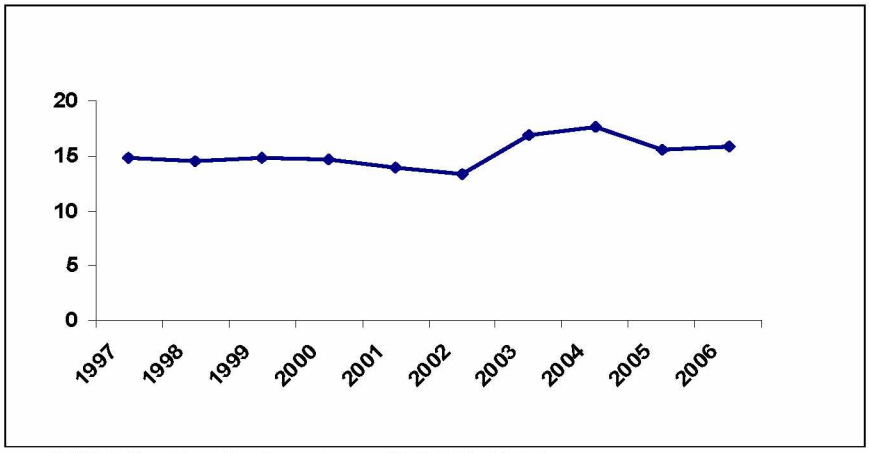
A. The agricultural sector

1. Overview

The agricultural sector, including fisheries, is the dominant sector in the economy of Belize and plays an important role in the country's socio-economic development. This significant and multifunctional role is demonstrated by the sector's contribution to economic growth (GDP), food security, the generation of employment and the earnings/savings of foreign exchange. This is in light of the fact that the rural communities in Belize are largely agrarian in nature with a high dependence on agriculture for employment, income, food, energy (charcoal) and medicine.

The performance of the sector over the last decade (1997-2006) may be characterized as fluctuating with an upward tendency. In 1997, for instance, the sector accounted for 14.8 per cent of total GDP compared to a high of 17.7 per cent in 2004, and 15.8 per cent in 2006. Agriculture's contribution to GDP for the period 1997 to 2006 is presented in figure 5. The decline experienced in the sector's contribution between 2001 and 2002 is attributed mainly to the declines in the crop subsector and, to a lesser extent, fisheries linked to natural disaster, erosion of the preferential treatment for bananas in the European market and inherent structural and institutional constraints affecting crop production in the country.

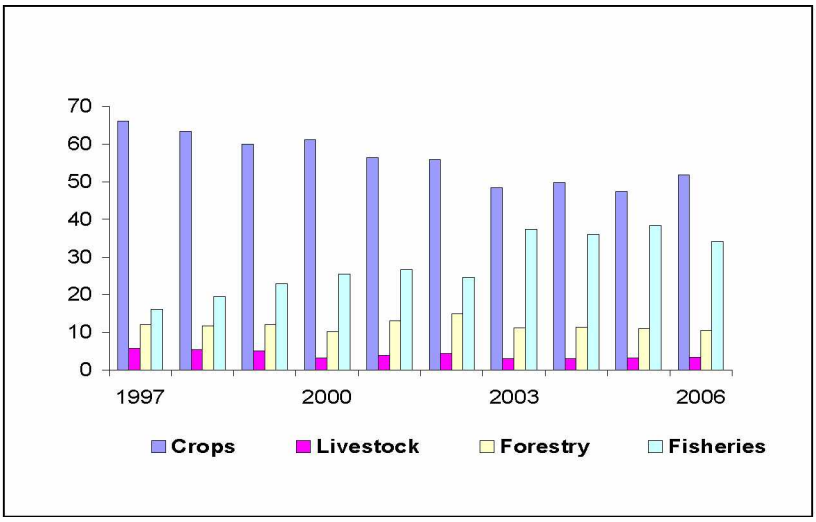
FIGURE 5: AGRICULTURE'S CONTRIBUTION TO GDP (1997-2006), 1990 CONSTANT PRICES



Source: ECLAC estimates based on official GoB data.

The contribution of the various subsectors to total agricultural GDP is presented in figure 6. The figure not only demonstrates the relative importance of the crop-subsector to agriculture in Belize but also the phenomenal increase in the contribution of the fisheries subsector to agriculture over the period under review.

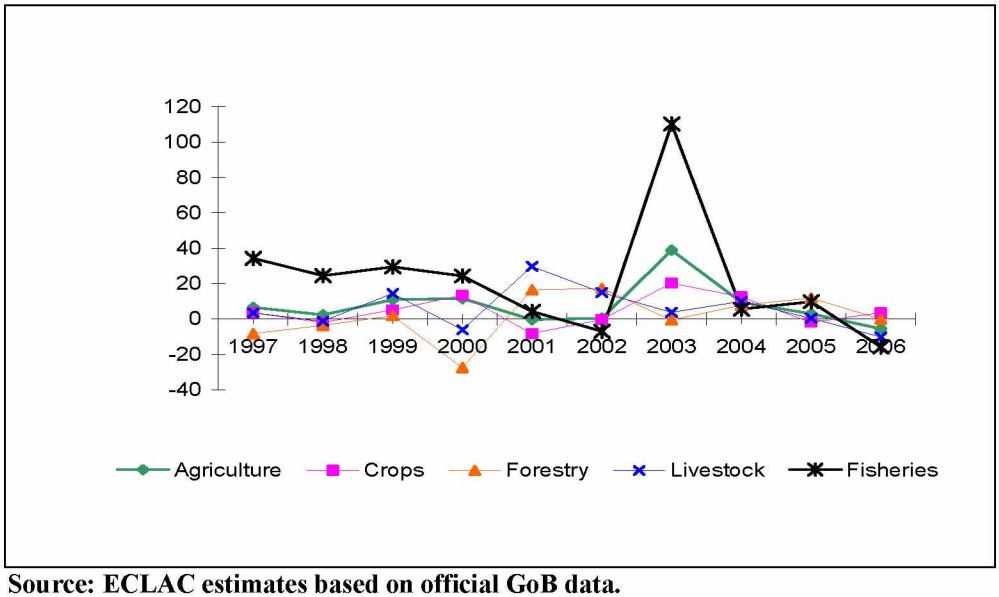
FIGURE 6: CONTRIBUTION OF AGRICULTURAL SUBSECTOR TO TOTAL GDP (1997 – 2006)



Source: ECLAC estimates based on official GoB data.

The graph in figure 7 presents the growth rate of the agricultural sector as well as those growth rates of the various subsectors for the period under review. The figure shows that there was real growth of the agricultural sector (including fishing) in every year, with the exception of 2001 and 2006 when value-added by the sector declined by 0.4 per cent and 5.5 per cent, respectively. The good performance achieved by the sector during the period was the result of significant expansion in the fisheries subsector (299.0 per cent) which in 2005 accounted for 38.4 per cent of total agricultural GDP, compared to 16.1 per cent in 1997. However, the fisheries subsector's contribution to total agricultural GDP declined to a level of 34.2 per cent in 2006.

FIGURE 7: AGRICULTURE AND SUBSECTORAL GROWTH RATES, 1997-2006



Source: ECLAC estimates based on official GoB data.

Despite the erosion of the preferential treatment of the sugar and banana industries in the European market, the Government of Belize has adopted the stance of most producers of those commodities in the CARICOM region and reaffirmed its position that both industries were of extreme importance in the economy and the welfare of rural communities. As such, the industries continued to be seen as critical in the economic development process of Belize. Accordingly, the Ministry of Agriculture and Fisheries and the other stakeholders within the industries continued to implement measures to enhance the viability and sustainability of these industries.

Positive results from Belize's agricultural diversification programme are reflected in significant increases in the production and exports of selected non-traditional agri-food products such as pepper sauce, fresh oranges, black-eyed peas, red kidney beans and papayas.

The country is relatively self-sufficient in staple food products such as corn, rice, beans, bananas, plantains, root crops and fruits. Some vegetables such as tomatoes, lettuce, broccoli, carrots, celery and cabbage are generally produced seasonally as a result of a primarily rain-fed production system and limited research for the identification of adaptable varieties. Therefore, there are periods of importations to accommodate shortfalls of supply on the local market.

The livestock subsector grew by 62.9 per cent over the period under review; from BZ$23.2 million contribution to GDP in 1997 to BZ$37.8 million in 2006. However, the subsector relative contribution to total agricultural GDP declined over the period under review, from 12.0 per cent in 1997 to 10.5 per cent in 2006. The country is relatively self-sufficient in poultry, eggs, pork and beef.

The forestry subsector fluctuated slightly over the period under review but recorded an overall small growth of 1.7 per cent.

The fisheries subsector has demonstrated phenomenal growth between 1997 and 2006. In 2006, the subsector's real contribution to GDP was BZ$123.7 million, compared to BZ$31.0 in 1997, a 299.0 per cent increase. The subsector's contribution to total agricultural GDP increased from 16.1 per cent in 1997 to 34.2 per cent in 2006. Belize is self-sufficient in seafood.

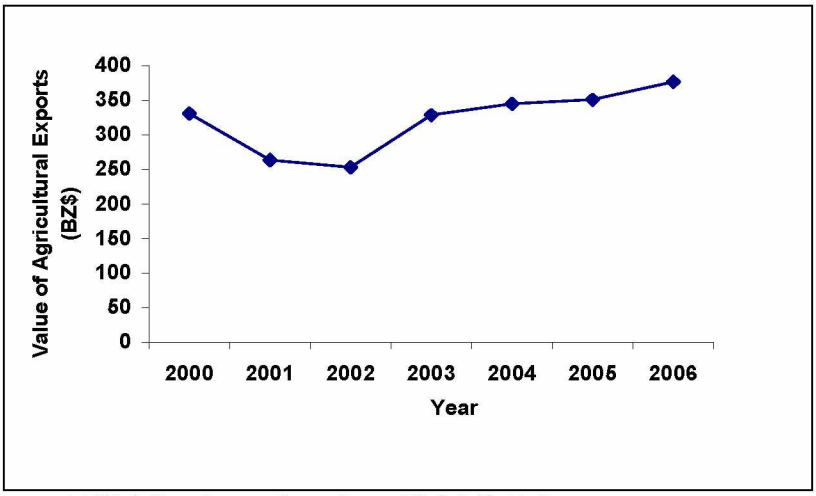
The volume of export of agricultural commodities for the period 1997 through 2006 shows some fluctuations with a tendency towards an increase. In fact, the volume export of citrus concentrates increased by 21.0 per cent over the period under review, while that of the total of other major commodities (sugar, bananas, papayas and marine products) increased by 16.4 per cent over the same period. Belize's export basket of agricultural goods by volume is presented in table 5.

TABLE 5: VOLUME OF MAJOR DOMESTIC AGRICULTURAL EXPORTS (TONNES)

Item	2000	2001	2002	2003	2004	2005	2006
1 Sugar	109.33	95.51	104.94	100.15	113.93	89.55	97.85
2 Banana	63.73	50.14	41.83	73.02	82.15	76.41	70.97
3 Papayas	5.2	6.25	11.10	16.57	25.22	28.63	34.47
4 Marine Products	3.18	4.07	3.28	7.74	8.43	9.25	7.98
Sub-Total (tonnes)	181.44	155.97	161.15	197.48	229.73	203.84	211.27
5 Orange Concentrates (gallons)	5.45	4.90	3.62	4.92	6.24	8.41	6.42
6 Grapefruit Concentrate (gallons)	0.89	0.81	0.73	0.77	1.89	1.25	1.25
Sub-Total: Concentrates (gallons)	6.34	5.71	4.35	5.69	8.13	9.66	7.67
Source: ECLAC estimates based on official GoB data.							

Similar to the situation regarding the volume of agricultural exports, the value of exports over the period 1997 through 2006 registered a significant increase of approximately BZ$45.92 million (13.9 per cent) with total domestic exports of major agricultural commodities moving from BZ$330.76 million in 1997 to BZ$376.68 million in 2006 (figure 8).

FIGURE 8: VALUE OF AGRICULTURAL EXPORT

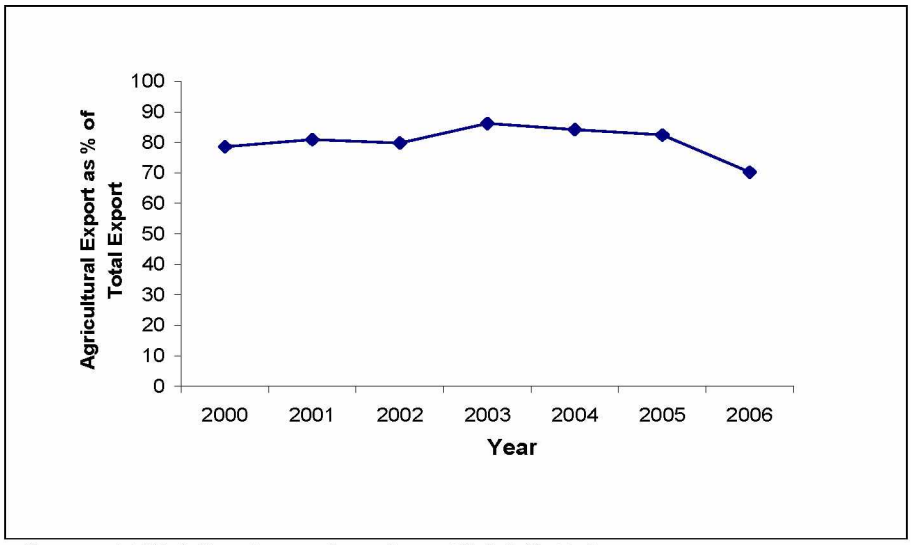


Source: ECLAC estimates based on official GoB data.

The most significant contributors to this increase in exports were sugar, papayas and marine products.

Figure 9 presents the contribution of agricultural exports to total domestic exports. The figure demonstrates clearly that the agricultural sector is a major contributor to export earnings in Belize.

FIGURE 9: AGRICULTURAL EXPORT AS PERCENTAGE OF TOTAL EXPORT, 2000-2006



Source: ECLAC estimates based on official GoB data.

Although the agricultural sector has traditionally relied on the exports of a narrow range of commodities (citrus, sugar, bananas and marine products) through preferential arrangements to markets in the United States, United Kingdom and CARICOM, the continuing trend in the erosion of these preferential markets as a result of World Trade Organization (WTO) regulations, now forces Belize's agriculture to become more competitive and diversified. Noteworthy has been the strategic decision to remain in sugar production and to make the necessary adjustments within the industry to improve its competitiveness and efficiency in response to reforms in the European Union (EU) sugar policy. Simultaneously, the other traditional commodities of citrus and banana are also implementing programmes for improving productivity as part of their strategy to become more competitive in the global market.

2. Physical features

(a) Climate

The climate of Belize is characterized by pronounced rainy and dry seasons; annual precipitation averages about 55 inches (1,400 mm). The dry season begins in mid-January and ends in mid-May. During this period, monthly rainfall averages less than two inches (50 mm). Drought is a frequent phenomenon that limits the yield of cultivated crops.

During the rainy season, many of the soils having poor natural drainage are saturated to the surface for long periods and require drainage for production of most cultivated crops.

Planning cropping systems to make best use of the poorly drained soils during rainy season and the thin well drained soils during the dry seasons presents important challenges to farmers of the area.

Temperatures vary from a mean monthly minimum of 63.5°F during January and February of 73.5°F during April and September. Maximum temperatures range from a mean monthly of 84°F during December and January to 92.2°F in May to September. The low minimum temperature during December to February promotes sugar accumulation (ripening) of the cane.

(b) Landform and geology

The northern area (sugarcane belt) of Belize is a nearly level plain, ranging in elevation from sea level up to a maximum elevation of about 130 ft (40 m). The entire area was inundated during the Pleistocene age; the highest level of the sea at that time is marked by an old shoreline now at an elevation of 180ft (55 m), to the south of the area.

(c) Soils

There are a great variety of soils in the northern part of Belize, but heavy soils are predominant. Variation in fertility is mostly caused by physical characteristics rather than by chemical quality; some variation is due to chemical qualities, e.g. low phosphorus associated with high calcium carbonate.

Charter (1941) has discussed soil properties from the perspective of sugarcane production. In his report, he grouped soils into six broad descriptive categories:

(a) Black clay over crisp white marl;

(b) Red clay over ochrous white marls with pink patches;

(c) Grayish clay over ochrous limestone white marls cemented by gypsum;

(d) Black sandy loams over white silicaceous marl;

(e) Plastic gray clays of variable depth; and

(f) Gray-black soils over plastic gypsiferous gray clays.

Most of soils of the sugarcane belt are calcareous, clayey and black or dark brown in colour. The dominant soil orders are Mollisols, Vertisols and Alfisols. Many have root zones less than 20 inches (50 cm) thick. The soils that have calcareous surface layers typically have calcium carbonate contents of 20 to 40 per cent or more in the sub-soils. The dominant clay mineral is montmorilloinate and the soils develop cracks 0.4 to 1.5 inches (1 to 4 cm) wide to depths of 10 to 20 inches (25 to 50 cm) or more during the dry season. A high proportion of the area, possibly as much as 70 per cent, has poorly drained soils that are saturated during most of the rainy season and covered with shallow water during a part of that season. The location of the dominant soil is shown in figure 10 (Wright et al, 1959) along with an estimate of the acreage and classification of each.

Declining soil fertility is widely recognized in sugarcane fields. Yields which were as much as 27 MT/acre (67 MT/ha) in the first few season after planting have gradually declined to around 14MT/acre (35 MT/ha) in many fields. The average yield is about 16 MT/acre (40 MT/ha). Many farmers realize that fertilization would increase yields but lack funds to do so, or if funds are available they may not see a clear prospect for profit even with increase yields. Many of the calcareous soils are low in phosphorus, potassium levels are adequate in general although some response to potash is often obtained; trace elements are low, especially in the calcareous soils; in spite of generally high contents of organic matter, nitrogen fertilizer is needed for most crops.

In most fields in the area soil differences may influence the success of diversification efforts. Failure in the introduction of crops due to errors in the choice of the best adapted soils undermine the confidence of farmers in diversification initiatives, and must be prevented or minimized. Only through recognition of important soil properties and the resulting suitability of soils can these failures be avoided.

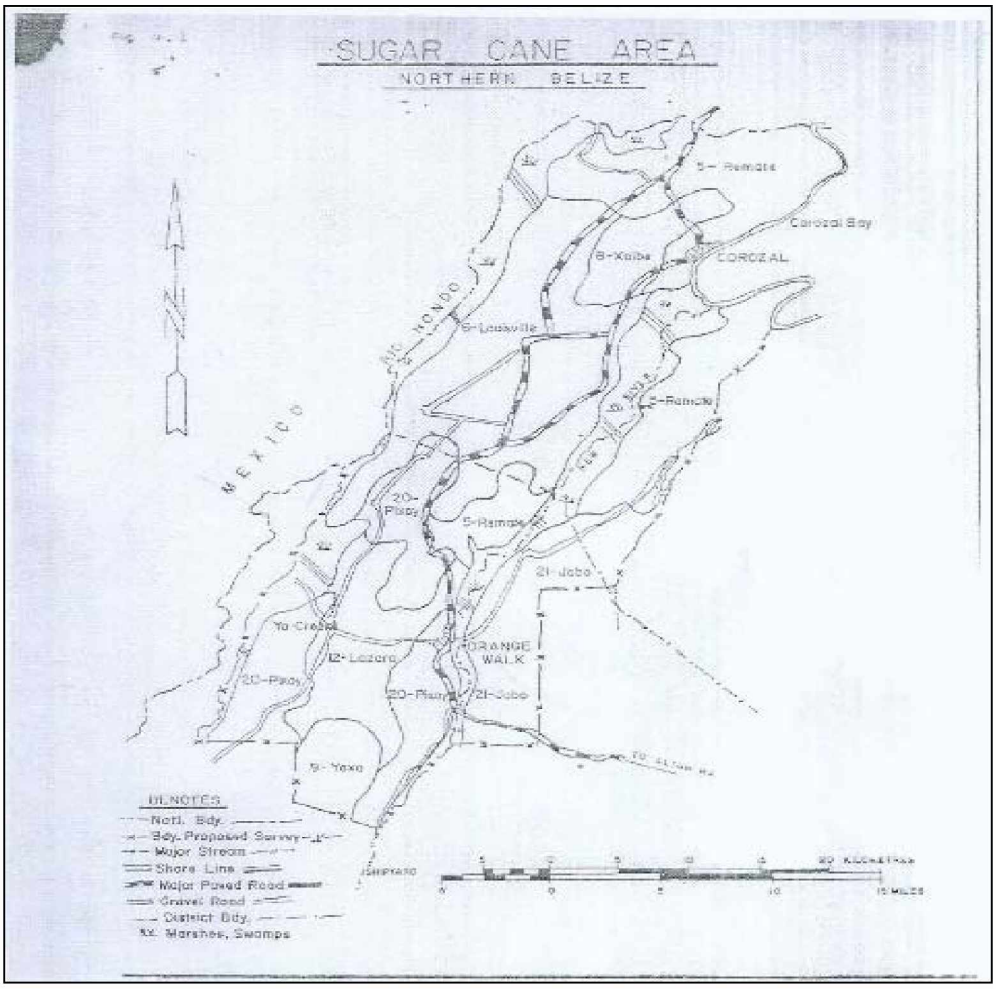
(d) Hydrology, drainage and ground water

The entire area drains into Chetumal Bay through the Rio Hondo river; the New River; and short drains directly into the Bay along the shoreline near Corozal. Much of the area has a poorly defined drainage system and wide areas of swamps and marshes with no defined water courses. As a result, the soils are saturated and covered with shallow water for long periods during the wet season. The movement of surface water is a major requirement for improving field productivity, and whilst such basic infrastructure is costly, its absence presents a major constraint to optimizing agricultural yields, and indeed development in the wider sense.

The most promising groundwater source for irrigation in the area is thought to be the limestone artesian aquifer that underlies the entire area at depths of 1,600 to 2,000 ft (500 to 600 m). The water is fresh and clear and flows to the surface or slightly above.

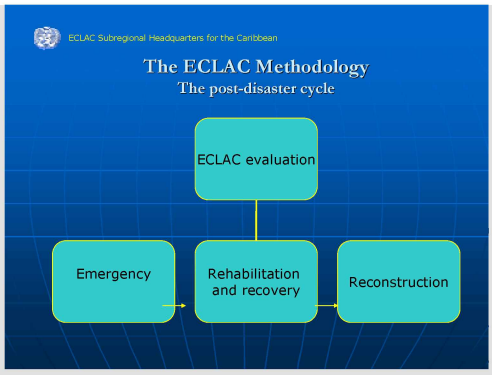
A supply of high quality irrigation is available from several streams and lakes in the area, but in general the scarcity of water at shallow depths is a drawback for irrigation and even for watering cattle. Some well water is brackish and much contains high level of calcium, magnesium and chlorides.

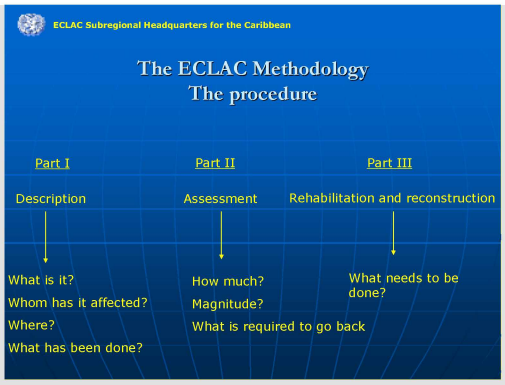
FIGURE 10: SUGAR CANE AREA - NORTHERN BELIZE

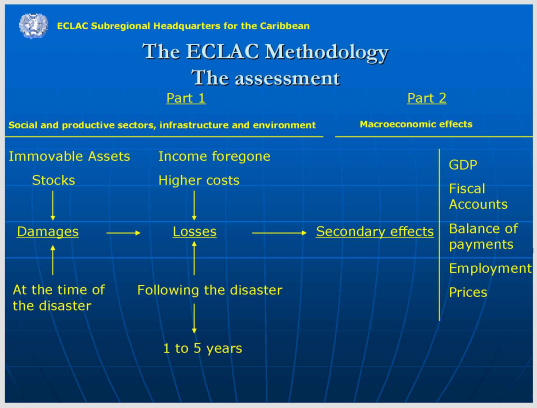


IV. DESCRIPTION OF DAMAGE AND LOSSES BY SECTOR

Box 2: Damage assessment: The ECLAC Methodology (DaLA)







The ultimate goal of the ECLAC assessment methodology is to measure in monetary terms the impact of disasters on the society, economy and environment of the affected country or region. National accounts are used as a means of valuation, supplemented with procedures for specific estimates such as environmental damages and the differential impact on women.

Application of this methodology provides affected countries or regions with the means to determine the value of lost assets and define reconstruction requirements. It enables the identification of the most affected geographical areas and sectors, together with corresponding reconstruction priorities. In addition, it provides a way to estimate effects on economic flows, the affected country's capacity to undertake reconstruction on its own and the extent to which international financial and technical cooperation are needed. Moreover, it can be used to identify the changes to public policy and development programmes/plans needed to deal with needs arising from the disaster and to avoid undesirable effects in economic performance and public well-being.

Assessment activities described in this Handbook should be carried out when the emergency stage has been completed or is nearing conclusion, so as not to interfere with those actions and to ensure the availability of the necessary personnel and basic information. They are intended to facilitate the identification of needs and priorities for the reconstruction stage.

Source: ECLAC Handbook for estimating the socio-economic and environmental effects of disasters; diagrams: ECLAC Subregional Headquarters for the Caribbean.

A. Infrastructure

1. Water storage, treatment and supply

An overview of the water supply sector was obtained through an interview with Mr. Herman Charlesworth, Disaster Recovery Manager at the Public Utilities Commission. Water is supplied to the consumers of Belize primarily by the Belize Water Services Ltd. (BWS), which is headquartered in Belize City and with a main treatment facility in Sand Hill, some 20 miles outside of Belize City. The BWS was formed in 2001, at which time it was vested with the assets and liabilities of the former Water and Sewerage Authority. A controlling number of the company's shares were at that time acquired by a joint British-Dutch company, as part of a privatization initiative by the Government of Belize. In October 2005, the Government of Belize repurchased majority shares in the company, thereby ensuring Belizean ownership. The company presently serves approximately 42,000 customers, with a total water demand of over 140,000 million US gallons per month.

On San Pedro, water is treated by reverse osmosis by the Belize Water Ltd. (BWL), and sold in bulk to BWS for distribution. BWL is owned by a company from Cayman. There are other providers of water in the outer communities throughout the country, however these are not regulated, but rather run by Village Water Boards.

The passage of Hurricane Dean resulted in damage to some of the distribution facilities. In Corozal and in San Pedro, damage to water supply equipment was restricted primarily to services coming out of the ground. However, in San Pedro, water was not lost. In Corozal, groundwater is pulled from two well points, with an 80,000 gallon tank installed at each well point. As part of the hurricane preparedness programme, the tanks are filled prior to the approach of a storm approximately 12 hours before the anticipated impact, and then isolated from the distribution system until after the passage of the storm. After the passage of the storm, water can be pumped directly from these tanks into the distribution lines, if required.

The impact of the storm was felt at night (20 August), and power was lost sometime between 9 – 10pm of that night. By 10:00am the next morning, the high winds had subsided. The BWS brought out generators and were up and running by about 11:00pm on the following night. The storage tanks were opened at that point, however water went quickly due to losses in the system. Nevertheless, at one of the sites, 75 per cent of the customer base in Corozal had water, albeit at a decreased pressure. The system was returned to normal (pressure, full customer base, etc) a week later. Power was restored by the Belize Electricity Limited (BEL) on 23 August at one well location, and on the 26 August, at the second.

In Orange Walk power also went off, however, BWS had generators hooked up by 5:00pm on 22 August. This reserve power did not have to stay on for very long, however, as BEL were back on line by 10:00pm that same night.

In San Pedro, BWL have a one million gallon tank and BWS maintains a 300,000 gallon tank. Based on a consumption rate on San Pedro of 400,000 gallons per day, these reserves are expected to last approximately three to four days in the event of an extreme event. During the

day of the hurricane, BWS shut down their system and locked down the tank. The system was, however, back on line by midday on the day after the storm.

Estimate of damages and losses were given by the Chief Operations Officer of BWS. The values given were:

- Estimate of Damages (BWS) BZ$100,000
- Loss of Income (BWS) BZ$ 50,000

Allowing for some increase in these figures to take into account losses experienced by BWL on San Pedro, the recommended damage and loss figures are given as:

- Estimate of Damages (Total) BZ$150,000
- Loss of Income (Total) BZ$ 80,000

For future scenarios, the following strategies have been proposed by the BWS for the reduction of vulnerability to their systems:

(a) In the event of an extreme hurricane, it is planned that San Pedro would be completely evacuated;

(b) BWS is now carrying out engineering designs for the housing of permanent stand-by generators at each of its well point locations;

(c) BWS maintains a well trained maintenance crew stationed in Belize City that can be deployed throughout the country as required; and

(d) Every year at the start of the hurricane season, the Hurricane Plan is reviewed and updated as required.

2. Electricity generation and transmission

BEL is the primary distributor of electricity in Belize. It serves a customer base of approximately 71,000 accounts, and meets a peak demand of 67 MW. This energy demand is supplied from a number of sources, which include its own diesel fired and gas turbine generation, as well as purchasing power from Belize Electricity Company Ltd. (BECOL), which owns and operates two hydroelectric facilities, Mollejon and Challilo, located in the San Ignacio – Cayo area, with a third (Vaca) due to come on stream next year. BEL also buys power from Comision Federal de Electricidad (CFE), a Mexican State-owned power company and from the Hydro Maya Limited installation in the Toledo District. All major load centres are connected to the country's national grid, which is interconnected with the Mexican national grid. It should also be noted that 70 per cent of the interest in BEL is held by a private consortium. Plans are in place also for the introduction of a cogeneration facility in the Orange Walk area, owned by the Belize Cogeneration Energy Ltd. (BELCOGEN), which is a subsidiary of Belize Sugar Industries. This plant is now scheduled to come on stream in 2009.

Hurricane Dean was not a large event for BEL, as the effects were restricted to Corozal and the surrounding towns. Even within the affected area, damage was not as severe as it could have been as a result of systems being built to a better standard after Hurricane Keith in 2000. Essentially, the following actions were taken at that time, which were intended to reduce the vulnerability of the system.

(a) Spans between poles were shortened;

(b) The class of poles used was improved, from a Class 3 to a Class 5 (thicker diameter);

(c) In areas where soft soils existed, crib foundations were used to provide additional foundational stability; and

(d) In San Pedro, guy wires were used to provide extra structural stability for poles.

As a point of interest, the poles in Corozal, even though being Class 5, performed worse than those in San Pedro.

Damaged poles along highway

The costs incurred as a result of the hurricane were obtained following discussion with the President and CEO of BEL. At the time of the Economic Commission for Latin America and the Caribbean (ECLAC) survey, no loss estimates had as yet been confirmed, however, BEL indicated that based on their experience with Hurricane Keith, losses were expected to be of the order of 10 – 12 per cent of damages. Cost estimates received from BEL were increased by 12 per cent in order to take into account any uncertainties in the estimates presented. These values are summarized below:

- The total cost of the estimated damage for the electricity generation sector was BZ$850, 000.
- The total cost of estimated losses for the electricity generation sector, based primarily on loss of income and cost of fuel, was BZ$110,000.

Vulnerability reduction efforts by BEL have focused on a programme to rebuild feeder systems to better standards, although to date there has been a focus on coastal areas. In addition, the emphasis within the company has been on improved standards rather than insurance.

3. Communications

In general, communications were down in the Corozal area for one to one and a half weeks due to power outages. Not all cell sites had back-up power, so their batteries went down after about three days. It was reported that wires that came down were cut up by people for sale as scrap metal which presented a problem for Belize Telemedia Limited (BTL). In terms of providers of telecommunications services in Belize, the largest such company is BTL which supplies land lines, wireless and internet services and has a customer base of approximately 140,000. There is another company, Speednet, which provides wireless services. It is estimated that their customer base is approximately 35,000, however they use BTL equipment. Both companies have licenses to cover the entire country, but in reality there are dead zones.

(i) Belize Telemedia Ltd.

A summary of damages suffered by BTL was obtained through an interview with the Chairman of BTL. In summary, the following points were raised:

(a) Buildings that contained switching equipment and towers that had dishes were, for the most part, unaffected by the hurricane;

(b) Cables were affected where these were hung on BEL poles;

(c) In San Pedro, a buried cable was exposed and snapped after the beach was eroded;

(d) It took approximately one month to get everything up and running in Corozal;

(e) Potential revenue losses in Corozal were mitigated by the fact that BTL set up a GSM site with generator power; and

(f) Trees that had fallen on cables required trimming.

An estimate of the total cost of damages and losses given by BTL is presented below:

- Total estimate of damage was BZ$400,000.
- The losses related to Hurricane Dean for this provider were estimated to be BZ$100,000 and included the cost of diesel used to run standby generators.

(ii) Speednet

This telecommunications provider presently uses BTL equipment to provide service to its customer base. Damages received were therefore linked to the damage profile for BTL. As such, estimates were made for this provider as follows: damages were estimated to be BZ$100,000 and losses at BZ$30,000.

Total estimates for both providers were therefore estimated to be as follows:

- Total estimate of damage was BZ$500,000.
- The losses related to Hurricane Dean were estimated to be BZ$130,000.

See table 6 for total damage and losses to the telecommunications subsector of the infrastructure section.

Vulnerability reduction initiatives were identified as follows:

(a) Each cell site should be provided with proper back-up power, as many of the sites only have battery power, which has typically a 7-8 hour life;

(b) There is the need to move to a wireless overlay configuration as rapidly as possible; and

(c) All equipment in the Belize City main office has been placed at +16ft above MSL. This is intended to safeguard this equipment against storm surge.

4. Transportation/roads

The damage observed to this subsector was restricted primarily to the northern parts of the country: Corozal District; Orange Walk; and San Pedro. Damage was observed primarily to feeder roads, building infrastructure, houses and commercial establishments. The network of main roads and highways remained in excellent condition after the passage of Hurricane Dean, however, as mentioned above, the feeder roads and agricultural roads were badly damaged, as these are typically unpaved. In addition, extensive damage occurred to most of the jetties on San Pedro. There was also significant beach erosion on the north-east coast of Ambergris Caye.

After the passage of the hurricane, the Ministry of Works deployed personnel to assess the damage to these roads and infrastructure, and to develop a schedule of repairs and repair costs. In general, damage observed and repair works required included:

(a) Highway rehabilitation;

(b) Feeder road restoration;

(c) Culvert repair/replacement;

(d) Bridge repair/replacement;

(e) Village street restoration;

(f) Town street restoration;

(g) Debris clean-up;

(h) Reconstruction of marine piers; and

(i) Beach re-nourishment.

5. Summary costs

A summary of all costs developed under the infrastructure heading is presented in the following tables. The first presents the direct damages for the Corozal Free Zone, Corozal District, Orange Walk and San Pedro. The second table presents the indirect losses that were estimated in these same areas.

TABLE 6: SUMMARY OF DAMAGE AND LOSSES TO THE INFRASTRUCTURE SECTOR

Direct Damage by Sector	District				Amount (Bz$)
	Corozal Free Zone	Corozal	Orange Walk	San Pedro	
Infrastructure - Transportation					
Feeder Road Repair (incl. installation of culverts)		140,300.00	46,500.00		186,800.00
Village Street Repair		270,000.00	180,000.00		450,000.00
Town Street Repair		112,500.00	54,000.00		166,500.00
Cane Road Restoration		400,000.00	100,000.00		500,000.00
Agricultural Road Restoration		600,000.00	200,000.00		800,000.00
Debris Clean-up	6,000.00	44,600.00	20,200.00	19,000.00	89,800.00
Bridge Repair				1,600.00	1,600.00
Structural Damage	500,000.00	4,300,000.00			4,800,000.00
Marine Piers Reconstruction				2,310,000.00	2,310,000.00
Beach Replenishment				105,600.00	105,600.00
Sub-Totals (Bz$)	**506,000.00**	**5,867,400.00**	**600,700.00**	**2,436,200.00**	**9,410,300.00**
Infrastructure - Electricity Generation					
BEL					750,000.00
Villages		100000			100,000.00
Sub-Total (Bz$)					**850,000.00**
Infrastructure - Water Supply					
BWS		100,000.00	30,000.00		130,000.00
BWL				20,000.00	20,000.00
Sub-Total (Bz)					**150,000.00**
Infrastructure - Telecommunications					
BTL		300,000.00	100,000.00		400,000.00
SpeedNet		75,000.00	25,000.00		100,000.00
Sub-Total (Bz)					**500,000.00**
Totals (Bz$)					**10,910,300.00**

Indirect Losses by Sector	District				Amount (Bz$)
	Corozal Free Zone	Corozal	Orange Walk	San Pedro	
Infrastructure - Transportation					
Loss of Sales	220,000.00	15,000.00			235,000.00
Loss in Gate Collections (for Mexicans entering CFZ)	20,000.00				20,000.00
Loss of Wages	210,000.00				210,000.00
Sub-Totals (Bz$)	**450,000.00**	**15,000.00**	**0.00**	**0.00**	**465,000.00**
Infrastructure - Electricity Generation					
BEL					90,000.00
Villages		20000			20,000.00
Sub-Total (Bz$)					**110,000.00**
Infrastructure - Water Supply					
BWS		50,000.00	15,000.00		65,000.00
BWL				10,000.00	10,000.00
Sub-Total (Bz)					**75,000.00**
Infrastructure - Telecommunications					
BTL		75,000.00	25,000.00		100,000.00
SpeedNet		18,750.00	6,250.00		25,000.00
Sub-Total (Bz)					**125,000.00**
Totals (Bz$)					**775,000.00**
TOTAL DAMAGES AND LOSSES - Infrastructure Sector					**11,685,300.00**

Within the infrastructure sector, it can be seen that the transportation and roads subsector accounted for the majority of the estimated damage and losses. The second ranked subsector was electricity generation, although this subsector and the remaining two were small in comparison to the first. The method of construction of the feeder roads makes them susceptible to erosion in times of heavy rainfall, as a result of the fact that they are unpaved. Typically, in fixing these roads, stones (gravel sized) are used to fill holes, and this is covered with approximately 6" – 12" of marl. Other challenges to the recovery system include:

(a) No sustained drain cleaning programme; and

(b) In Corozal, the Ministry of Works only had one back hoe, one loader, four trucks and one bulldozer. At the time of the ECLAC mission, both the back hoe and the bulldozer were down, seriously hampering the recovery efforts after such a severe hurricane event.

B. Productive sector - Agriculture, fisheries and forestry

1. Description, analysis and estimation of damage

(a) Overview

Hurricane Dean, in the early morning of 21 August 2007, impacted Belize as a Category 5 hurricane, with maximum sustained winds of 165 mph and gale force winds extending up to 60 miles from the centre. The hurricane made landfall on the central part of the Caribbean coast of the Yucatan Peninsula and severely affected the entire northern part of Belize.

The coastal and inland communities of the Corozal and Orange Walk District and to lesser extent the Belize district were the areas primarily affected by hurricane force winds, which caused severe damage to households and livelihood activities. The agricultural sector, including large portions of papaya, plantain and sugar cane plantations, suffered significant damages. There were also significant damages to corn, vegetables, tree crops and subsistence crops, with some damage to livestock. The high loss to the agricultural sector is attributed to the strong winds which accompanied Hurricane Dean. The fisheries subsector was severely impacted, with extensive loss of boats and equipment of northern based fishermen and a predicted loss of stock and future revenue due primarily to the impact of the hurricane on crucial supporting habitats.

The analysis of the impact of Hurricane Dean on the agriculture sector was conducted utilizing the ECLAC macroeconomic methodology for estimating socioeconomic and environmental effects of disasters in general and, in particular, the methodological framework related to "*Estimating the Effects of Disasters on the Agriculture Sector*". Within this context, the damage to the sector was categorized under two broad headings, direct damage and indirect damage/loss.

In assessing direct damage of the sector, only damage to assets and stocks at the time of the event was considered. The direct damages were, therefore, identified under four broad headings:

- Damage to farmlands;
- Damage to physical infrastructure and to machinery and equipment;
- Damage/loss of crops that were ready to be harvested; and
- Damage/loss of stock (livestock, inputs, harvested products, etc).

In assessing the direct damage, only production ready to be harvested at the time of the hurricane was taken into consideration. However, for affected annual crops that were still growing at the onset of the hurricane, losses were based on investment in labour and input.

In the case of stocks, when total losses occurred, damages were estimated at farm gate prices and inputs at replacement value. Assessments for partial loss and damage were effected on a prorated basis.

Damages caused by the hurricane that has negative impacts on production and income throughout the recovery period were estimated as indirect damages/losses. In addition, the costs involved in mitigating the impact of the hurricane in order to build back better were included as indirect damage/loss.

Table 7 provides a summary of the direct damage, indirect damage/loss and total impact of Hurricane Dean to the crops, livestock and fisheries subsectors. On-farm infrastructural damages to the crop and livestock subsectors are included in subsector damage estimates. Damages to farm roads are not included in the estimates for the agricultural sector as they are captured and addressed under damage to infrastructure.

TABLE 7: SUMMARY OF TOTAL DAMAGE/LOSSES BY SECTOR (BZ$)

Subsector	Damage/Losses	Damage/Losses	Total Damage/Losses
Papaya	25,614,000	41,724,900	67,338,900
Sugar Cane	8,400,000	14,419,640	22,819,640
Corn	1,988,400	2,390,360	4,378,760
Plantains	1,332,500	2,351,865	3,684,365
Other Crops	2,754,224	3,991,496	6,745,720
Sub-Total Crops	**40,089,124**	**64,878,261**	**104,967,385**
Livestock	943,737	272,095	1,215,832
Fisheries	1,459,525	8,191,831	9,651,356
Total Damage	**42,492,386**	**73,342,187**	**115,834,573**
Source: ECLAC estimates based on official GoB data.			

Total damage to the agricultural sector, as presented in table 7, is estimated at BZ$115.83 (US$57.92) million, of which direct damage is estimated at BZ$42.49 (US$21.24) million and indirect losses put at BZ$73.34 (US$36.67) million. The crop subsector was severely impacted,

accounting for 90.6 per cent of total damage, followed by the fisheries subsector (8.3 per cent) and the livestock subsector (1.1 per cent) in that order in terms of level of impact.

With respect to the crop subsector, the papaya industry was severely impacted, accounting for 58.1 per cent of total damage to the agricultural sector, followed by the sugar industry (19.7 per cent), corn (3.8 per cent), plantains (3.2 per cent) and the total of other crops (5.8 per cent) in terms of severity of damage.

Table 8 presents the damage to the agricultural sector by district. With respect to the crop and livestock subsectors, most of the damage was recorded in the Corozal area which accounted for 74.1 per cent of total damage to the sector, followed by Orange Walk (16.8 per cent) and the Belize district (0.8 per cent). It was not possible to assign damage to the fisheries subsector by district.

TABLE 8: TOTAL DAMAGE ESTIMATES BY AFFECTED DISTRICTS

Affected Areas	Damage	Damage/Losses	Total Damage	%
Corozal	33,436,287	52,372,830	85,809,117	74.1
Orange Walk	7,264,600	12,207,000	19,471,600	16.8
Belize District	331,974	570,526	902,500	0.8
Others (Fisheries)	1,459,525	8,191,831	9,651,356	8.3
Total Damage	**42,492,386**	**73,342,187**	**115,834,573**	**100.0**
Source: ECLAC estimates based on official GoB data.				

2. The crop subsector

(a) Overview

The crop subsector is the major subsector within the agricultural sector and in 2006 contributed 8.2 per cent and 51.9 per cent of total GDP and agricultural GDP, respectively.

The area under production for selected crops in acres is presented in table 9, while the corresponding level of annual production is presented in table 10. The tables show significant increases in both the acreages and level of production of papayas, black beans and bananas, with significant reductions in both coefficients being recorded for cassava, cocoyams, corn and plantains.

TABLE 9: AREA UNDER SELECTED CROP PRODUCTION, BELIZE (ACRES)

Crops	2000	2001	2002	2003	2004	2005	2006
1. Sugar Cane	57,322	57,322	59,500	61300	59,000	60,000	60,000
2. Papaya	481	497	780	608	1,044	1,352	1,430
3. Bananas	4,663	5,181	4,784	6,161	5,708	6,035	6,089
4. Plantains	1,798	2,007	1,852	1,551	1,797	999	1,048
5. Pineapple	435	375	490	271	410	341	188
6. Citrus	-	-	35,230	36,369	36,369	38,000	38,458
7. Corn	35,019	30,168	35,335	31,567	31,416	29,291	26,003
8. Black Beans	2,413	1,337	4,475	3,476	2,548	3,518	3,475
9. Red Kidney Beans	13,266	17,056	11,582	11,799	11,429	10,027	9,100
10. Cow Peas	5,143	5,993	6,933	4,798	5,898	5,091	5,320
11. Cocoyam	290	327	307	223	155	131	103
12. Cassava	203	285	626	205	176	44	43
Source: ECLAC estimates based on official GoB data.							

TABLE 10: ANNUAL PRODUCTION FOR SELECTED CROPS, BELIZE

Crops	2000	2001	2002	2003	2004	2005	2006
1.1 Sugar Cane	1,089,128	1,011,214	1,150,656	1,073,247	1,149,475	929,392	1,173,468
1.2 Sugar (short term)	120,275	103,862	111,313	103,583	116,577	100,435	11,394
2. Papaya	12,648,699	12,321,122	24,219,340	31,824,010	61,109,421	62,705,272	73,368,900
3. Bananas	3,625,615	3,072,567	2,600,109	4,351,359	4,767,598	4,769,053	4,879,781
4. Plantains	1,626,227	1,158,189	879,770	611,420	813,135	416,650	770,634
5. Pineapple	4,853,600	4,472,000	4,208,727	3,655,287	4,759,880	4,963,188	3,162,150
6. Citrus	6,619,438	7,191,904	5,353,536	5,326,747	6,705,378	8,770,967	6,913,551
7. Corn	69,933,362	80,986,720	73,610,658	78,474,112	67,150,300	76,376,425	62,606,816
8. Black Beans	2,018,000	1,240,000	3,283,920	2,581,640	2,179,656	2,955,850	2,932,800
9. Red Kidney Beans	9,501,267	12,796,125	4,939,496	9,667,940	6,629,920	7,621,550	5,680,700
10. Cow Peas	6,298,925	7,198,492	8,225,356	6,902,400	5,951,000	5,049,000	4,907,100
11. Cocoyam	2,023,720	2,841,770	1,882,225	1,034,737	581,160	618,880	576,438
12. Cassava	2,000,600	3,557,400	12,686,800	2,706,130	2,624,350	396,600	527,645
Source: ECLAC estimates based on official GoB data.							

The crop subsector was heavily impacted by Hurricane Dean, with total damage estimated at BZ$104,967,386. The direct damage is estimated at BZ$40,089,125 and the indirect loss put at BZ$64,878,261. The papaya industry was the sector most severely impacted followed by sugar, corn and plantains (table 11).

TABLE 11: TOTAL DAMAGE TO CROP SUBSECTOR IN BELIZE

Crops	Estimated Damage (Bz$)	Estimated Losses (Bz$)	Total Damage (Bz$)
Sugar Cane	8,400,000	14,419,640	22,819,640
Papaya	25,614,000	41,724,900	67,338,900
Bananas	1,250	1,875	3,125
Plantains	1,332,500	2,351,865	3,684,365
Pineapples	882,000	812,695	1,694,695
Citrus	12,600	17,640	30,240
Coconuts	413,100	192,780	605,880
Assorted Fruit Trees	754,763	1,471,787	2,226,550
Timber Trees	81,000		81,000
Corn	1,998,400	2,390,360	4,378,760
Beans	456	859	1,315
Assorted Veg.	536,660	1,341,650	1,878,310
Habanero	47,125	88,560	135,685
Cocoyam	23,520	61,150	84,670
Cassava	1,750	2,500	4,250
Total	**40,089,125**	**64,878,261**	**104,967,386**
Source: ECLAC estimates based on official GoB data.			

Tables 12 through 14 present the impact of Hurricane Dean to the crop subsector on a district basis. Crop damage were greatest in the Corozal District which accounted for 80.6 per cent of the total crop losses valued at BZ$84,602,085 (table 11). Orange Walk district accounted for 18.5 per cent of total crop losses which is valued at BZ$19,464,100 (table 12). Crop losses in the Belize district is estimated at BZ$901,200 or 0.9 per cent of total crop losses (table 13).

TABLE 12: TOTAL DAMAGE TO CROP SUBSECTOR IN COROZAL DISTRICT

Crops	Pre-Hurricane Acreage or Quantity	Estimated Loss (Acreage or Units)	Estimated Value Per Unit (Bz$)	Estimated Direct Damage (Bz$)	Estimated Indirect Loss (Bz$)	Total Damage (Bz$)
Sugar Cane	32,000	9,000	800	7,200,000	12,359,690	19,559,690
Papaya	1,430	1,148	18,000	20,664,000	33,062,400	53,726,400
Bananas						
Plantains	400	400	2,500	1,000,000	1,765,000	2,765,000
Pineapples	150	75	7,000	525,000	483,750	1,008,750
Citrus						
Coconuts	250	126	27,000	340,200	158,760	498,960
Assorted Fruit Trees	450	284	2,250	639,000	1,246,050	1,885,050
Timber Trees	30	25	3,000	75,000		75,000
Corn	10,500	4,546	355	1,613,830	1,940,860	3,554,690
Beans						
Assorted Veg.	129	129	3,000	387,000	967,500	1,354,500
Habanero	5	5	6,500	32,500	56,875	89,375
Cocoyam	100	60	392	23,520	61,150	84,670
Cassava						
TOTAL				**32,500,050**	**52,102,035**	**84,602,085**
Source: ECLAC estimates based on official GoB data.						

TABLE 13: TOTAL DAMAGE TO CROP SUBSECTOR IN ORANGE WALK DISTRICT

Crops	Pre-Huricane Acreage or Quantity	Estimated Losses (Acreage or Units)	Estimated Value Per Unit (Bz$)	Estimated Damage (Bz$)	Estimated Losses (Bz$)	Total Damage (Bz$)
Sugar Cane	33,000	1,500	800	1,200,000	2,059,950	3,259,950
Papaya	506	275	18,000	4,950,000	8,662,500	13,612,500
Bananas						
Plantains	140	70	2,500	175,000	308,875	483,875
Pineapples	45	40	7,000	280,000	258,105	538,105
Citrus	5	2	6,000	12,000	16,800	28,800
Coconuts	120	25	2,700	67,500	31,500	99,000
Assorted Fruit Trees	170	50	2,250	112,500	219,375	331,875
Timber Trees	5	2	3,000	6,000		6,000
Corn	10,000	825	448	369,600	443,520	813,120
Beans						
Assorted Veg.	50	26	3,000	78,000	195,000	273,000
Habanero	2	1	6,500	6,500	11,375	17,875
Cocoyam						
Cassava						
Total				**7,257,100**	**12,207,000**	**19,464,100**
Source: ECLAC estimates based on official GoB data.						

TABLE 14: TOTAL DAMAGE TO CROP SUBSECTOR IN BELIZE DISTRICT

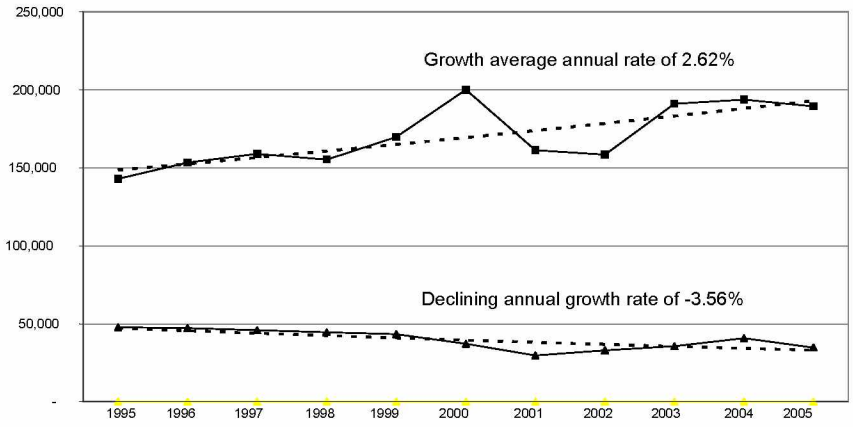
Crops	Pre-Hurricane Acreage or Quantity	Estimated Losses (Acreage or Units)	Estimated Value Per Unit (Bz$)	Estimated Damage (Bz$)	Estimated Losses (Bz$)	Total Damage (Bz$)
Sugar Cane						
Papaya						
Bananas		0.5	2,500	1,250	1,875	3,125
Plantains		63	2,500	157,500	277,990	435,490
Pineapples		11	7,000	77,000	70,840	147,840
Citrus		0.1	6,000	600	840	1,440
Coconuts		2	2,700	5,400	2,520	7,920
Assorted Fruit Trees		1.45	2,250	3,263	6,362	9,625
Timber Trees						
Corn		14	355	4,970	5980	10,950
Beans		1.25	365	456	859	1,315
Assorted Veg.		11.375	6,300	71,660	179,150	250,810
Habanero		1.25	6,500	8,125	20,310	28,435
Cocoyam						
Cassava		0.5	3,500	1,750	2,500	4,250
Total				**331,974**	**569,226**	**901,200**
Source: ECLAC estimates based on official GoB data.						

(b) The sugar industry

Sugar production continues to be a major economic activity in Belize and has made and continues to make a significant contribution to the agricultural sector, national income and export earnings. In 2005, sugar production accounted for 9.4 per cent of the value of total agricultural output and averaged almost 4.5 per cent of total GDP in the last five years. The total revenue generated in the same period by the sugar sector averaged some US$35.2 million per annum. Although sugar revenues declined over the past decade, its contribution to overall economic activity remains very significant.

The sugar industry is the largest industry in the agricultural sector and Belize's single-most important export product. Its contribution to total export earnings averaged about 23 per cent for the last decade, but was down to 19.3 per cent in the last five years. Although Belize's total merchandise exports grew by an annual rate of 2.6 per cent, sugar exports experienced a declining growth rate of -3.6 per cent (figure 11). Part of this negative growth can be explained by a declining and cyclical domestic production of cane and sugar (see table 10).

FIGURE 11: BELIZE SUGAR EXPORTS RELATIVE TO TOTAL MERCHANDISE EXPORTS (US$'000)



Source: Alpuche et Al, 2005 and latest data from BSI.

Sugarcane and sugar production is concentrated in the two northern districts of Orange Walk and Corozal in the country. The socio-economic importance of the sugar industry is well established and its income distributional impacts are relatively more widespread in northern Belize. The industry provides employment to approximately 13.7 per cent of the working population and accounts for almost half of all the agricultural labor force, concentrated largely in the northern districts. In 2003 the sugar industry provided direct employment to at least 10,644 persons which included self employed small farmers, field and factory workers. In 2004, total direct employment was estimated at 4,859 persons, alongside 8,474 registered cane farmers.[4]

[4] Source: CSO, Labor Force Statistics (2004)

Furthermore, approximately 2,000 more people are directly involved in various other activities related to the industry. Taking into account the number of farmers and their family dependants and related activities, approximately 40,000 people rely on the sugar industry - which approximates the entire population of Orange Walk and Corozal Districts and almost 28 per cent of the country's population in 2004. Given the industry's importance to the economy (in addition to the country's social and political life), any rapid decline of sugar production would create significant increases in the incidence of poverty, especially as sugarcane production is primarily small-farmer based and plays a significant role in providing income and mitigating poverty.

Sugarcane is grown on approximately 60,000 acres and the industry produces up to 1.2 million tons of cane, yielding between 115,000 and 125,000 tons of sugar, depending on the effect of uncertain weather patterns on cane quality in any year. Belize consumes about 10 per cent of the sugar it produces and has traditionally sold approximately 50 per cent of its sugar production to preferential markets, with quotas of 40,000 tons white sugar equivalent (42,000 tons raw) to the EU and 11,000 tons to the United States. The remaining sugar is placed as direct consumption sugar into CARICOM where the price is at a slight premium over the world market price. Hence, the industry remains exposed to a residual world market of volatile prices, which is a woefully inadequate benchmark for cost competitiveness.

The existence of the sugar industry has spurred a range of economic and social investment in the Northern Districts, including the establishment of social infrastructure to support it through the provision of services to the general population in the area. These include the Government of Belize (GOB) efforts at providing and maintaining roads, schools, upgrading the health services system along with housing facilities. All the major commercial financial institutions have established branches in either Corozal or Orange Walk Districts, along with local credit unions and the State-owned Development Finance Corporation (DFC), primarily to facilitate investment in the sugar industry. With the anticipated accelerated decline in industry revenues in the near future, the GOB will be required to identify alternative economic activities for displaced dependants of the sugar industry.

Unlike most sugar producing countries in the Caribbean, the Belize sugar industry is not dependent on financing from the government. It is privately owned and profitable with sugarcane produced by more than 8,000 independent, small farmers. The industry's structure is unique, comprising three major groups of stakeholders – sugarcane farmers, sugarcane processor and the GOB, and various committees and mechanisms to facilitate the industry's management and operations. The industry falls under the purview of the Ministry of Agriculture, Fisheries and Cooperatives.

Sugarcane farmers are organized in The Belize Cane Farmers Association (BSCFA) which is the officially recognized corporate body to administer the affairs of farmers and is managed by an elected central Committee of Management. BSCFA is divided into two district divisional associations, one each for the Corozal and Orange Walk districts, respectively. Each divisional association is further divided into nine district branches and all representatives are elected by registered cane farmers. The structure provides a mechanism for direct farmer contact and administration.

Sugar is manufactured in the country's sole sugar factory by the Belize Sugar Cane Board (BSI), a company whose majority shareholders are employees of the same company. The BSI operates the sole processing facility near Orange Walk Town. The company's shareholding consists of 81.29 per cent BSI Employee Holdings Ltd., 10 per cent Tate & Lyle Holdings Ltd., 5.68 per cent Government of Belize and 3.03 per cent DFC Investment Company Ltd. The company has undergone self-imposed restructuring including the reduction of its workforce from 609 in 2003 to 392 by 2005. The current legislation allows for additional manufacturers to exist, but it is most unlikely that investment would occur in other factories to produce sugar at this time.

BSI is currently well advanced with plans to commence construction and operation of an electricity co-generation plant next to the Tower Hill sugar factory in late 2008. The plant is expected to produce 32.5 MW of power of which a portion representing approximately 20 per cent of Belize's national energy demand will be sold to the national grid. It will also address current steam and power constraints by the factory. This augurs well for lowing energy costs and reducing the dependence on imported (oil) energy. The project is slated for commercial operation in late 2008.

Production of other by-products such as potable alcohol, ethanol and specialty sugars are also being explored to supplement industry income. These planned investments will be critical to securing the industry's viability and sustaining the vitality of the Northern Districts in a post-sugar reform period.

The Government of Belize acts as a facilitator in the sugar sector and maintains a strong regulatory role. The Sugar Industry Act of 2001 provides the legislative framework for the industry and a good foundation for it to incorporate competitive practices and evolve from high dependence on government's guidance. This legislation restructured some existing regulatory bodies and incorporated new institutions. Although implementation has been slow, the legislation heralded a new era of cooperation among stakeholders and reflects a "maturing" of the industry.

The Sugar Industry Control Board (SICB) is the principal autonomous body that regulates the industry including providing oversight over all other committees and bodies incorporated under the legislation. The Board includes representatives of the government, cane farmers and BSI. Due to a lack of adequate management processes and institutional capacity within the industry, the SICB is required to take on many executive functions that under normal circumstances would be considered beyond its regulatory mandate.[5] In this regard, the industry will need to develop stronger institutional capacity to coordinate, regulate and provide better oversight as part of its strategy of reform and improvement.

Preferential access under the EU Sugar Protocol facilitated large income transfers to African, Pacific and Caribbean (ACP) countries, including Belize. These transfers will be reduced under the proposed reforms of the EU sugar markets. Losses for some Caribbean ACP countries are expected to be significant relative to external income. The most damaging element of the proposal is the cut in the guaranteed price of imported raw sugar by 36 per cent over four years, beginning in July 2006. This means that the price will decline from Euro 523.7 per ton to

[5] Alpuche et Al, 2005.

Euro 496.8 in 2006/2007 and 2007/2008, and Euro 448.8 in 2008/2009, and Euro 335.2 by 2009/2010. This is down a mere 3 per cent from the EU original proposal of a 39 per cent decline. The less severe reduction in the first two years of the new regime is interpreted as providing some breathing space to ACP countries to adjust.[6]

Belize is already one of the lowest cost sugar producing countries in the Caribbean. In addition to Guyana, the BSI is determined to be the most competitive internationally among the Caribbean ACP producers. Based on current data, Belize generally believes that its industry could remain viable under the EU sugar regime reform.[7] Notwithstanding the depth and magnitude of the reform, the sugar industry will need to incorporate significant innovation and changes to maintain its competitive position and enable its survival as preferential markets decline in the future. Belize is among the ACP group of countries determined to bear a significant loss arising from the reform. The adaptation period is expected to exact a heavy economic and social toll on the industry, the sugar dependent districts and, by extension, the Belizean economy.

Belize's sugar industry's potential to adapt successfully in the longer term to the new market environment is determined by the challenges that it faces in its internal and external environment. A Strength, Weakness, Opportunities, and Threats (SWOT) analysis of the industry is summarized below which reflects that the industry can be competitive in external markets if its weaknesses and threats can be addressed with incremental investments in key areas, adequate management, strong industry institutions and supportive policies.

(c) Strengths and weaknesses

The sugar industry's strengths may be summarized as follows:

(a) Unique privately-owned industry;

(b) Good legislative framework for development of the industry;

(c) No financial dependence or support from the government;

(d) Increased cooperation and collaboration among stakeholders;

(e) Government commitment and support for the industry;

(f) Modern and relatively efficient milling facility;

(g) Well established nucleus of critical skills in the industry based on training and experience;

(h) Stakeholders working together have already recognized the need for and identified the critical areas for industry reform if it is to achieve international competitiveness; and

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[6] Working Document for the Third Meeting of CARICOM Stakeholders on Sugar, February 2006, Trinidad and Tobago.

[7] Based on IICA's Value Chain Analysis (VCA) study, 2006.

(i) Good credibility of cane farmers and BSI with financial and sugar trading institutions.

Its weaknesses can be summarized as follows:

(a) High levels of dependence on government's intervention;

(b) Inadequate public information and public relations campaign;

(c) Weak institutional framework, management and technical support services of the BSCFA;

(d) Slow implementation record within the industry;

(e) A high level of inefficiency in the industry, particularly cane production and transportation;

(f) Low levels of technological research, innovation and transfer;

(g) Low levels of technology knowledge and usage at the farm level;

(h) Low levels of field mechanization;

(i) Inadequate irrigation and drainage system;

(j) High cost and inefficient transport system for sugar cane from field to factory and of sugar from factory to port;

(k) High cost of financing;

(l) Limited control over cane supply and scheduling of cane deliveries; and

(m) Dependence on preferential markets.

(d) Opportunities and threats

The major threats to the industry include:

(a) The reform of the EU preferential market access and future access to other preferential market(s);

(b) Low world market price relative to Belize's cost of production;

(c) Increased availability and use of sugar substitutes;

(d) Increased freight rates;

(e) Low country credit rating that affect access to and financial costs of external funds;

(f) Limited access to foreign exchange because of tight government foreign exchange policy;

(g) Impact of the Euro/US$ exchange rate fluctuations on the industry's competitiveness;

(h) Weak fiscal position of the government; and

(i) Increasing domestic taxation.

Although there are major external threats to the industry, there are opportunities that can be exploited that include:

(a) Possibilities for an increase in Belize's sugar quota to the EU market as a result of the exit of certain Caribbean States from the sugar industry;

(b) Increased access to the Caribbean sugar market;

(c) Diversification and increased revenue generation within the sugar industry through the development of value added products and sugar derivatives such as cogeneration, alcohol/ethanol, refined and specialty sugars and energy cane biomass cultivation;

(d) Access to funding under the proposed EU "accompanying measures";

(e) Scope to increase productivity and efficiency both at the field and factory levels to compete in the world market at a price of US$0.12/lb; and

(f) Consolidation within the industry especially within sugar cane production, harvesting and transport to achieve economies of scale.

In the aftermath of Hurricane Dean, the SICB, working closely with the BSI and the BSCFA, conducted a detailed assessment of the damage caused to the sugarcane fields. The assessment was carried out in the nine sugarcane growing branches of the Corozal and Orange Walk Districts, respectively, and formed the basis for the development of a rehabilitation plan for the industry.

All cane fields in the sugar belt suffered some form of wind damage ranging from uprooting, severe lodging, or breakage of the cane plants. Minimal damage was attributed to flooding. The B52-298 variety (white cane) which represents approximately 60 per cent of the cane planted in the sugar belt suffered severely from mainly breakage and toppling, while the B79-474 and BBZ-8257 varieties suffered extensive root damage.

Some 12,000 acres of late harvested fields, 10,000 acres in Corozal district and 2,000 acres in the Orange Walk district, were severely affected and therefore would require immediate attention through fresh fertilization and weeding to be saved for delivery in the upcoming crop year.

The early and late harvested ration or old growth sugar cane field totaling approximately 50,000 acres suffered significant damage.

It is estimated that total sugar cane loss is equivalent to 10,500 acres, with 9,000 acres located in the Corozal district and 1,500 acres in Orange Walk. As a result, sugar cane production for the 2007/2008 crop is projected to reach only 1.09 million tonnes, a decline of 210,000 tonnes from the pre-Hurricane Dean projection of 1.3 million tonnes.

The generally damaged condition of the cane to be harvested and delivered to the factory along with harvesting difficulties is expected to result in lower sucrose yields. The tonnes cane/tonnes sugar ratio is, therefore, projected to decline to 12.4 to 1 in the 2007/2008 crop compared to the normal ratio of 10.8 to 1.

The total estimated damage to the sugar industry is BZ$22,819,640 with direct damage estimated at BZ$8,400,000 and indirect losses at BZ$14,419,640. The Corozol district suffered most of the damage estimated at BZ$19,559,690 (85.7 per cent), with Orange Walk District accounting for the remaining BZ$3,259,950 (14.3 per cent) worth of damage. The details are presented in tables 11 through 14.

(e) Papaya industry

The papaya industry has exhibited a phenomenal rate of growth over the last seven years (2000-2006), with total area under production moving from 481 acres in 2000 to 1936 acres in 2006 and production increasing from 12,648,699 lbs to 73,368,900 lbs for the corresponding period. Approximately 98 per cent of total national production is located in the northern districts, mainly Corozol.

The industry suffered the heaviest loss within the agricultural sector as a result of the passage of Hurricane Dean, with a total of 1,423 acres of papayas destroyed. Wind damages included loss of fruits at various stages of maturity, lodging, uprooting and breakages of plants. Of the 1,423 acres destroyed, 1148 acres were located in the Corozol District and 506 acres in the Orange Walk District.

The passage of Hurricane Dean also impacted negatively and significantly on export income from papaya and also has resulted in the loss of income by workers in the field and pack houses.

The total estimated damage to the papaya industry is put at BZ$67,338, 900 or 58.1 per cent and 64.2 per cent of total loss within the agricultural sector and the crop subsector, respectively. Of the total damage, BZ$25,614,000 represents damage, and BZ$41,724,900 losses. Approximately 80 per cent of total damage was recorded in the Corozol District.

(f) "Other crops" subsector

The category "other crops", which included bananas, plantains, pineapples, citrus, coconuts, assorted fruit trees, timber trees, corn, beans, assorted vegetables, Havanero, cocoyam and cassava suffered substantial damage from Hurricane Dean, with total impact on this category estimated at BZ$14,808,846. The direct damage is estimated at BZ$6,075,125 and the indirect losses put at BZ$8,733,721. Details are provided in tables 10 through 14.

The crops in this category that were significantly impacted were corn with an estimated total damage of BZ$4,378,760, plantains (BZ$3,684,365), assortment of vegetables (BZ$1,878,310), pineapples (BZ$1,694,695) and coconuts (BZ$605,880). The other crops suffered minor damage.

In the case of corn, approximately 5,371 acres were impacted mainly in Corozol (4,546 acres) and to a lesser extent Orange Walk (825 acres). It should be noted that at the time of the hurricane, the production of corn was at, or very close to, the maturity state. As a result, approximately 8,670,900 lbs of corn, equivalent to 4,129 acres of production, were salvaged. There was a cost involved in the harvesting of the salvaged corn. The salvage operation was accomplished mainly by manual labour and the unit labour cost, equivalent to 50 per cent of the farm gate prices per lb salvaged corn, is reflected in the direct cost.

Approximately 470 acres of plantains, 400 acres in Corozol and 70 acres in Orange Walk were impacted.

3. Livestock subsector

The livestock subsector in Belize is relatively small contributing only 1.6 per cent to total GDP and 10.5 per cent of agricultural GDP. The subsector suffered moderate damage as a result of Hurricane Dean, with damage reported mainly for poultry, pastures, feeding regime and beehives. There was very little damage to on-farm infrastructure.

The overall estimate of damage to the industry is put at BZ$1,215,832 of which BZ$1,207,032 (99.3 per cent) occurred in the Corozol District. Of the total livestock damage, BZ$943,737 represents damage and BZ$272,095 losses. The damage which occurred in the Orange Walk District was related to animal houses.

Details of the damage incurred by the livestock subsector by industry are presented in tables 15 and 16.

TABLE 15: TOTAL DAMAGE/LOSS TO LIVESTOCK INDUSTRY IN BELIZE

Class Of Animal/Item	Pre-Hurricane Quantity (Nos/Units)	Estimated Losses (Nos/Units)	Estimated Value Per Unit	Estimated Damage (Bz$)	Estimated Damage/Losses (Bz$)	Total Damage (Bz$)
Cattle	2,500	25	1,125.00	28,125	37,500	65,625
Pigs	1,931	90	330.00	29,700	22,680	52,380
Sheep	635	30	160.00	4,800	8,100	12,900
Pastures	2,500	2,000	336.00	672,000	84,000	756,000
Fences		5	4,000	20,000		20,000
Animal Houses (Pens)		85	406.25	32,500	1,300	33,800
Back-Yard Chicken	8,000	1,200	8.00	9,600	10,800	20,400
Broilers	110,000	16,400	6.83	112,012	50,840	162,852
Bee Hives	200	175	200.00	35,000	56,875	91,875
Total Damage				**943,737**	**272,095**	**1,215,832**
Source: ECLAC estimates based on official GoB data.						

TABLE 16: TOTAL DAMAGE/LOSS TO LIVESTOCK INDUSTRY IN COROZAL

Class Of Animal/Item	Pre-Hurricane Quantity (Nos/Units)	Estimated Losses (Nos/Units)	Estimated Value Per Unit	Estimated Damage (Bz$)	Estimated Damage/ Losses (Bz$)	Total Damage (Bz$)
Cattle	2,500	25	1,125.00	28,125	37,500	65,625
Pigs	1,931	90	330.00	29,700	22,680	52,380
Sheep	635	30	160.00	4,800	8,100	12,900
Pastures	2,500	2,000	336.00	672,000	84,000	756,000
Fences		5	4,000	20,000		20,000
Animal Houses (Pens)		50	500.000	25,000		25,000
Back-Yard Chicken	8,000	1200	8.00	9,600	10,800	20,400
Broilers	110,000	16,400	6.83	112,012	50,840	162,852
Bee Hives	200	175	200.00	35,000	56,875	91,875
Total Damage				**936,237**	**270,795**	**1,207,032**
Source: ECLAC estimates based on official GoB data.						

4. Fisheries subsector

(a) Overview of the industry

The fisheries subsector is extremely important to the socio-economic development of Belize, in general, and, of those rural communities located along the coastal areas, in particular. There are approximately 2,130 licensed fishermen and 653 fishing vessels in Belize operating within the institutional framework of five main fishing cooperatives. The fisheries subsector contributed 5.4 per cent of total GDP and 34.2 per cent of agricultural GDP in 2006.

In 2006, total fish production by the five fishermen cooperatives, as presented in table 17, is estimated at 1,239,231 lbs. Conch meat (45.1 per cent), lobster tail (33.9 per cent), conch fillet (9.5 per cent) and sea shrimp (3.7 per cent) were the main contributors to this production.

TABLE 17: FISHERMEN COOPERATIVES PRODUCTION 2006 (LBS)

Commodity	Cooperatives					Total
	National	Northern	Placencia	Rio Grande	Caribbean	
Fish Fillet	14,364.0	23,762.5	4,748.0	331.0	-	43,205.5
Lobster Meat	23,528.0	13,216.0	855.0	236.0	-	37,835.0
Lobster Tail	220,707.0	165,749.0	12,251.0	2,007.0	19,149.0	419,863.0
Conch Meat	147,678.0	396,393.5	12,557.0	2,226.0	647.0	559,501.5
Conch Fillet	85,793.0	26,273.5	4,034.0	-	1,070.0	117,170.5
Stone Crab Claws	1,534.0	4,564.5	-	-	-	6,098.5
Sea Shrimp	-	46,241.0	-	-	-	46,241.0
Whole Fish	-	-	9,029.0	82.0	-	9,111.0
Squid	-	17.0	-	-	-	17.0
Conch Trimmings	185.0	-	-	-	-	185.0
Conch Operculum	3.0	-	-	-	-	3.0
TOTAL	**493,792.0**	**676,217.0**	**43,474.0**	**4,882.0**	**20,866.0**	**1,239,231.0**
Source: ECLAC estimates based on official GoB data.						

Over the past few years, the lobster fishery has dominated the fishing industry by becoming the highest and the most important income earner artisanal fishery in Belize. On an average 500,000 lbs of lobster tail are exported annually. It is a seasonal fishery, kept as "open access" for eight months of the year. Lobster tails and lobster head meat are bought from the fishermen by the five fishing cooperatives. These cooperatives are required to sell about 5 per cent of their processed lobster locally. Lobsters are caught throughout the inner reef system of the Barrier Reef using lobster pots, hook sticks and shades or "casitas". Fiberglass and wooden skiffs averaging between 12 and 28 feet propelled by outboard engines (25-75HP) are used in the lobster fishery.

Lobster production by the five fishermen cooperatives has remained fairly stable over the last 20 years ranging between 433,000 and 625,000 lbs with over 419,863 lbs of lobster tails and 37,835 lbs of head meat produced in 2006. This showed a decrease of 14.6 per cent in lobster tail and 16.3 per cent in head meat production compared to 2005. This represented 36.5 per cent of the total wild marine commodities produced. The lobster season in Belize opens from 15 June

to 14 February of each year allowing fishermen to harvest lobster from the main fishing grounds. In addition, there are other regulations that govern the sustainable existence of the lobster fishery.

The two major fishing cooperatives, Northern and National Fishermen Cooperative, are the only cooperatives that have a processing plant that process fishery products for exportation. Caribean, Placencia and Rio Grande Fishermen Cooperative deliver their fishery products to either one of these major fishing cooperatives. Over the last 18 years, lobster tails exports have remained fairly stable between 400,000-600,000 lbs. In 2006, lobster fishery earned over US$7.5M and US$75,705.00 in foreign exchange on 383,960 lbs and 21,630 lbs, respectively, of processed lobster tails and head meat exported to the United States. This showed an increase in foreign exchange earnings of 6.6 per cent for lobster tails and a decrease of 40.3 per cent for head meat compared to 2005. An average price of US$19.00 was received for each pound of lobster tails by the cooperatives. Belize enjoys duty-free access for all exports to the United States market under the Caribbean Basin Initiative (CBI).

Conch fishery continues to be the second commercially important commodity in Belize. Conch is harvested solely by free diving to depths from 10-90 feet. In early 1960, the demand for conch increased significantly on the world market. By 1972, Belize exported 1.25 million pounds of conch meat. Conch fishing is undertaken in all six fishing areas in Belize for nine months of the year. The conch fishing is an artisanal and seasonal fishery during the closed lobster season, the fishermen who had previously targeted lobster now target conch, and when the seasons are running concurrently they fish both. Conch is caught along the fore-reef, and the inner lagoons, and is fished exclusively by diving, because the species is sedentary. Wooden sailing sloops measuring up to 30 feet are used in the conch fishery. These are equipped with sails and auxiliary engines (7.5-1.5 HP). They carry up to eight small canoes and as many as 11 fishermen and remain out at sea for six to 12 days. Six hundred and fifty-three vessels were licensed in 2006, which showed an increase of 0.2 per cent compared to 2005.

Conch production by the five fishermen cooperatives has been fairly stable over the past six years ranging from 400,000 lbs and 623,000 lbs with over 692,303 lbs produced in 2006. This showed an increase of 9.4 per cent in production compared to 2005. In 2006, the fishermen cooperatives produced 559,502 pounds and 117,171 pounds of conch meat and fillet, respectively, representing 55.2 per cent of the total wild marine commodities produced.

In 2006, the fishing cooperatives exported 701,628 lbs of conch meat to the United States valued at US$4.0M. Also exported was 6,950 lbs of conch trimmings valued at US$13,900.00. This showed an increase of 4.3 per cent in foreign exchange earnings and 30.4 per cent in export weight for conch meat compared to 2005. Tremendous pressure has been placed on the conch fishery due to rising prices on the international market. Presently, the National Fishermen Cooperative is exporting ground conch as a form of value added with greater economic returns.

The success of fishing cooperatives paved the way for the shrimp-trawling fishery to appear in Belize. Full-time commercial shrimp trawling began in 1967 with the granting of a five-year concession to American Trawlers, which ended in January 1972. Many problems led to the decline in this lucrative business, low cooperative membership, the expansion of the tourist industry, the small size of fleet including high fuel prices, no cooperative grading machine and

decline in production. In 1986, the Government of Belize, as part of its fishery development policy, provided incentives to have more shrimp trawlers operate in Belize.

Shrimp trawling activities have been regulated by the Belize Fisheries Department, where close season (15 March – 14 July inclusive in any year) is dependent upon the results obtained from consistent independent surveys. However, operations have stopped voluntarily at times due to the small non-profitable catches taken. The most commonly caught species are *the Panaeus duorarum* and *Panaeus schmitti*.

The Marine Shrimp Fishery can be divided into the Industrial Trawl Fishery and the Coastal Artisanal Fishery. The Artisanal Shrimp Fishery is a small fishery; it is limited to fishing activities in the southern portion of the country where small skiff and cones are utilized. The Industrial Trawl Fishery consists of trawlers designed like those used in the Gulf of Mexico. They have inboard engines with an average horsepower of 365 (Cummins engine), the length of these vessels ranges from 33.2-36.4 meters. These trawlers operate during the night on the southern shrimping grounds, either the Victoria Channel or in front of Dangriga.

The production of marine shrimp has decreased steadily over the last two years. In 2006, 46,241 lbs of marine shrimp was produced showing a decrease of 33.9 per cent in production compared to 2005. This production represented 3.7 per cent of the total wild marine commodities produced.

The Marine Shrimp Fishery is economically important to Belize, since it earns foreign exchange revenue and provides employment to many Belizeans. In 2006, 5,900 lbs of marine shrimp valued US$42,287.00 was exported to the United States. This showed a decrease in export weight of 25.8 per cent and an increase of 29.7 per cent in foreign exchange earnings compared to 2005.

Most finfish landed at the fishing cooperatives occurs mainly as an incidental catch. It has been documented that most of the finfish landed is sold to hotels, private individuals and at local markets. In addition, most fishing cooperatives do not receive finfish unless a reasonable and profitable quantity is landed because it is not economically feasible to process a small quantity. Finfish are caught by hand-lining, spearing, long-lining, gillnetting and trapping using fish pots. Snappers, groupers, mackerels and jacks are the most desirable species for export, however, it should be noted that the Lutjaniae family make up the largest single family of exported fish.

Whole fish and fish fillet production by the Fishermen Cooperatives for 2006 amounted to 9,111 lbs and 43,206 lbs, respectively. This showed a decrease of 45.1 per cent for the production of whole fish and an increase of 23.3 per cent for fish fillet by the fishermen cooperatives compared to 2005. Seventeen thousand pounds of salted fish was produced and exported by various independent fishermen to Guatemala and Mexico.

Deep-sea fishing outside the Barrier Reef, although practiced by a few fishermen, could raise the production of finfish significantly but local fishermen are reluctant to make the necessary investment until it has been shown to be economically feasible.

(b) Impact of Hurricane Dean on the subsector

The marine ecosystem in northern Belize and particularly in the Bacalar Chico, Hol Chan and Caye Caulker Marine Reserves were heavily damaged as a result of the high winds and strong current and wave action associated with the hurricane. Though it is very unlikely that a full assessment of environmental damages to mangrove forests, seagrass beds and the barrier reef could be completed in the immediate future, the economic costs associated to this natural ecological disaster is estimated in millions of dollars. The aforementioned ecosystems in the affected marine protected areas serve an extremely important ecological role in many life stages of multiple marine species such as feeding, nursery, spawning and refuge areas for many commercial and non-commercially important marine species. These badly damaged ecosystems are inhabited by important near-shore populations of Spiny lobster, *Panulirus argus* and Queen conch, *Strombus gigas*, which are the two most important marine species in Belize. The ecosystems are also occupied by various finfish species such as groupers, snappers and jacks.

To estimate the damages of the fisheries sector, the Belize Fisheries Department carried out a survey of the fishermen affected by the hurricane during the period 23 August to 2 September 2007. This survey was focused primarily on quantifying the loss of capacity to the fisheries sector and its related impact on the foreseen loss in production and revenues normally generated by the sector. Individual fishermen interviews were carried out in the villages of Sarteneja, Chunox, Cooper Bank and Corozal Town in the Corozal District and in Belize City. This survey revealed significant losses of fishing gear and equipment and damages to houses and fishing camps.

The total damage to the fisheries subsector is estimated at BZ$9,651,356 of which damage accounted for BZ$1,459,525 and losses BZ$8,191,831.

Details on damage estimates are presented in table 18. The table shows that the damage estimated resulted from damages to boats, engines and fishing camps and damages to loss of 10,656 lobster traps, 4,614 lobster shades, 257 hook sticks, 297 fishing lines, 75 fish traps, 16 beach traps, 122 canoes, 131 diving masks and 133 pairs of diving fins.

TABLE 18: TOTAL DAMAGE TO FISHERIES SUBSECTOR IN BELIZE

Fishing Gear/Equipment	Estimated Pre-Hurricane Dean Units Owned	Units Damaged or Destroyed	Estimated % Loss of Gear Capacity	Unit Cost (Bz$)	Total Damage (Bz$)
Lobster Trap	26,178	10,656	40.7	85.0	905,760
Shades	10,960	4,614	42.1	60.0	276,840
Hooksticks	2,570	257	10.0	15.0	3,855
Fishing Lines	2,970	297	10.0	5.0	1,485
Fish Trap	167	75	44.9	100.00	7,500
Fish Beach Trap	16	16	100.0	1,200.0	19,200
Canoes	2,131	122	5.7	800.0	97,600
Diving Masks	2,131	131	6.1	35.0	4,585
Diving Fins	2,131	133	6.2	80.0	10,640
Boat Damage					14,640
Engine Damage					30,480
Fishing Camp Damage					86,940
Total Damage					**1,459,525**
Source: ECLAC estimates based on official GoB data.					

Details of losses are presented in table 19. The table shows that the loss of capacity on the lobster and conch fisheries is estimated at 40 per cent and 30 per cent, respectively, in northern Belize.

TABLE 19: TOTAL DAMAGE/LOSS TO FISHERIES SUBSECTOR IN BELIZE

Commodity	Projected National Production (lbs)	Projected Revenue (Bz$)	Estimated Production		Estimated Income Loss During Recovery Period (Bz$)
			% National	Quantity (lbs)	
Lobster Tails	419,863	14,590,480	40.0	167,945	5,836,192
Lobster Head Meat	37,835	151,410	40.0	15,134	60,564
Conch	692,302	5,559,300	30.0	207,691	1,667,790
Conch Fillet	117,170	1,147,775	30.0	35,151	344,332
Sea Shrimp	46,241	662,845	25.0	11,560	165,711
Fish Fillet	43,206	432,060	20.0	8,641	86,412
Others	15,415	154,150	20.0	3,083	30,830
Total Damage	**1,372,032**	**22,698,020**	**32.7**	**449,205**	**8,191,831**
Source: ECLAC estimates based on official GoB data.					

Utilizing these loss coefficients, the combined estimated loss of production from these two commodity groups includes 167,945 lbs of lobster tails, 15,134 lbs of lobster head meat, 207,691 lbs market clean conch meat and 35,151 lbs of conch fillets. In addition, it is projected that production losses will also be incurred for sea shrimp (11,560 lbs), fish fillet (8,641 lbs) and other fish (3,083 lbs). The total loss in production volume translated in an estimated loss of income from fisheries of BZ$819,183.

According to the fisheries damage assessment survey that was conducted, 214 fishermen were directly affected by the hurricane. Table 20 shows that these fishermen originated from nine communities in Belize. It is estimated that an additional 1,070 persons (fishermen family members) were also indirectly affected.

TABLE 20: FISHERMEN AFFECTED BY HURRICANE DEAN

Location	Number of fishermen affected
Belize City	48
Belmopan	1
Caye Caulker	16
Chunox	26
Copper Bank	25
Corozal Town	6
Orange Walk	2
Sarteneja	89
St Mathew Village	1
Total	**214**
Source: ECLAC estimates based on official GoB data.	

Nearly, 42 per cent of fishermen originated from Sarteneja, 22 per cent from Belize City, and approximately 12 per cent from Chunox and Copper Bank. Smaller groups of fishermen from Caye Caulker and Corozal Town were also affected.

The survey also showed fishermen in northern Belize fish primarily in fishing zones 5, 4, and 1, in order of importance. Fishing zone 5 is the central fishing zone and is the most productive zone. It is comprised of the marine habitat included from a line drawn perpendicular from Belize City to the barrier reef and southwards to a line drawn perpendicular from Placencia to the barrier reef. Zone 4 is the second most important fishing zone and is comprised of the marine habitat to the north of zone 5 extending up to the Belize-Mexico border. This zone in northern Belize received the greatest impact from Hurricane Dean and is very likely that seagrass beds and corals in this zone were heavily damaged from the strong currents and high waves associated with the hurricane. The destruction of coastal mangrove areas, seagrass beds, coral reefs and suspension of sediments from the seafloor can significantly diminish fisheries productivity in these fishing grounds.

It is anticipated that Hurricane Dean will impact negatively on the fishing cooperatives in Belize. Since the early 1960s, the fishing cooperatives have played a very important role in Belize's fishing industry. Fishermen grouped together and formed fishing cooperatives to ensure they receive maximum economic benefits from the sale of their fisheries products. The cooperatives process, package and market fisheries products on behalf of their membership and then distribute the earnings from the sales to their members. In Belize, there are presently five fishing cooperatives in operation.

Belize's first fishing cooperative, Northern Fishermen Cooperative Soc. Ltd, has in recent years suffered significant declines in lobster (31 per cent in lobster tails since 1999) production mainly as a result of its members delivering their fisheries products at another cooperative. The

cooperative's assets are currently estimated at $16m. Management problems coupled with membership disloyalty and non-payment of loans have financially crippled this cooperative.

A further reduction in lobster and conch production resulting from reduced fishing capacity and habitat degradation could significantly reduce even further the income of this cooperative and prevent servicing of its loan obligations to its creditors. The cooperative could then declare itself bankrupt in the short term (6-12 months). There could be huge economic losses to fishermen and destabilization of the fisheries sector as the only fishing cooperative that would thus remain in full operation, National Fishermen Producers Cooperative, does not have the capacity to process, package and store the national fisheries production. The supply of ice for fishing operations could be significantly disrupted.

C. Productive sector – Tourism, commerce and other services

1. Tourism

(a) General overview

Damages and losses within the tourism sector were experienced primarily in Corozal and in San Pedro. There were reports of the industry in Orange Walk benefiting to a limited extent from the misfortunes of Corozal. Notwithstanding this, damage to the tourism sector in this area included structural and water damage to guest houses and hotels, whereas losses were as a result of loss of income. In particular, the following list summarizes the items that were most frequently listed as being damaged (assessment carried out by the Belize Tourism Board).

- Damage to piping and plumbing
- Damage to satellite dishes
- Damage to buildings (thatch roofed huts)
- Landscaping damage
- Roofing problems
- Flooding damage

In San Pedro, damages included: some structural damage, landscaping damage, beach erosion, leaking roofs and damage to pools. It should be noted that the extensive damage that occurred to piers and jetties was already accounted for in the infrastructure section. In general, the view was expressed that the hurricane occurred in the off-season and therefore the impacts on the tourism sector were not as bad as they could have been. A review of the following table, taken from *Travel & Tourism Statistics Belize 2006*, indicates that during the months of September and October, there are typically less than half the number of visitors to the country as during the high season months of December to April. Because of this, the resulting loss of income was, to some extent, mitigated.

TABLE 21: VISITORS TO COUNTRY DURING HIGH SEASON MONTHS (DECEMBER TO APRIL)

Month	2006P	2005	2004	2003	2002	2001	2000	1999	1998
January	22,264	22,165	22,166	19,648	17,820	18,896	17,033	15,603	18,522
February	24,278	24,734	23,645	20,412	19,377	19,767	18,767	16,907	17,825
March	29,415	29,321	26,817	24,460	23,388	21,526	22,921	19,711	18,784
April	23,888	20,503	20,320	19,660	17,027	18,398	18,699	15,190	16,414
May	19,898	17,999	17,386	17,967	16,106	16,335	15,704	13,865	12,879
June	21,572	20,460	18,939	19,228	16,953	17,081	16,148	14,072	13,583
July	22,024	20,062	21,734	20,670	18,011	18,704	18,307	17,061	15,289
August	18,498	18,335	17,479	19,689	16,184	17,342	16,633	16,709	15,708
September	11,626	10,013	10,432	9,975	8,634	8,659	11,019	10,351	10,611
October	10,883	12,011	12,167	11,524	10,397	9,069	8,580	10,743	9,634
November	18,079	16,711	16,873	16,313	15,603	12,822	13,632	13,985	11,449
December	24,883	24,259	22,873	21,028	20,021	17,357	18,324	16,599	15,357
Total	247,309	236,573	230,832	220,574	199,521	195,955	195,766	180,795	176,054

Source: Travel and Tourism Statistics Belize 2006

In addition to the losses related above, there were also losses in revenue due to reduced visitor numbers for a period of two weeks to the marine parks (Hol Chan, Lighthouse Caye), and to the mainland attractions. These latter consist of cave tubing, Mayan ruins, etc.

Table 22 is a tabular summary of the damages and losses associated with this subsector:

TABLE 22: TABULAR SUMMARY OF DAMAGES AND LOSSES

SUMMARY FOR COROZAL	BZ$	Comments
Damage	**601,000.00**	**From BTB Survey**
Losses		
Loss of Wages (hotel workers)	27,300.00	
Loss of Wages (Tour operators, drivers, etc.)	147,302.40	
Loss of Hotel Income	192,040.80	
Loss of Room Tax Revenue	17,283.67	
Total Losses	**383,926.87**	
SUMMARY FOR SAN PEDRO & CAYE CAULKER		
Damage	**720,000.00**	**From BTB Survey**
Losses		
Loss of Wages (hotel workers)	1,264,760.00	Hurricanes Dean and Felix
Loss of Wages (support services)	270,158.00	Hurricanes Dean and Felix
Loss of Hotel Income	2,673,888.00	Hurricanes Dean and Felix
Loss of Room Tax Revenue	240,649.92	
Total Losses	**4,449,455.92**	
SUMMARY OF OTHER LOSSES		
Loss in Visitor Spending	1,871,893.33	
Loss in Dive Shop Business (San Pedro)	197,300.00	
Loss in Adventure Tours Business (San Pedro)	708,300.00	
Loss in Spin-off Businesses (Buses, tour guides, etc.)	440,395.00	
Total Other Losses	**3,217,888.33**	
Total Damage and Losses – Tourism Sector	**9,372,271.12**	
Source: ECLAC estimates based on official GoB data.		

D. The environmental sector

The impacts of Hurricane Dean were felt primarily in the northern coastal plain and offshore areas of Belize, e.g. Corozal and Orange Walk. The more severe impacts of the storm were experienced further north in the country. This section of the country is characterised by an underlying limestone rock structure, covered by topsoil of various thickness. A number of slow flowing rivers run in a generally south to north direction, in response to the flat topographical gradients that characterise this region. The vegetation of this area is characterised by deciduous seasonal forest, high marsh forest and mangroves. Mangrove wetlands are to be found in various locations along the coastline.

An environmental survey was carried out by personnel from the Department of the Environment, and it was determined that the main areas of environmental concern associated with the impacts of Hurricane Dean were:

(a) Beach erosion at Ambergris Caye, Caye Caulker and the Consejo shore area;

(b) Damage to mangrove and other coastal vegetation;

(c) Mechanical damage to the Barrier Reef and to sea grass beds; and

(d) Damage to sea grass beds from sedimentation.

The results of the assessments are summarized as follows:

(a) Beach Erosion – This was evident along the north-eastern shorelines of Ambergris Caye and Caye Caulker. Erosion was observed mostly in areas where coastal vegetation had previously been removed by Hurricane Keith. It was estimated that approximately 15-25 per cent of these beaches was lost. Minimal coastal erosion was seen along the Consejo shoreline, as mangrove stands provided protection to the beaches. By contrast, the southern coast of the Cerros Peninsula was the most heavily impacted. In particular, this was seen to occur where fringing mangrove had been cleared.

(b) Damage to vegetation – Most of the vegetation lost was in the zone of highest winds. It is estimated that between 40-60 per cent of the vegetative cover in these areas was lost. Many of the trees that were brought down had large crowns and shallow root systems. The fringing mangroves that line the shoreline of much of this area exhibited remarkable resilience, as they were minimally impacted. By contrast, much of the standing vegetation behind these mangrove areas was wind scorched and clean of leaves. This finding demonstrates the benefit of this type of coastal vegetation. Mangrove zones on San Pedro and Caye Caulker were not

significantly impacted, and it was estimated by the Department of the Environment that the affected areas covered less than 20 per cent of the total mangrove area.

(c) Damage to the barrier reefs – At the time of the ECLAC assessment, a detailed inventory of the coral reefs had not been carried out, however there were observations of soft coral being washed up on the beaches of north Ambergris Caye. This was to be expected, given the level of predicted hurricane waves that would have affected these reefs.

(d) Damage to sea grass beds – The survey carried out indicated large plumes of sediment in the area west of Caye Caulker and San Pedro. It was therefore expected that the sea grass beds in this area would be subject to smothering from this sediment.

In summary, the findings led to the conclusion that the damages to the environment from Hurricane Dean were less severe than those experienced with Hurricane Keith. This is not a surprising finding, given that Dean was a fast moving system, which brought limited precipitation. In addition, and of relevance to the cayes, the quadrant of the hurricane that affected the northern offshore areas was not the most damaging.

Table 23 is a listing of the damage and losses resulting from Hurricane Dean that have been tabulated by the Department of the Environment. It should be noted that many of the costs presented go beyond rehabilitation and include mitigation strategies.

TABLE 23: SUMMARY FOR THE ENVIRONMENT

Impact	Area	Description	Amount (Bz$)	Comment
Coastal Erosion	Ambergris Caye, Caye Caulker, Corozal	Estimated 15-25% of beach lost along the varying lengths severely affected near Corozal.	500,000.00	Damages
Vegetation	Corozal Town, San Pedro, Caye Caulker	20% of mangroves affected in the Cayes	6,000,000.00	Damages
Marine Environment Pollution	Ambergris Caye, Caye Caulker	Damage to sea grass beds and to coral reef due to siltation	200,000.00	Losses
	San Mateo, San Pedro		1,100,000.00	Losses
TOTALS			**7,800,000.00**	
Total Damage			**6,500,000.00**	
Total Losses			**1,300,000.00**	
Source: Department of the Environment, Belize				

E. Social sector

1. Education

Some 61 per cent of schools, or 81 out of 153 schools, in the two districts which were the most affected by Hurricane Dean, reported some degree of damage. Although the damage was widespread, particularly in Corozal where 58 of the 75 schools experienced the battering of Dean, the overall effect on buildings was not terribly severe. In the main, assessments suggest the turbulence caused by Dean affected mainly outer doors, windows, roof sheeting, guttering, electrical wiring, a number of outer walls and toilet facilities. Details are presented in table 24.

TABLE 24: SCHOOLS REPORTING DAMAGE BY DISTRICT

District	Number of schools in each District	Number of schools damaged as a result of Dean	number of schools used as shelters	% of all schools damaged
Corozal	75	58	9	77%
Orange Walk	58	23	12	40%
Totals	153	81	21	61%
Source: ECLAC estimates based on official GoB data.				

Despite the fact that most schools were closed at the time that Hurricane Dean struck Belize, as many as 9,000 children may have been affected by the impact of the disaster. Some, due to damage to school furnishings and educational material lost, and others due to the damage to the school facilities which were used as shelters.

Table 25 details the impact of Hurricane Dean on the education sector which amounted to BZ$799,900. Of that sum, loss incurred due to use of schools as shelters accounts for 4 per cent of total impact. Damage to schools furnishings, however, forms 40 per cent of the value of overall damage. The overall limited impact of Dean to the education facilities is as much attributed to the nature of the hurricane itself as to the capacity of many of the newly constructed facilities to withstand a Hurricane level 2.

TABLE 25: IMPACT OF HURRICANE DEAN ON THE EDUCATION SECTOR

Total impact	799,900.00
Damage (i.+ii.)	768,400.00
i. damage to educational facilities	457,700.00
ii. Damage to school furnishings	310,700.00
Loss	
i. damage caused by use of schools as shelters	31,500.00
Source: ECLAC estimates based on official GoB data.	

2. Health

Hurricane Dean had minimal impact on the health sector which can be seen from table 26, in which there was no reported damage to health facilities. The total impact to the health sector amounted to BZ$ 303,300. which was incurred due to increased spending in medical supplies, fuel and transport subsidies, the mounting of a public health campaign, supplies used in the insect vector control and the relocation of patients, in rank order.

A number of factors may be responsible for this low impact. One factor was the nature of Hurricane Dean when it made landfall in Belize, but the other factors include the absence of

major facilities in the path of the hurricane, the early relocation of patients and services and the resilience of the existing institutions.

The health sector has to be commended for the major public health campaign which was mounted. This dispatch of mobile health services with much needed supplies to affected communities contained health risks such as possible outbreaks of waterborne diseases such as cholera, and reduced threats caused by the destruction of many family sanitary facilities, by stagnant water and contaminated water following the event. Due to the provision of health services provided by a full contingent of Cuban and Mexican health personnel together with Belize health care professionals, both primary and secondary health care was able to be provided.

The impact to the health subsector in Belize accounted for less than 1 per cent of the total impact on the social sector.

TABLE 26: IMPACT OF HURRICANE DEAN ON THE HEALTH SECTOR

Total impact	303,300.00
Damage	
i. facilities	0
Loss	303,300.00
i. relocation of patients	5,800.00
ii. Mounting of public health campaign	40,000.00
iii. Fuel and transport/subsistence	90,000.00
iv. Medical Supplies	160,000.00
v. Supplies used for insect vector control	7,500.00
Source: ECLAC estimates based on official GoB data.	

3. Housing

Housing accounted for the largest proportion, some 96 per cent, of the value of the impact to the social sector by Hurricane Dean.

The 2002 poverty assessment of Belize, reported that it was common knowledge throughout the country that having dwellings with strong construction materials that could resist hurricane winds was a necessity. However access to differing levels of income and knowledge of construction to withstand hurricane winds did not always allow persons to transfer that knowledge into their lived reality. The outcome of those differences is evident in the rural areas

where, according to the 2002 Poverty Assessment, at least 6 per cent of housing was still constructed of sticks and palmetto.

According to the 2000 census data, the ownership structure of housing in Belize with approximately 63 per cent of all dwelling units, being either owned outright or being bought on hire purchase, fits the typical Caribbean pattern of home ownership. Despite the significantly large proportion of home owners in the rural sections of Belize (72.5 per cent) it cannot be assumed that those home owners are adequately insured or possess any home insurance. Damage due to natural disasters, such as that caused by Hurricane Dean, sustained to housing therefore becomes the burden of the individual homeowner who may receive support from family and neighbours. As a last resort the State may have to provide support.

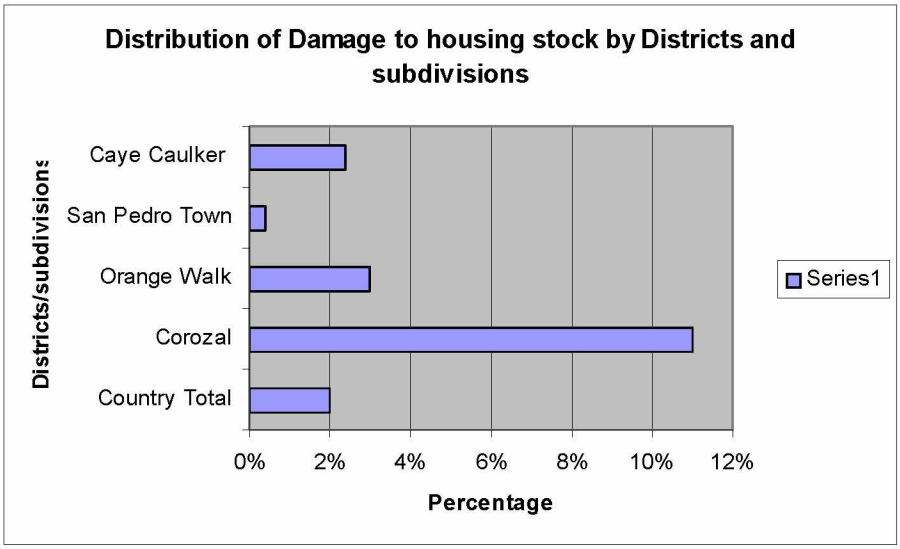
Table 27 details the number of houses damaged and/or destroyed by Hurricane Dean by districts based on the 2007 mid-year estimates. The total number of houses affected by Hurricane Dean is 1,175 representing some 2 per cent of the national housing stock. Of those houses which were affected, some 29 per cent were totally destroyed. In comparison to Hurricane Keith (2000), in which some 67 per cent of houses that were affected were totally destroyed, it can be said that the effect of Hurricane Dean was not as severe. Not only were the proportion of houses destroyed by Keith greater but the value was greater because many of the most affected were located in the prime financial mortgage areas of the Cayes.

TABLE 27: HOUSES DAMAGED AND DESTROYED BY HURRICANE DEAN BY DISTRICTS AND SUBDIVISIONS BASED ON THE 2007 MID YEAR ESTIMATES

Districts and Subdivisions	Total Population	Households	Houses destroyed	Houses damaged	Total Houses affected
Country Total	**311,480**	62296	339	**786**	**1,175**
Urban	158,930	31786			
Rural	152,550	30510			
Corozal	**36,365**	7273	275	**506**	**781**
Corozal Town	9,110	1822			
Corozal Rural	27,255	5451			
Orange Walk	**47,145**	9429	60	**200**	**260**
Orange Walk Town	15,990	3198			
Orange Walk Rural	31,155	6231			
Belize	**93,215**	18643	2	**80**	**82**
Belize City	63,670				
San Pedro Town	10,445	2089	0	50	50
Cay Caulker	19,100			30	
Cayo			2		2
Source: ECLAC estimates based on official GoB data.					

Figure 12 illustrates that Corozal was the district most severely affected with more than 11 per cent of its housing stock damaged followed by Orange Walk with just over 3 per cent and Caye Aulker with a little over 2 per cent.

FIGURE 12 DISTRIBUTION OF DAMAGE TO HOUSING STOCK BY DISTRICTS AND SUBDIVISIONS



Source: ECLAC estimates based on official GoB data.

The impact of Hurricane Dean on the housing subsector amounted to BZ$33.2 million, as detailed in table 28, with only a small proportion of the overall impact due to loss incurred by the removal of debris.

TABLE 28: IMPACT OF HURRICANE DEAN ON THE HOUSING SECTOR

Total Impact	33,230,100.00
Total Damage	33,198,000.00
Damage	
i. reparation of damaged houses	14,288,000.00
ii. Replace of destroyed houses	13,560,000.00
iii. Damage to household furnishings	5,350,000.00
Loss	
i. Cost of removal of debris	32,100.00
Source: ECLAC estimates based on official GoB data.	

V. MACROECONOMIC IMPACT OF HURRICANE DEAN

A. Summary damage and losses

The impact of Hurricane Dean on Belize was moderate when compared to the impact of some of the more severe hurricanes that have hit countries in the region. The total impact of the hurricane on the socio-economy was estimated at BZ$179.03 million or US$89.51 million (see table 29). Damage to assets and stocks represented 53 per cent of the total or BZ$94.9 million, while losses (flows of income or contingency spending) accounted for the remaining 47 per cent (BZ$83.8 million). This outcome probably stems in part from the speed and wind/rain dynamics of the hurricane and the sectors that were affected, leading to relatively smaller future income losses. By way of comparison, it is interesting to note that Hurricane Keith in 2000 resulted in an estimated impact of BZ$560.1 million, over three times the impact of Dean. The division of the impact was even more skewed for Keith, with damage accounting for 75 per cent of the total.

TABLE 29: SUMMARY DAMAGE AND LOSSES FROM HURRICANE DEAN ON BELIZE

Sector and subsector	Total Impact US$ thousands	Damage and losses Total Impact BZ$ thousands	Damage	Losses
Total	**89512722.65**	**179025445.3**	**94879387**	**83835358.3**
Productive sectors	**62603422.65**	**125206845.3**	**43813387**	**81393458.3**
Agriculture	**57917287**	**115834574**	**42492387**	**73342187**
Papaya	33669450	67338900	25614000	41724900
Sugar cane	11409820	22819640	8400000	14419640
Corn	2189380	4378760	1988400	2390360
Plantains	1842182.5	3684365	1332500	2351865
Other crops	3372860.5	6745721	2754225	3991496
Livestock	607916	1215832	943737	272095
Fisheries	4825678	9651356	1459525	8191831
Tourism	4686135.65	9372271.3	1321000	8051271.3
Social Sectors	17166650	**34333300**	**33655700**	**366900**
Housing	16615050	33230100	33198000	32100
Education and culture	399950	799900	457700	31500
Health	151650	303300	0	303300
Other services				
Infrastructure	9742650	**19485300**	**17410300**	**2075000**
Road transport	4937650	9875300	9410300	465000
Water supply and water disposal	112500	225000	150000	75000
Electricity generation	480000	960000	850000	110000
Communications	312500	625000	500000	125000
Environment	3900000	7,800,000.00	6,500,000.00	1300000
Source: ECLAC estimates based on information provided by the authorities in Belize.				

Although the economic impact of Dean was contained, it was far outweighed by social and humanitarian fall-out, particularly because the heavily affected agriculture sector was a

crucial source of livelihood for the most affected population. A scaling of the total impact by different sectoral and macroeconomic variables gives some sense of the disparate effects of the hurricane. From an economic standpoint, the impact represented only 7.3 per cent of GDP; underscoring the fact that substantial economic fall-out occurred only in the agriculture sector. Reinforcing this point, the impact represented 63.8 per cent of agricultural GDP. Moreover, highlighting the potential rehabilitation and reconstruction that might be required, the impact represented 38.8 per cent of gross domestic investment. However, the impact represented only 9.4 per cent of consumption. Suggesting some challenge to external stability, the total impact accounted for 11.5 per cent of exports of goods and services and 9.1 per cent of public external debt.

Total impact in relation to key macroeconomic variables:

- 7.3 per cent of GDP
- 63.8 per cent of agricultural GDP
- 21.0 per cent of exports of goods
- 11.5 per cent of exports of goods and services
- 38.8 per cent of gross domestic investment (GDI)
- 9.4 per cent of consumption
- 9.1 per cent of public external debt

As indicated by table 28 above, the hurricane was largely a productive sector event. The productive sectors suffered almost 70 per cent of the total damage and losses, largely confined to the agricultural sector. Meanwhile, damage to the social sectors and infrastructure represented 19.2 per cent and 10.9 per cent, respectively. The agricultural sector bore the brunt of the impact of the disaster accounting for 64.7 per cent of the total impact. Damage and losses in the papaya subsector amounted to $67.3 million or 37.6 per cent of the total impact. Given that it is prone to plant breakage and loss of fruit, the papaya subsector was badly damaged by the hurricane. The sugar cane subsector suffered total damage of $22.8 million as the crop was affected by wind damage, and water logged fields that led to lower sucrose content of canes. The corn and plantain crops suffered impact of $43.7 million and $36.8 million, respectively, while other crops including pineapples, coconuts, fruit trees and vegetables were impacted to the tune of $67.5 million or 3.8 per cent of the total impact.

The livestock subsector, which along with fisheries is an important source of protein for the population, suffered damage amounting to $121.6 million. Fall-out in the sector was mainly to poultry and bee-keeping. Fisheries were impacted to the tune of $96.5 million. The tourism sector was only moderately damaged with losses amounting to $93.7 million, as it was spared the ravages of the hurricane.

In the social sectors the main fall-out from the disaster was on the housing sector, which suffered an impact of $33.2 million, attesting to the relatively low quality of the affected housing. Education and health suffered an impact of $0.8 million and $0.3 million, respectively. Damage and losses in the infrastructure sector totaled $194.9 million or around 11 per cent of the total impact. Fortunately, the damage was largely contained in the northern section of the country. The bulk of the damage was to road transport, followed by electricity generation and communications. The environmental sector was damaged to the tune of $7.8 million, equal to 4.4 per cent of the total impact.

1. The pre-disaster macroeconomic performance 2006

Spurred on by accelerated GDP growth of 5.6 per cent in 2007 (relative to 3.0 per cent in 2006), complemented by a relatively tight fiscal stance and prudent monetary policy, macroeconomic performance strengthened in 2007. Moreover, the start of commercial oil production facilitated an improvement of the balance of payments which, if maintained, could ease the impact of the external constraint on growth.

2. Output, inflation, wages and employment

Although growth in the non-oil sector slowed to 2.5 per cent, this was well supported by a 3.3 per cent growth in the oil sector, which came on stream in 2007. Primary sector activity declined as the agricultural sector was buffeted by disease, adverse weather and a contraction in output of farmed shrimp. Nevertheless, sugar cane production was up by 26.3 per cent to 1,173,469 long tons buoyed by favourable weather. However, the heavy biomass yields affected the sucrose content of harvested canes.

Citrus output, on the other hand, declined by 23 per cent to 6.9 million boxes of fruit. Banana production was also down due to adverse weather, sigatoka infestation and insufficient investment by growers in the wake of uncertainty surrounding the new EU import regime. Meanwhile, papaya production posted strong growth, reflecting fairly strong competitiveness and market demand.

3. Fiscal performance

The fiscal position improved in 2006, with the overall deficit falling from 6.8 per cent of GDP to 1.8 per cent of GDP. Total revenues and grants increased by 12.6 per cent to $591.6 million driven mainly by growth in tax receipts and grants. Tax proceeds rose sharply buoyed by growth in activity and tax reform, which saw the introduction of the broad based general sales tax in July. Non-tax revenue declined as petroleum royalties were offset by the deferral of property income to 2007 and a reduction in license fees.

Total expenditure declined marginally by 0.9 per cent to 26.3 per cent of GDP. Notably, all categories of current spending contracted, except subsidies and transfers, underscoring efforts to contain current costs. Capital expenditure rose by 5 per cent to 4 per cent of GDP, largely reflecting spending on locally funded projects. The major capital projects included upgrade to the University of Belize, infrastructure projects, particularly rural electrification and upgrade of health facilities.

The public sector debt increased by over 10 per cent to US$1206.8 million, the equivalent of 98.7 per cent of GDP and up from 98.5 per cent of GDP in 2005. Domestic debt grew much faster than external debt probably reflecting efforts to shield against fluctuating international exchange rate and interest rate risks.

4. Monetary developments

Buoyed by dynamic growth in broad money (13.3 per cent), the banking sector remained liquid in 2006. Nevertheless, this high liquidity might also be a reflection of relatively weak loan demand or insufficient bankable projects to finance. Interestingly, liquidity was high even in the context of government achieving a primary surplus, thereby curtailing its borrowing, and efforts to squeeze excess liquidity out of the system by the sterilization of the surpluses of the Belize Social Security Board (BSSB).

Broad money grew by 13.2 per cent to $1505 million, bolstered by a 19.8 per cent rise in narrow money and a 9 per cent increase in quasi-money. Both savings and time deposits expanded as holders sought better returns.

On the asset side, net credit to the private sector rose by 12.6 per cent almost twice the rate of growth for 2005. Unfortunately, this growth was fuelled by a sharp increase in personal loans, which drove demand for consumer goods rather than investment in productive activity. Net credit to the central government increased by $38.5 million, associated with a five-year treasury note issue that was valued at $31.5 million.

The net foreign assets of the banking system expanded by 94.6 per cent propelled by the improvement in the balance of payments and new loan disbursements.

5. Balance of payments

A welcomed narrowing of the current account deficit, largely reflecting oil and agricultural exports, and higher tourism receipts and remittance inflows led to an improvement in the overall balance of payments in 2006. The overall surplus increased from 3.1 per cent of GDP to 4.1 per cent of GDP. The merchandise trade deficit contracted by almost 20 per cent to $371.4 million, reflecting a 31 per cent increase in exports that far surpassed the 10 per cent rise in imports. Petroleum accounted for 56 per cent of the increase in the value of exports. Propelled by higher volume and prices, sugar exports increased by over 43 per cent to $100.1 million. Earnings from citrus exports shot up by 55.1 per cent to $120.2 million associated with high prices.

The services account posted a substantial improvement with net receipts expanding by 53 per cent to $410.5 million. Tourism earnings (up 30.2 per cent) were buoyed by stay-over arrivals, even in the face of lower cruise passenger arrivals. Also, the capital account surplus rose on account of debt forgiveness and higher capital grants. By contrast, the financial account deteriorated as foreign direct investment plunged by 33 per cent to $169.8 million.

B. Expected macroeconomic performance in 2007 without Hurricane Dean

1. Overview

Following relatively dynamic 5.8 per cent level in 2006, growth slowed to 3 per cent in 2007, reflecting the fall-out from Hurricane Dean on the agricultural, fisheries and other sectors and sluggish growth in tourism. These downside pressures more than offset a pick up in petroleum production and robust activity in the Corozal Free Zone. Inflation moderated to 3.5

per cent from 4.3 per cent last year, dampened by lower acquisition costs for diesel and gasoline. Driven by an uptick in capital spending, the overall deficit increased from 1.8 per cent of GDP in 2006 to 2.1 per cent of GDP in 2007. On the downside, the balance of payments weakened posting a sharply reduced surplus of $16.3 million or 1.3 per cent of GDP, down from $65.4 million or 5.3 per cent of GDP in 2006.

2. Output, inflation, wages and employment

Spurred on by newly commercial oil production, growth in 2006 was exceptional and as such the economic activity was expected to slow in 2007. Nevertheless, the impact of the hurricane meant that the growth slowdown would be greater than expected. Reduced momentum in some key sectors prior to the hurricane compounded by the effects of the disaster dampened activity in a number of sectors. Oil production was up sharply by more than 41 per cent during the first half of the year reflecting more intense exploitation of existing wells. However, tourism was sluggish with growth of only 1.2 per cent in the relatively high value added stay-over segment. Although cruise arrivals were up by 5.7 per cent to 358, 047 during the first half of 2007, compared to same period last year, the fairly small spending by this class of visitors would not have compensated for the slow growth in the stay-over market. Agriculture was buffeted by the hurricane, with output expected to fall by around 13 per cent. The papaya, banana and other crops subsectors were badly affected by the hurricane, suffering impacts estimated at $67.3 million, $36.8 million and $46.9 million, respectively. Livestock and fisheries were also impacted and tourism suffered impacts estimated at around $9.4 million

Inflationary pressures eased in 2007, with the rate dropping to 3.5 per cent, compared with 4.3 per cent last year. Impetus for higher consumer prices came from foodstuffs, related to shortages stemming from the hurricane, household goods and recreation. Chicken costs, which were already up due to the hike in the price of corn feed stock, was aggravated by the hurricane. Nevertheless, these increases were offset by reductions in prices of clothing, transportation and medical care. Meanwhile, the unemployment rate fell to 8.5 per cent in 2007, from 9.4 per cent in 2006.

3. Fiscal performance

On the policy front, fiscal policy continues to rule the roost in Belize. The successful debt restructuring in early 2007 seemed set to provide the authorities with some degree of freedom in fiscal management. However, short-term fiscal outcomes have been somewhat derailed by the impact of Hurricane Dean on government spending and also election spending. Bolstered by capital spending, which shot up by over 30 per cent, particularly related to rehabilitation and reconstruction after the hurricane and social development projects, the overall deficit shifted upwards from 1.8 per cent of GDP to 2.1 per cent of GDP. Key projects included the Social Investment Fund, the Health Sector Reform project and environmental and education projects.

Current spending was much more subdued as wage costs were contained and interest payments benefited from the debt rescheduling. Revenues were bolstered by a spike in petroleum revenue with increased output from the Spanish Lookout Oilfield. Tax returns also fared well enough with higher take from taxes on international trade and transactions, associated

in part with growth in imports in the aftermath of the disaster. Grant receipts also increased, reflecting greater international assistance.

The debt burden has eased with the restructuring, which has extended the average life and duration of the public sector external debt owed to private creditors by roughly 11 and 6.8 years, respectively. The public debt stock stood at US$1171.7 million as at the end of the first semester and represented 90.4 per cent of GDP. Importantly, the government has embarked on implementing a petroleum revenue management fund to save some of the returns from the sector for the future.

4. Monetary developments

Monetary conditions were relatively stable in 2007. Broad money had posted dynamic growth of almost 10 per cent at the end of the first half of the year relative to the similar period last year. This growth was driven by growth in domestic credit and inflows from tourism and merchandise exports. However, money growth would have slowed in the second half of the year, dampened by the impact of the hurricane, leading to fairly stable overall growth. In a favourable development, credit expanded to productive activity in tourism, construction, agriculture and fisheries, helping to liberate the constraint faced by these sectors. Nevertheless, credit to the government also increased fairly sharply to facilitate debt restructuring payments. The overall increase in inflows to tourism, in particular, boosted the net foreign asset position of the banking system.

5. Balance of payments

In spite of a 40 per cent increase in petroleum exports, the balance of payments will deteriorate in 2007, reflecting the fall-out from Hurricane Dean on agricultural exports. The overall balance surplus will contract from 1.8 per cent of GDP in 2006 to a deficit of 0.4 per cent of GDP in 2007. This would stem largely from a worsening of the current account deficit from 0.8 per cent of GDP in 2006 to 2.6 per cent of GDP in 2007. Agricultural exports were buffeted by the hurricane with impact estimated at over 60 per cent of GDP and around 12 per cent of exports of goods and services. Exports of papaya, sugar, banana and fisheries were significantly reduced as a result of the hurricane. Tourism earnings were also dampened by loss of business in a number of establishments.

Current transfers were up by over 13 per cent, partly associated with relief and recovery assistance in the wake of the hurricane. Notwithstanding the current account position, the financial account remained robust with the surplus expanding sharply to US$51 million. Underscoring renewed confidence in the wake of the debt restructuring, foreign direct investment remained strong at around US$69 million and is expected to increase in the short term with further oil exploration. Meanwhile, reserves stood at US$96.1 million at the end of August 2007, providing two months of import cover which, although below the stipulated three months, was the highest level since the first quarter of 2005.

C. Macroeconomic performance as at the first half of 2007

Robust growth impetus in 2006 carried over to the first half of 2007 as petroleum production increased and was complemented by increased electricity generation, expansion in

telecommunications, including mobile telephony and dynamic activity in the Corozal Free Zone trade. With these developments, GDP grew by 4.4 per cent in the first half of the year and this momentum could have carried through for the whole year, but for the hurricane. Reversing expectations of a decline up to April, cruise ship passenger arrivals increased by 8.7 per cent to 306,814 on the heels of an increase in port calls from 148 to 156. Year on year arrivals by the end of June had risen by 5.7 per cent to 358047.

Meanwhile, the crucial agriculture sector posted a lacklustre performance with declines in key activities. Buffeted by a slow start to the harvest, plus adverse weather and froghopper infestation, sugarcane deliveries slipped by 3.8 per cent to 1,129,137 long tons. Sugar production contracted by 17.2 per cent to 92, 208 long tons, reflecting a worsening of the cane to sugar ratio by 15 per cent due to reduced factory efficiency.

1. Output and inflation

Fortuitously, petroleum production shot up by 41.2 per cent in the first semester of 2007 as production spiked in the Spanish Lookout field. Higher activity in this sector was supported by a 12.1 per cent increase in real output in the wholesale and retail trade subsector buoyed by an upsurge in activity in the Corozal Free Zone. Tourism activity also picked up somewhat, stay-over visitors through the border areas and airport rose by 1.2 per cent to 94, 272 visitors, mainly from the United States market that accounted for 64,409 visitors, 68.3 per cent of the total. Citrus production was up by 2.4 per cent to 6.7 million boxes, but with lower average juice per box of fruit, juice production increased by only 1.4 per cent to 36.1 million pound solids. Fortunately orange juice producers also benefited from higher export prices in the first half of the year. On the other hand, banana production contracted by 19.5 per cent to 1.6 million boxes undermined by sigatoka disease and unfavourable weather. Nevertheless, the industry was still on course to achieve its projected target of 3.6 million boxes, but this was negated by the impact of the hurricane.

Inflation increased by a mere 1 per cent during the quarter spanning February to May of 2007, reflecting higher prices for a number of commodities. However, these were dampened by lower prices for food products and clothing and footwear.

2. Fiscal performance

In spite of the debt work out, the fiscal stance remains an important challenge to macroeconomic stability in Belize. The fiscal position weakened during the first half of 2007, relative to the comparative period last year. The overall deficit expanded by 27.6 per cent to $37 million in the first half 2007 relative to the similar period last year. Total revenue and grants posted commendable growth of 25.1 per cent, but was surpassed by growth in expenditure of 25.6 per cent. Although the more non-discretionary costs, especially wages and salaries and pension payments were contained at around 4 per cent growth each, discretionary spending, particularly capital outlays ballooned, as government continued capital projects in infrastructure, health, education and the environment. Indeed, capital costs accounted for 23 per cent of the total increase in spending.

The favorable outcome on the income side reflected dynamic growth (25 per cent) in income and profits tax receipts, which were bolstered by petroleum proceeds from recent

commercial oil production. This was supplemented by higher proceeds from taxes on international trade and transactions

3. Monetary developments

Broad money posted fairly strong growth of 9.8 per cent propelled by growth in net domestic credit and receipts from tourism and merchandise exports. Narrow money increased by 12 per cent associated with increased business holdings and quasi-money shot up due to an accumulation of time deposits. Commendably, credit to productive activity including tourism, the banana subsector and marine products increased during the semester. Net foreign assets expanded by 17.2 per cent, reflecting inflows from tourism.

4. Balance of payments position

The balance of payments registered a favourable out-turn buoyed by tourism receipts, merchandise inflows and remittances, which surpassed import payments. The current account posted a surplus of $9.9 million. The trade deficit expanded by 15.1 per cent, reflecting in part higher purchases of electricity, fuel, machinery and other products by the Commercial Free Zone. However, the services account posted a surplus of $246.9 million, which contributed to the current account surplus. Meanwhile, the surplus on the capital and financial account at $13.9 million was three times the level for the same period last year. The account was propped up by foreign direct investment inflows, into tourism, real estate and electricity generation.

D. The post-disaster macroeconomic performance

Hurricane Dean has derailed the optimistic outlook for the economy. With growth of 4.4 per cent in the first half of the year and dynamic expansion in the petroleum, wholesale and retail trades and the electricity sector, the prospects were for growth of at least over 3 per cent in 2007. However, the hurricane led to an even deeper contraction in agriculture, which was already struggling before the event and with additional shocks to tourism and infrastructure will reverse the growth out-turn for the economy. This undoubtedly will have negative contagion impacts on macroeconomic performance, as a whole, especially short-term fiscal consolidation and balance of payments stability.

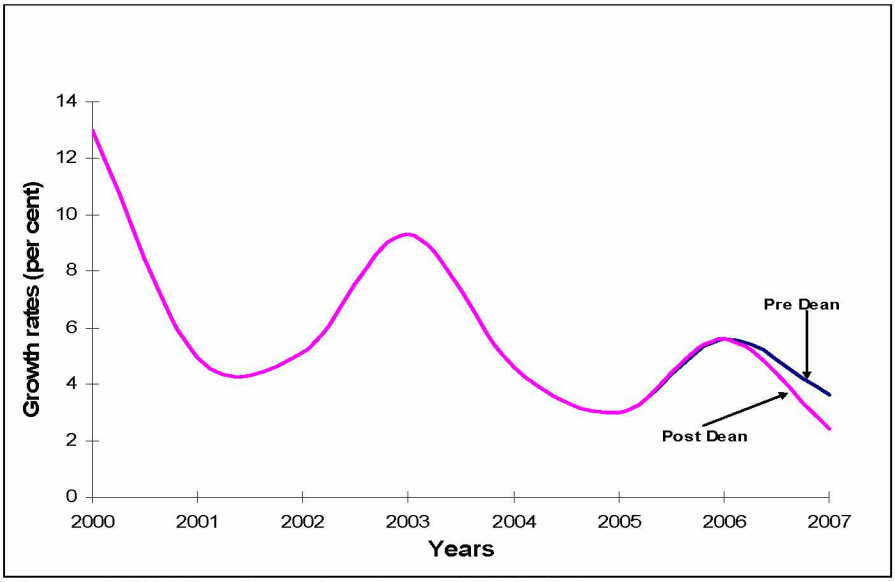
1. Impact on GDP

Prior to hurricane, growth was projected at around 3.6 per cent for 2007. However, with the fall-out in key sectors this prospect would not be achieved. Indeed, the hurricane was estimated to have led to a 1.2 per cent loss in the forecasted growth leading to a growth out-turn of 2.4 per cent instead (see figure 13). The adverse multiplier effects of this slower growth will necessitate higher government borrowing in the short term to replace lost infrastructure and to shore up the engines of growth, including agriculture and tourism.

The sectoral impact of the disaster was disparate, with agriculture suffering the brunt of the impacts. In fact, the contraction in agriculture at 13.3 per cent was quite severe, so much so that the hurricane could have been described as largely an 'agricultural affair'. With total damage in agriculture at around BZ$115.83 million or 65 per cent of the total damage, the setback in the sector was considerable. In the crop subsector, the crucial papaya and sugarcane

subsectors were relatively heavily impacted with total effects of $90.2 million, equivalent to 78 per cent of the total agricultural sector impact. Around 60 per cent of the acreage of papaya under cultivation was destroyed by the hurricane leading to substantial loss of income and disruption of the livelihoods of workers. The sugar cane subsector suffered losses that went directly to GDP of $14.4 million that would lead to a major contraction in real output in the sector in 2007. Lower output will stem both from 16.2 per cent reduction in sugar cane production and reduced productivity consequent on lower sucrose content from harvested canes.

FIGURE 13: BELIZE: GDP GROWTH RATES BEFORE AND AFTER HURRICANE DEAN



Source: ECLAC estimates based on official GoB data.

Nevertheless, the other sectors did suffer some effects. Tourism was estimated to contract by 0.4 per cent, although this figure was conservative as data on the full extent of the damage and losses were not received. It was fortuitous that the sector did not bear the brunt of the damage as its recovery prior to the event was fledgling, especially the important stay-over market. Operators in the sector will need to speedily restore damaged properties to return room capacity to fairly normal levels for the winter season. This no doubt would depend on the extent of internal resources, insurance coverage and speed of settlement of claims and the capacity to access bridging financing. Hoteliers in the San Pedro/Caye Caulker region might require assistance to speedily restore their operations. Marginal declines (0.1 per cent and 0.04 per cent) were expected in the community, social and personal services sector and the government services sector, reflecting the impact on education, health and other services.

The hurricane also had important fall-out on the housing sector as evidenced by the $33.23 million worth of damage and losses. Aside from the social hardship, this would have affected the productivity of impacted households. Nevertheless, given the potential for major housing sector impact of hurricanes, the country was fortunate in that the social impact of the housing sector fall-out was much more severe than the economic effects.

Transport and communications, although suffering total impact of almost $12 million, only had GDP fall-out of 0.03 per cent. This underscored the predominant stock damage rather than loss of income or increased contingency spending. For one, damage was largely contained to selected districts-mainly Corozal, Orange Walk and San Pedro, and also, the main highway, which is quite costly to repair and rehabilitate, stood up quite well, with the brunt of the impact falling on feeder roads and agricultural roads many of which were unpaved. Along with the road network, the jetties in San Pedro were also damaged, water supply was somewhat disrupted and telecommunications networks suffered some down time.

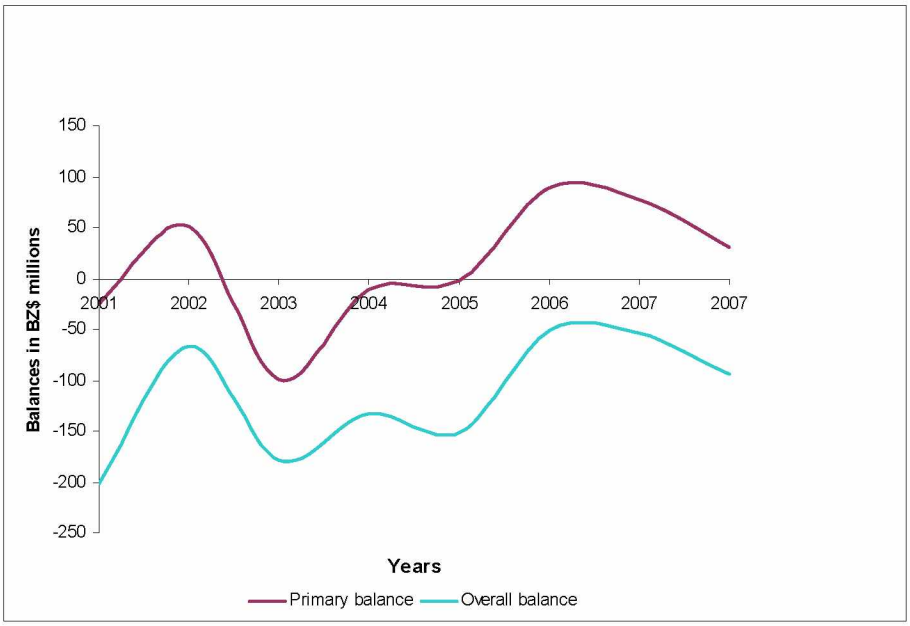
2. Prices, wages and employment

Supply side shocks, especially in the domestic food crop and livestock sector will lead to higher prices. These inflation impulses will only be partly offset by the dampening of demand stemming from lower incomes and more sluggish money supply growth. As a result, the rate of inflation is expected to increase from a projected 3.5 per cent to 4.6 per cent. Wage costs have been affected by higher contingency spending for relief and clean-up operations and will therefore be higher than projected for the year. Employment in the agriculture sector has been affected by the down-turn in output, especially in papaya, sugar cane, corn and plantains. It was quite likely that some workers would have been laid off in these subsectors in line with the slump in production. Some loss of employment was also expected in the small business sector, especially small retailers and agro-producers, as many of them would have suffered damage to their operations.

3. Fiscal operations of central government

The successful debt restructuring in February 2007 provided the government with a window of opportunity to push through fiscal consolidation and debt management in an effort to achieve medium-term debt sustainability. The restructuring entailed the conversion of outstanding debt into bonds with amortization starting in 2019 and ending in 2029. Importantly, these bonds will carry a coupon rate 4.5 per cent during the first three years, 6 per cent for the next two and 8.5 per cent for the remaining period to maturity. This provides a manageable payment schedule for the government allowing it to simultaneously tackle debt and growth challenges. In spite of the debt work-out, Hurricane Dean will derail government's fiscal consolidation goals in the short term.

FIGURE 14: BELIZE: PRIMARY AND OVERALL FISCAL BALANCES BEFORE AND AFTER HURRICANE DEAN



Source: ECLAC estimates based on official GoB data.

The overall fiscal deficit will increase from 1.8 per cent of GDP in 2006 to 3.7 per cent of GDP in 2007 after the hurricane, thereby overshooting the projected deficit of 2.1 per cent of GDP. The deteriorating fiscal position would largely stem from growth in spending, as the fall-out in the sectors affected would not have a significant impact on the revenue intake. Previously, total expenditure was projected to increase from 26.3 per cent of GDP to 28.9 per cent of GDP. However, with the hurricane, total expenditure will now rise to 30.3 per cent of GDP. Growth in spending will be led by capital outlays mainly reflecting repairs to roads, jetties and other public infrastructure that were damaged during the disaster. In addition, important outlays were allocated for emergency relief and clean-up costs, which have been budgeted at around 0.5 per cent of GDP.

TABLE 30: BELIZE: CENTRAL GOVERNMENT FINANCES (MILLIONS OF BELIZE DOLLARS)

			Pre-Dean	Post-Dean
	2005	2006	2007	2007
Total Revenue and grants	525.6	591.6	694.8	673.9
Tax revenue	457.8	514.6	592.8	570.0
Taxes on income and profits	120.2	136.6	172.4	158.0
of which: Petroleum revenue	…	…	20.6	29.8
Taxes on property	6.0	4.4	6.4	5.3
Taxes on goods and services	158.2	202.6	228.6	212.1
of which:General sales tax	…	77.0	167.8	161.3
International trade and transactions	173.4	171.0	185.4	194.7
Non-tax revenue	53.6	51.6	69.6	68.2
of which: Petroleum royalties	…	4.8	5.8	6.7
Grants	14.0	25.4	32.4	35.6
Total Expenditure	648.4	642.8	748.8	768.6
Current expenditure	556.4	546.4	622.4	634.7
Wages and salaries	221.2	218.2	230.8	237.7
Pensions	39.8	39.0	36.4	36.4
Goods and services	110.8	102.4	153.0	160.7
Subsidies and current transfers	35.2	47.2	71.4	74.3
Interest expenditure	149.6	139.6	130.8	125.7
Domestic interest exp.	19.6	24.0	23.0	23.0
foreign interest exp.	130.0	115.6	107.8	102.7
Capital expenditure	92.0	96.6	126.4	134.0
Overall balance	-123.0	-51.6	-54.0	-94.8
Primary balance	26.6	88.4	76.8	0.0
Source: Ministry of Finance and Central Bank of Belize data and ECLAC estimates				

Apart from emergency relief, other allocations were made for assistance to households which were damaged or destroyed. This was partly reflected both in growth in transfers and subsidies from the projected 2.8 per cent of GDP to 2.9 per cent and also outlays on goods and services from 5.9 per cent of GDP to 6.3 per cent of GDP. Although wage costs would have increased for contingency spending for additional work hours during the relief and emergency phase and probably overtime work, these costs were more or less contained. Interest costs on the debt likewise were expected to be contained, although government might need to contract additional debt in the short term for rehabilitation works.

On the revenue side, total revenue and grants were projected to fall from 26.8 per cent GDP ($694.8 million) prior to the hurricane to 26.5 per cent of GDP ($673.9 million) after the event (see table 30). In spite of the forecasted higher intake from petroleum revenue as the sector was largely unaffected, and also higher receipts from taxes on international trade and transactions consequent on higher imports for relief, reconstruction and rehabilitation works, tax revenue was expected to decline by 3.8 per cent from the projected figure to $570.9 million or 22.4 per cent of GDP.

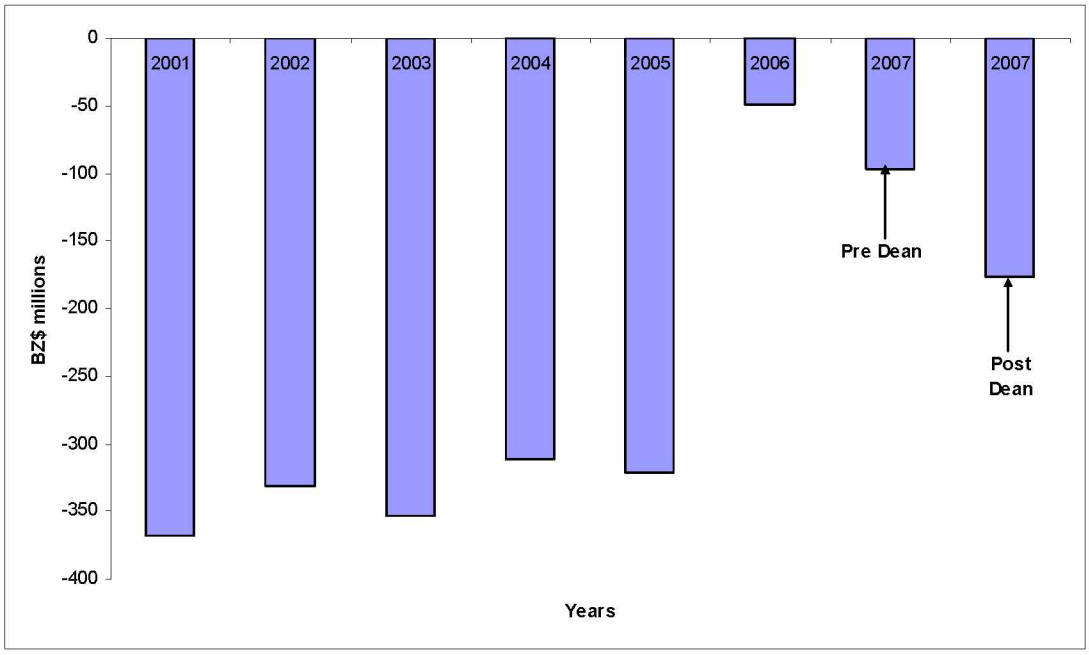
4. Monetary and exchange rate conditions

The slowdown in economic activity, growth in the money supply is expected to slow to around 11 per cent, compared with over 13 per cent last year. Inflows of savings and time deposits are expected to decline as incomes contract for households and firms in affected sectors. Total domestic credit is expected to decline as a result of the slower pace of activity. Nevertheless, credit to agriculture, tourism and transport and communications and commercial activities should increase as investors in these areas attempt to rehabilitate operation and production. Meanwhile, the banking system is expected to drawdown foreign assets to assist in funding recovery and rehabilitation of the domestic economy. With these developments, net international reserves of the country are projected to contract providing for a smaller reserve cover. The real exchange rate with respect to the United States dollar is expected to remain relatively stable. However, with the depreciation of the United States dollar relative to major currencies such as the Euro and Pound Sterling, the price competitiveness of Belize's products in these other markets will improve.

5. Balance of payments

The marked contraction in the current account deficit of the balance of payments in 2006 portended well for external stability. This was complemented by capital inflows that resulted in an overall balance of payments surplus of BZ$99.8 million, equivalent to 4.1 per cent of GDP (see table 31 below). Hurricane Dean has reversed this favourable outcome. In the wake of the disaster, the structural current deficit is projected to expand sharply to BZ$177 million, equivalent to 7 per cent of GDP and up from the forecasted 3.7 per cent of GDP prior to the hurricane. The bulk of the deterioration will come from the trade account, with the deficit projected to expand from 14.5 per cent of GDP to 18.1 per cent of GDP. Agricultural exports have been buffeted by the hurricane. Papaya, which was the most severely affected crop, is expected to suffer a major fall-off in exports due to the loss of production, especially of fruit that was near maturity. Sugar exports are projected to decline in line with the fall in output. Although on a lesser scale, exports of citrus, plantains and other crops will all contract due to loss of output.

FIGURE 15: BELIZE: BALANCE OF PAYMENTS CURRENT ACCOUNT BEFORE AND AFTER HURRICANE DEAN



Source: Central Bank of Belize and ECLAC estimates.

In the services account, tourism receipts will be down somewhat, reflecting loss of business for affected properties. Fortunately, most hotels and other tourist properties would have been up running in a relatively short period of time, thus limiting the period of closure. The fall-out in the services account would have been mitigated by insurance inflows for affected properties, especially in the tourism sector. However, current transfers were projected to rise by 5 per cent, reflecting higher workers' remittances to assist relatives with relief and recovery in the wake of the disaster. The extent of remittances would have been affected by the uncertainty about the health of the United States economy, which supplies the bulk of these flows.

Given the limited capacity of the government to drawdown additional debt, due to issues relating to project execution capacity and constraints on the flow of additional private capital, the capital account surplus was not expected to offset the current account deficit, leading to an overall deficit. The capital account surplus was projected to increase by 9.7 per cent to BZ$124.2 milllion, equal to 4.9 per cent of GDP. Private sector inflows were expected to increase, buttressed by growth in foreign direct investment as hoteliers and other business owners brought in funds to repair damaged businesses. However, public sector disbursements were expected to increase only marginally, as government keeps a lid on new debt.

TABLE 31: BALANCE OF PAYMENTS (IN BZ$ MILLIONS)

			Pre-Dean	Post-Dean
	2005	2006	2007	2007
Current account balance	-321	-49.4	-97	-177.0
Trade balance	-462	-371.4	-376.2	-460.1
Exports of goods	650.6	852.4	923.4	878.4
Of which: Petroleum exports	…	81.2	114	119.7
Imports of goods	-1112.4	-1223.8	-1299.4	-1338.5
Services balance	267.4	410.4	404.8	400.8
Income balance	-228.8	-236.4	-283.8	-283.8
Of which: Public sector interest payments	-170.4	-122.4	-117.4	-119.7
Current transfers (net)	102.4	148	158.2	166.1
Capital account	353.6	133.6	113.2	124.2
Capital transfers	6	18.2	12	13.8
Public sector	130.6	108	55.4	55.4
Of which: Central government disbursements	409.8	167.2	1221.2	1221.2
Of which: Central governments amortizations	-285	-85.2	-1184.6	-1184.6
Private sector	216.4	7.4	45.8	55.0
Of which: Foreign direct investment	253.8	169.8	150	157.5
Errors and omissions	1.8	15.4	0.0	0.0
Overall balance of payments	34.4	99.8	16.2	-52.8
Source: Central Bank of Belize and ECLAC estimates.				

6. Economic challenges going forward

Over the short to medium term, Belize faces a few key economic challenges, which must be tackled to achieve stable growth in a framework of overall macroeconomic stability and improved living standards. The most immediate concern is the debt. Although the restructuring has provided some breathing space for the economy, there is the need to maintain fiscal prudence and careful debt management to prevent the debt from ballooning again and undermining other macroeconomic gains. The short-term challenge in this respect is the impending election, next year, which is expected to be preceded by the usual election spending. Nevertheless, this is only a small deviation, what is required is improved budgetary practices that properly earmark funds for debt servicing, an upgrade in tax administration to increase intake and a more proactive approach to economic management to stem problems before they arise.

A careful medium to longer-term debt sustainability framework needs to be worked out with appropriate targets for economic growth, net debt acquisition, interest rates, exchange rate risks and distribution of debt between external and domestic debt. A consistent economic management approach around this framework, but also including issues of economic change and restructuring, is vital to ensuring stability and growth rates that are closer to potential levels.

With regard to production systems, there is a need to tackle the competitiveness challenge both from the viewpoints of price and quality. This requires improved attention to product quality management in agriculture, enhanced logistics and timely transport and delivery systems. The traditional sectors, particularly sugar and bananas, need to be revitalized through

strengthened husbandry, productivity and branding to secure competitive market share under the new EU Economic Partnership framework. This would demand improved research and development systems and also use of technology to enhance production and marketing systems in these activities. Tourism holds much potential, but needs to be properly developed to enhance service quality and value for money. There is the need for a well-crafted marketing programme that focuses in part on product differentiation. However, the overarching need is for Belize to carefully design a strategy of the kind of tourism its wants to pursue. This is critical in light of the thrust into cruise tourism, where the return per input is relatively low, compared to stay-overs, and also the intriguing potential in eco and heritage tourism. The tourism strategy needs to carefully weight these sub-components in terms of potential market demand, product development requirements, supply side constraints to be tackled and pricing and determine the relative emphasis that will be placed on each based on a rationale estimation of potential costs and benefits.

The quantity and quality of the human capital base is an important constraint on development in Belize, as in most Caribbean countries. There needs to be a well articulated programme of human resource planning and programming to take stock of required skills in various professions and technical areas and to meet this demand by training, retraining and upgrading of skills of the workforce. This is especially critical for the public sector, which is often most constrained, but also applies to the private sector, where skills and competencies acquired in universities and other training institutions often do not match those required on the job. This points to the need for more work-school programmes where students, especially at the tertiary level, can gain practical experience of the world of work while pursuing academic training. Attention should be paid to strengthening the management and organizational skills, especially of persons at the senior management levels. Further emphasis should be placed on building up skills in science, engineering and other areas that are vital to a modern, competitive economy.

VI. CONCLUSION

The assessment of the disaster caused by Hurricane Dean highlights the increased priority and urgency necessary in some areas already identified by the Government of Belize for rehabilitation, reconstruction and sustainable development, and in some new areas.

Following the assessment and discussions with government officials, members of the private sector and civil society, two kinds of measures are being recommended: strategic measures or approaches and more short term approaches which can address specific needs.

These recommendations take into consideration Belize's unique ecological nature, its new economic structures which will establish it as an economy in transition from predominantly agrarian to one that will also have an energy base and one which continues to have an eco-tourism advantage. The recommendations, therefore, seek to address the reduction of susceptibility to future shocks caused by natural disasters and to strength resilience. The not too severe impact of Hurricane Dean should not result in business as usual, but should serve as a wake-up-call to the authorities to ensure that policies are put in place to safeguard the society from the imminent threats posed by natural disasters.

In that regard the suggested strategic mitigation approaches to advance sustainable livelihoods and development are as follows:

(a) Strengthen disaster management capacity at the micro, meso and macro levels;

(b) Build capacity in the capture of information regarding damage and loss at the community level;

(c) Build capacity in determining the impact of siltation on the habitat of fish;

(d) Assess the risk of Belize City to extreme storm surge and to map **all** critical facilities;

(e) Evaluate beach erosion extents and possible effects on telecommunications cables;

(f) Strengthen economic diversification efforts (within and outside of agriculture) to generate alternative employment opportunities and as a risk reduction strategy;

(g) Use the resource boom, such as receipts from oil production, to reduce debt;

(h) Improve competitiveness of tourism by improved product development and branding of subsectors;

(i) Provide special incentives to increase the participation of youth and female producers, particularly those who are heads of households, in the economic development process;

(j) Address the relocation and/or retrofitting of communities located in hazard zones;

(k) Upgrade the quality of housing and sanitation of the poor in rural and urban communities;

(l) Strengthen affordable micro credit facilities (rural development investment funds); and

(m) Strengthen baseline information systems especially national statistical systems producing timely and periodic data.

In the short term, recommendations to address strengthening resilience in specific areas include:

(a) Support efforts of civil society to meet the basic needs of the poorest;

(b) Provide training for the informal construction sector in risk reduction practices at community level;

(c) Undertake a country-wide programme of drain cleaning;

(d) Conduct an inventory of construction equipment in various districts – Ministry of Works plus private contractors, to reduce vulnerability in the event of a disaster;

(e) BEL programme of vulnerability reduction should be continued and encouraged – supporting improved standards, particularly in coastal zones;

(f) Replacement of automatic recording station at Half Moon Caye – Meteorological Office;

(g) BWS should be encouraged to install own generating capacity at rural pumping stations;

(h) Facilitate BTL to move to a wireless overlay system, so that downed lines will have minimal impact for most areas across the country; and

(i) Encourage BTL to install back-up generating power at selected sites.

These recommendations have been presented with the expectation that they will become part of the government's programme of reconstruction and that resources will be applied to implement them.