

## **National Emergency Management Organization of Belize Damage Assessment and Evaluation Committee**

# **Hurricane Keith Assessment of Damages and Needs Analysis**

### **Executive Summary**

The Damage Assessment Committee has completed a rapid assessment of the effects of Hurricane Keith on the economic infrastructure and services as well as the transportation network and social infrastructure. Social and general public services particularly as it relates to responding to the disaster have not yet been incorporated in this report. Based on aerial and site surveys, and input from the various sectors, the preliminary estimates of direct cost of damage is placed at about \$523.1 mn. The sectors that were mostly affected were the agricultural sector and the tourism industry.

These figures are preliminary and likely to be refined based on further detailed assessment, which will be ongoing for the next few days.

### **Background**

Tropical Depression (TD) No. 15, which formed off the tip of Honduras on Thursday, 28 September, developed into tropical storm Keith by 4.00 p.m. of the following day but at the time did not pose an immediate threat. During the next 36 hours TS Keith rapidly developed into a Category 4 hurricane with maximum sustained winds of 135 miles per hour. For almost two days (Sunday and Monday) Hurricane Keith stagnated over the islands of San Pedro and Caye Caulker before eventually crossing the mainland Maskall gradually weakening as it made its way northwest towards Mexico. Following the indication of the Department of Metreology, the all clear was declared in the afternoon of Wednesday, October 4, 2000.

Within 24 hours, floods began affecting the Cayo District. Over the next three days, both the Macal and the Mopan rivers began rising, cresting at various sites and flooding communities along these rivers. In addition, the Rio Hondo and the New River affected some twenty villages in the northern districts which are inhabited by some 25,482 persons. The Belize district was also affected by the flooding of the Belize River which affected some seventeen villages and 12,726 persons.

### **Nature of Damages**

There are three elements to this disaster. Firstly, the excessive wind and storm surge which caused extensive infrastructure damage mainly along the coast. Secondly, torrential rains and which substantially affected crops, livestock and physical infrastructure. In the third instance, the destruction of homes from both the direct onset of the Hurricane and the floods have caused the displacement of thousands of persons, and it is anticipated that many of these persons, those dependent on subsistence and commercial farming, are facing at least two to four months of loss of sustenance and/or

income.

### **Aerial view of damages in San Pedro**



### **Extent of Damages**

The preliminary valuation of costs and damages associated with these two events—the passage of Hurricane Keith and the resulting floods stand at some \$523.1 mn. This figure can be broken down into three elements. The first of these, the direct cost of responding to the crisis, that is the mobilization to effect clean-up and temporary stabilization of transportation and communication infrastructure, is estimated at more than \$40.0 mn. The second element consists mainly of losses in agriculture and infrastructure; and this has been calculated at some \$523.1 mn. A summary of these losses can be found at Table 1 below, with further details in Table B of the appendix. The third element is attributed to the social needs that arise out of displacement due to both the wind damage and storm surge during the Hurricane and the consequent floods. Preliminary estimates place this figure at some \$10.0 mn in a worse case scenario and \$4.0 mn in the best case scenario.

<b>Table 1. Summary of Damages to the Various Sectors</b>	
<b>Sectors</b>	<b>Value of Damages (BZ\$mn)</b>

Economic Infrastructure	32.1
Economic Services	280.3
Agriculture	84.2
Livestock	11.9
Fishing and Aquaculture	14.0
Tourism	120.2
Environment	50.0
Transportation Network	132.7
Roads	70.0
Streets	26.6
Other Vessels	10.8
Social Infrastructure	25.3
General Public Services	78.0
	n.a.
<b>GRAND TOTAL</b>	<b>523.1</b>

## I. Economic Infrastructure

The preliminary estimate of damages to this sector suggests losses of \$32.1 mn. The most affected was the energy sub-sector.

### a. Energy

Major damages were experienced in the Belize District, namely in San Pedro Town and in the village of Caye Caulker. Belize City also suffered extensive damage, which has resulted in some fluctuation of power and outage in the City. There was also power failure in the Orange Walk District. The Belize Electricity Limited estimate that the damage caused to its installations and distribution network amounts to approximately \$12.0 mn, 70% of which was caused in San Pedro, 35% in Caye Calker and 5% in Belize City and Ladyville.

### b. Water and Sanitation

Water supply, one of the lifeline services in any disaster, was also severely disrupted due to the hurricane. Both cayes were hard hit and initial cost to restore facilities will be in the region of \$3.0 mn.

The importance of providing potable water to avoid diseases is top priority. It is expected that whilst giving attention to the severely affected areas, WASA will incur major expenses arising out of problems such as broken pipes and other technical problems arising out of flood damage. Additional complications on San Pedro include the need to replace parts for the desalination plant and to restore the operations of the pump, which cannot be run since power is not yet fully restored. The inability to restore the pumps in turn threatens to compromise the sewer system since residences are using their

amenities. If this situation persists, there is a risk of a breakdown that can result in an outbreak of health related problems. The interim measure being taken to address this issue is the installation of generators to power the pumps, which are currently being transported to the island.

### **c. Telecommunications**

Preliminary reports from BTL indicate that the most affected area in terms of damages was San Pedro and Caye Caulker. Here, BTL lost its tower, the switches and the entire transmission and distribution network. Consequently, the entire network for these two areas will need to be totally reconstructed at an estimated cost of \$3.5 mn. It is expected that the tower and the switch will be installed within one month and the distribution networks targeted for completion by the end of November so as to minimize the effect on the tourism industry.

### **d. Airports, Airstrips, Ports and Piers**

Transportation by land, sea and air were adversely affected by the excessive rains but were restored within three days except in heavily flooded rural areas. Phillip Goldson International airport suffered minimal flood damage resulting mainly in loss of revenue due to the five day closure.

It is estimated that approximately 90% of the piers at both San Pedro and Caye Caulker were severely damaged while the damages to the remaining 10% were minimal.

## **II. Economic Services**

The preliminary assessment of total damages in agriculture amounts to \$76.5 mn, whilst that of tourism amounts to \$120.2 mn. At this point it is clear that environmental damages will be quite significant, however, intense analysis will be required to quantify these damages.

### **a. Citrus**

The districts of Toledo and Stann Creek were the bulk of the citrus is produced, was least affected. It is estimated that 3000 acres of citrus were affected in the Cayo district and 6000 acres in the Belize and Orange Walk districts. This loss is valued at \$6.7 mn.

### **b. Sugar**

Reports from the northern districts indicate that over 40,000 acres of sugar-cane valued at \$33 mn, were damaged. Approximately 12,000 acres are flooded while over 28,000 acres were blown down. This is a severe blow at a time when the industry is faced with the challenges of trade liberalization and depressed world market prices for sugar. This industry will require immediate injection of capital to rehabilitate the affected fields.

### **c. Other Crops**

Bananas did not suffer any significant economic damage in the south. In the northern and central regions non-traditional export crops such as papayas, hot peppers etc. suffered damages to approximately 300 acres valued at \$7.5 mn.

Major domestic crops such as rice was affected in three districts, namely Orange Walk (10,000 acres), Belize (2000 acres) and Cayo (1000 acres). The total value of this

amount of rice is estimated at \$9.7 mn. Corn, another important crop was damaged to the tune of \$17.3 mn and the districts most affected were Orange Walk, Cayo and Corozal. Soybean, a new crop that is being promoted, suffered losses of approximately \$1.0 mn.

Most affected by the floods are the subsistence farmers who lost a total value of approximately \$9.0 mn especially those along the banks of the Rio Hondo, Belize River and New River. This area will need a coordinated approach for medium and long term strategies to alleviate the loss of income obtained from farming.

#### **d. Livestock**

It is estimated that 15% of the total livestock industry will be affected or approximately \$11.9 mn. Due to continued flooding, it is quite likely that this figure will need to be revised upward as other areas become affected.

#### **e. Fisheries**

Damages to the fisheries sector is significant especially since the lobster season, which extends from 15 June - 15 February, was on its way to being one of the best in recent years, with an approximate gross value of \$15 million. The conch season, scheduled to open on 1st October has been delayed for at least 2 months which will result in an estimated loss of 25% (\$5.0 mn). The same will occur for shrimp and finfish. The foregone revenue due to lower yields of these species in capture fisheries amounts to \$7.8 million. In addition, estimates of damages to boats, engines, gear, piers and dwellings were made by the Fisheries Department, amounting to \$3.6 million. Aquaculture did not suffer much damages and estimates stand at \$0.6 mn in the Belize District. Also included in these losses is damage to the infrastructure of the marine protected areas and the Fisheries Department.

#### **f. Infrastructure**

Investments on infrastructure and equipment that were affected by the hurricane is estimated at a total value of \$11.0 mn and is distributed by order of importance in Orange Walk (Blue Creek), Belize Rural Villages, Cayo and Corozal.

Damaged feeder roads will cost an estimated \$5.0 mn to repair and replace. A total of 100 miles of farm roads were affected in Corozal and Cayo and in the Orange Walk and Belize District 400 miles were damaged.

#### **g. Flooding in the Northern Districts**

The districts of Belize, Orange Walk and Corozal are suffering from excessive flooding, which continues to increase and therefore seriously threatens the safety of the local communities along the banks of the Belize River, New River and Rio Hondo. These areas are also the most productive areas hence the expected damage to the productive sector, in particular agriculture, shall be of crisis proportion.

#### **h. Tourism**

The tourism industry has suffered a major setback in San Pedro and Caye Caulker resulting in millions of dollars in losses. Fortunately, the reef and some beaches are fairly intact. This indicates that urgent action must be taken to restore room capacity and amenities to sustain the tourism product.

## i. Environment

Substantial erosion and damage to the environment will result from the excessive rains and accumulation of water, which is now making its way across the flood plains towards the sea.

## III. Transportation Network

Preliminary assessment of damages to physical infrastructure, mainly roads and bridges, indicates an estimated loss of \$107.5 mn, comprising of \$96.6 mn in roads and streets and \$10.8 mn in culverts, soil erosion and bridges.

One of the domestically operated airlines reported damages to five of its aircrafts estimated at \$0.3 mn.

## IV. Social Infrastructure

Extensive winds, rain and flood damage has resulted in a \$75.0 mn lost to residential housing. The worst destruction was felt in San Pedro at a cost of \$20.0 mn and on Caye Caulker (hardest hit on the west side) approximately \$15.0 mn worth of destruction.

<b>Table 2. Number of Persons Affected by Hurricane and Flood By Districts</b>				
	<b>Evacuated</b>	<b>Isolated</b>	<b>Partially Affected</b>	<b>Total Affected</b>
<b>FLOOD</b>				
Orange Walk	1,833	3,646	8,597	14,126
Cayo	--	--	4,613	4,613
Belize District	170	693	11,863	12,726
Corozal	--	3,224	8,132	11,356
<b>TOTAL</b>	<b>2,053</b>	<b>7,563</b>	<b>33,205</b>	<b>42,821</b>
<b>HURRICANE</b>				
San Pedro	1,500	--	--	1,500
Caye Caulker	200	--	--	200
<b>TOTAL</b>	<b>1,700</b>	<b>--</b>	<b>--</b>	<b>1,700</b>

The hurricane and the flood had directly impacted on the lives of approximately one sixth of the population largely in the Orange Walk, Cayo, Corozal and Belize districts. As a result of the loss of houses in San Pedro and Caye Caulker due to the direct hit of hurricane Keith it is estimated that at least 1,700 persons are homeless.

The effect of the flood is much greater than that of the hurricane in terms of the level of displacement and isolation of the population.

## Follow-up Analyses and Reports

It must be underscored here that these figures are preliminary. The Damage Assessment and Evaluation team is currently working on revising these based on the completion of housing assessment in Belize City, an assessment in Orange Walk, and the abatement of flood waters and assessment of damages in Belize Rural South and Central. Furthermore, it must be noted that floodwaters are still rising in some areas, and only just receding in others.

### **Aerial view of extensive flooding in Roaring Creek**



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