



National Emergency Management Organization
Damage Assessment and Needs Analysis

INITIAL DAMAGE ASSESSMENT REPORT



HURRICANE RICHARD
(Category 1 Storm)

Assessment Report as at 27TH OCTOBER, 2010

BELIZE C.A.

The 48 Hour Report or IDA (Initial Damage Assessment) builds on earlier reports providing additional and more precise information. It aims at determining relief and immediate response requirements and is conducted immediately in the early and critical stage of a disaster, as soon as the conditions allow survey teams to operate. The IDA also provides initial valuable information on the needs for rehabilitation and reconstruction (e.g. repairs to damaged structures, restoration of agriculture, animal husbandry, fisheries and industrial production).

This report assessment is informed by initial field reports produced by on the ground DANA personnel and earl responders.

Limitations to Report: The damage and losses presented here reflect the available information, compiled during the initial 48 hours of field assessments. It is important to note that these estimates are preliminary due to the quick turnaround time required for an assessment of this nature. The damage and losses presented here reflect the available information, compiled during the Mission's duration to selected affected areas. This is not a final assessment of the damage and needs since it reflects information available at the time of the mission, taking into account that at this time a number of surveys and specialist sectoral analysis will only be commencing.

The 48 hr report includes where possible preliminary cost estimates of damage.

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I. Executive Summary

The Process: Data/ information represented in this document were compiled from DANA and sectoral field assessments. Field teams were deployed to affected areas immediately after the all clear was declared by the Prime Minister. The DANA writing team has utilized a process of cross referencing to verify and analyze field assessment results. DANA field results are cross referenced with incoming sector results and other available assessments such as those carried out by the Red Cross. It should be noted that the large expanse of the impacted area and the high dispersal of impacted communities has slowed the immediate availability of information.

The Report: The characteristic of the IDA is that it is broad in scope and focuses on overall patterns and trends. It identifies:

- the magnitude of a disaster (without necessarily delivering exact figures)
- the impact of a disaster on society
- people's capacity to cope
- the most urgent relief needs and potential methods for delivery
- priorities for action
- the utilization of resources for immediate response
- the need for detailed assessment of specific geographical areas or substantive sectors
- the level of continuing or emerging threats
- the need for international assistance

The Effect/ Event Summary:



Hurricane Richard with sustained winds of 90 mph made landfall 20 miles south of Belize City on a westerly track moving at 13mph, in the region of Northern Lagoon at approximately 5:00 p.m. and continued a path through to Gallon Jug in the Orange Walk District, with hurricane force winds extending 20miles from the centre and tropical storm force winds extending 105 miles from the centre, with the strongest winds located within the NE quadrant of the system.

In preparation for landfall, some 4,639 individuals sought shelter nationally and it is believed that thousands of other coastal dwellers voluntarily relocated inland to family and friends. Some 86 individuals are still in national shelters in the Belize and Stann Creek districts. There is 1 casualty directly attributed to Hurricane Richard, and one individual missing.

Housing: Hurricane Richard's path took it directly across several of Belize's population centers including both national cities. Richard's large circulation bands interacted with more than 50% of the national population (192,800)¹. Much of Hurricane Richard's impact was caused by its strong associated winds and storm surge in Belize City. Field assessment teams have now confirmed some 890 houses/ dwellings as having experienced varying levels of damage. 60% of this number comes from Belize City (Damages concentrated primarily in South Side communities). Inhabitants of the Jane Usher Blvd., Faber's Road and Neal Pen Road are the hardest hit in this region. It should be noted that several of the houses impacted in Belize City and Dangriga Town are as a result of storm surge and resulting pooling from lack of retaining seawall structures (shore protection) and from poor improper drainage.

Belmopan and its surrounds were also significantly impacted by the strong winds of the system. It is estimated that 15 -20 percent of homes in the Maya Mopan/Salvapan/San Martin/ Las Flores areas have suffered level 3 and 4 damages. Most damaged structures in San Martin will require complete reconstruction.

There are reported damages to homes across 53 communities in the path of hurricane Richard. Damages constitute primarily loss of roof structures and water damaged to homes as a result of roof failure. To date estimates of losses to the housing sector amounts to some BZD \$14.1 million.

The Relief Supplies Subcommittee has indicated the need to provide relief to some 1,128 families in Belize City, 261 families in Belize Rural, 62 families in the Belmopan and surrounding areas and 106 families in the Stann Creek District.

Priority relief and restoration needs include food, water, and non food (bedding, clothes, etc.) relief as well as roofing and wall repair/ construction materials.

Education: The Ministry of education has reported some BZD\$407,000 dollars in losses. Losses are attributable to minor infrastructural damage i.e. damages to roof and window structures as well as to water damage to school equipment, materials and books.

Losses of school supplies in affected homes have not been quantified however there is an appeal for basic school supplies and uniforms allowing for a quick return of normalcy of school and student participation.

Health: There are no reported significant damages to health infrastructure or disruption to health services. The Ministry of Health officials continue to monitor the national situation for potential secondary threats of Hurricane Richard.

As a precautionary method the Ministry of Health requests the restocking of dengue vector control reagents.

Agriculture: The agriculture sector has been the hardest hit by Hurricane Richard. Within this sector the Citrus Industry has recorded the greatest loss as some 1,500 acres of un- harvested oranges and grapefruits

¹ Population Reference extrapolated from 2010 population estimates derived from SIB publication "Belize: Total Population Estimates and Projections (1980-2050)"

were blown off trees. The industry is making all attempts to salvage downed grapefruits however their window of opportunity is closing quickly. Orange First crop is considered a complete loss as fruits, at the time of the storm were too immature for harvest. Losses in the citrus industry account for 30% of this seasons citrus harvest with a projected loss of BZD\$29.1 million.

Other industries impacted include the Papaya industry. Papaya is vulnerable to moderate and extreme wind situations. Some USD\$5.1 million dollars in damage have been reported to farms in the Indian Creek area. Losses are also recorded to the vegetable and coffee industries as well to subsistence and backyard crops and fruit trees.

Initial estimates of export and subsistence crops and agriculture infrastructure reported by the extension services of the Ministry of Agriculture and Fisheries now amounts to some BZD\$38.4 million.

There is a need for the provision of seed stock materials and agricultural input particularly to support those industries that were greatest impacted and to quickly re-establish subsistence farms.

Fisheries: Damages to fisheries supporting ecosystems have been recorded by the Fisheries Department. These damages to mangrove, coral and sea grass ecosystems are expected to disrupt fisheries population and fishermen catch in the immediate future. Impacts are greatest in Fisheries designated Zone 5 (central). Long term economic losses to the sector require monitoring by the Fisheries Department.

Apart from these damages, there is a quantifiable loss associated with the impairment of fishing capacities. Loss of vessels, camps and gears by artisanal and commercial fishermen amounts to BZD\$ 4.28 Million dollars. Potential losses to the industry as a result of loss of fishing capacities are estimated as being BZD\$ 4.68 million dollars.

The Fisheries Department is making an appeal to donors and partners to assist in restoring fishing capacities of artisanal fishermen.

Initial assessments of aquaculture facilities have indicated damages to processing plants as well as escape stock. Losses to this sub sector have not yet been fully quantified however there is already a reported loss estimated of BZD\$1 million by one of the three companies impacted.

Total reported losses to the fisheries and aquaculture industry are estimated at approx BZD\$ 10 million.

Tourism: Initial estimates released by the Belize Tourism Board and tourism operators indicate initial losses to the industry as being BZD\$7.4 million. Reconstruction/ repair of damage infrastructure/ facilities is crucial as the tourism season is set to open in November.

Public Utilities: Damages to electricity distribution system has been estimated as being BZD\$250,000. It should be noted that electricity has been restored in most communities, however a small amount of communities along the northern and western corridor remain without power. The absence of electrical power have also disrupted water systems in some rural communities as these communities do not have back up generation capabilities to power water pumps.

Total losses (direct + economic losses) determined from the data available, have been estimated as being BZD\$70.5 million based on very preliminary reports of damages. Table 1 below summarizes losses by sector.

Table 1: Summary of Losses by Sector

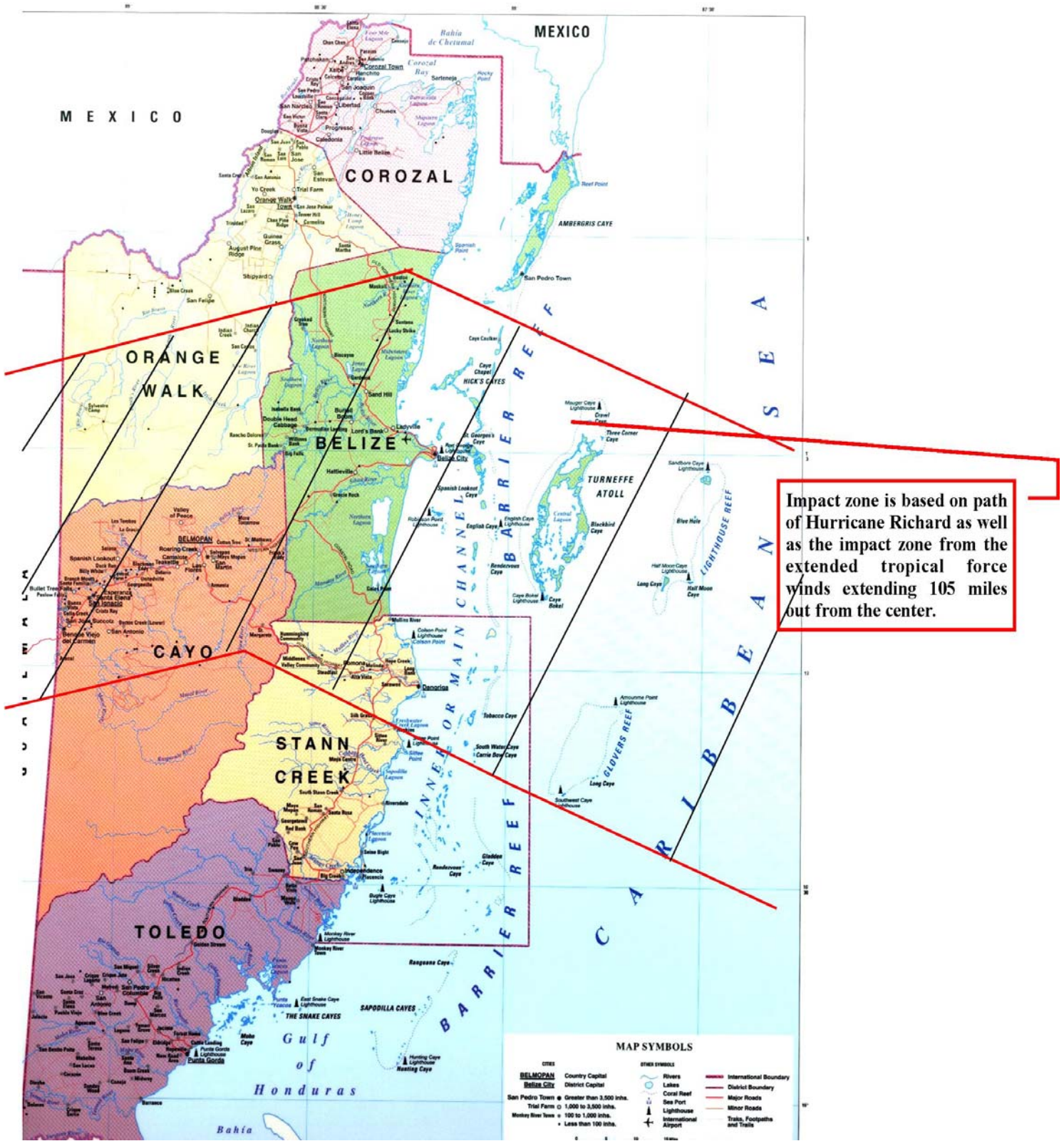
Sector	Direct Losses² (BZD)	Potential Economic Losses³
<u>HOUSING</u>		
• Repair	\$7,125,000	
• Rebuild	\$7,050,000	
<u>EDUCATION</u>		
• Infrastructure	\$222,000	
• Books, Equipment, Materials	\$185,000	
AGRICULTURE	\$113,656	\$38,122,596.50
TOURISM	\$6,040,300	\$1,411,930
FISHERIES/AQUACULTURE	\$5,276,500	\$4,680,000
PUBLIC UTILITIES	\$250,000	
SUB TOTALS	\$26,262,456.00	\$44,214,526.50
TOTAL	\$70,476,982.50	

*****All estimates are presented in BZD**

² Direct losses refers to the monetary value of the completely or partially destroyed assets such as social, physical and economic infrastructure;

³ Economic losses are determined income losses and comprise both the change of flow of goods and services and other economic flows such as increased expenses, curtailed production and diminished revenue which arise from the direct damage to production capacity and social and economic infrastructure. It also looks at the projected loss.

Figure 1: Impact Zone



Impact zone is based on path of Hurricane Richard as well as the impact zone from the extended tropical force winds extending 105 miles out from the center.

II. BACKGROUND

1. The Mission

*“ The NATIONAL EMERGENCY MANAGEMENT ORGANIZATION (NEMO) in cooperation with the respective Emergency Management Committees, and all Public and Private Agencies, is established to **Preserve Life and Property** in the event of an emergency, threatened or real, and to mitigate the impact on the country and its people”.*

The DANA Committee is responsible for the coordination of resources to effect the rapid assessment of damages resulting from disasters. Assessment reports generated by DANA serve to inform national humanitarian responses, early recovery efforts and approaches to the international community for projects aimed at replacing damaged infrastructure and other systems with mitigation.

2. Description of the Phenomenon and their Effects



Hurricane Richard was the seventeenth named storm and the tenth hurricane of the 2010 Atlantic hurricane season. On October 21 the system was classified as Tropical Depression Nineteen approximately 125 miles (200 km) south of Grand Cayman.

Upon intensifying to tropical storm status, Richard was moving southeastward, with models predicting further intensification over the western Caribbean. Richard moved parallel just offshore the Honduras coast, and began strengthening, after the shear diminished. On October 24, Hurricane Hunters indicated that Richard attained hurricane status, based on surface winds of 85 mph (137 km/h). Radar images at this time indicated a nearly-closed eyewall.

Radar from Belize indicated that eye of Hurricane Richard made landfall at approximately 5: 45 p.m. about 20 miles (35 km/h) south-southeast of Belize City, at peak intensity. The eye briefly became better defined just after moving ashore. Maximum sustained winds at landfall were estimated as being 90 MPH (150 KM/HR). Hurricane force winds extended outward up to 15 miles and tropical storm forced winds extended outward up to 105 miles, with the he primary wind impact being along the path of system, affecting some 53 communities and 2 cities of the Belize, Orange Walk (south), Cayo and Stann Creek Districts.

A storm surge of 3 to 5 ft accompanied the storm as it made land fall and caused flooding of city streets and the ground floor of many residences in Belize City. Field team reports indicate significant water damage to household items as a result of the surge.

Hurricane wind condition continued inland and resulted primarily in damages and losses to roofs and contributed to the collapse of wooden homes in its direct path. Damages to agricultural crops and infrastructure were also attributable to the strong associated winds.

3. Affected Population

3.1 Description of affected Population



The large expanse of Hurricane Richard's circulation bands allowed its interaction with over 50% of the Belizean population. More than 75% of damages to homes and subsistence crops were borne by the nation's poor and marginalized populations. Areas hit hardest in Belize City and its surrounding areas are areas associated with high rates of poverty and records high incidences of single female headed households. Highly impacted communities such as Hattieville also share this description. This fact is important in restoration planning as most families displaced as a result

of damage or destruction of property are unable to immediately restore their homes and replace lost possessions.

The surrounding areas of Belmopan which were also heavily impacted supports (Las Flores, Salvapan, Maya Mopan, San Martin) supports a large poor migrant community. Some 15-20 % of homes in these areas were completely destroyed and a larger number of residents suffered complete losses to subsistence farms and backyard gardens.

3.2 Vulnerability of Women and Children

Impacted households reflect large numbers of women and young children. Early estimates indicate that as much as 75% of those severely impacted are women, elderly and young children. These displaced individuals have had to seek shelter in the homes of families and friends. In some cases families units had to be separated to facilitate this measure.

3.3 Cultural/Historical Sites

The National Institute of Culture and History reported minor damage and disruptions to 5 archeological sites. Nohoch Che en, Xunantunich, Altun Ha, Actun Tunichil Muknal, and El Pilar reported fallen trees, disrupted trails, and large amount of debris. There are no reports of structural damage. NICH estimates cleanup costs as being BZD\$ 75,000. All sites have been reopened to visitors.

4. Emergency Actions

4.1 Government Actions

The Government of Belize through its Relief and Supplies Committee, chaired by the Ministry of Human Development and Social Transformation, has launched immediate efforts to provide basic relief items (food and non food items) to the affected population. Social workers have been deployed to the hardest hit areas to provide psychosocial relief as well as to coordinate detail assessments of needs. The Government of Belize has released an initial BZD\$3 million to aid relief and restoration efforts.

The Damage Assessment and Needs Analysis Sub Committee of NEMO continues to utilize field teams to access impacted communities

National and local efforts are also underway to support immediate clean up and community restoration. One such initiative is the mobilization of unemployed youths in South side region to participate in government supported cash for work programme.

4.2 International Cooperation

- The foreign assistance subcommittee has been activated. Donors including the EU and members of the diplomatic core have expressed their intention to support priority response efforts.
- The country has received a donation of relief food items from neighboring Quintanaroo, Mexico. The Foreign Assistance Committee has reported additional pledges for support to the Humanitarian relief effort.
- The United Nations System in Belize continue to provide logistical support to the Damage Assessment and Needs Analysis Subcommittee as well as the Relief Supplies Sub Committee. In country United Nation's agencies stands prepared to support national relief and restoration efforts.
- The Belize Red Cross have conducted needs assessments surveys in impacted regions and have distributed home kits to those families most significantly impacted.

III. ASSESSMENT OF THE DAMAGE

1. Social Sectors

1.1 Housing



Field assessments recorded damages to structures supporting some 890 households. Damages are attributable primarily to wind force and storm surge. Of the impacted households some 570 are recorded as experienced level 1 and 2 damages to roof and wall structures and an additional 187 were severely damaged or destroyed. 134 households were disrupted as the associated storm surge deposited mud and debris into the dwellings. Table 2 below summarizes the damage to homes by District. A detailed description by communities can be found as Annex 1 of this document.

Based on reconstruction and repair estimates provided by the NEMO engineer, *losses to the housing sector is estimated as being BZD 14,137,500.*⁴ The estimated total reflects only cost for reconstruction/ repair; it does not take into consideration the cost of replacing personal household items.

Table 2: Housing Impacts by Districts

District	# of Households Impacted	# of Homes Damaged	# of Homes Destroyed
Belize	457	298	85
Cayo	292	180	53
Stann Creek	141	92	49
TOTALS	890	570	187

It should be cautioned that data sets for Belize City, Belize Rural and Dangriga areas are incomplete and that number of affected household is expected to increase with field verification and recalibration of data. The IDA indicates a reduction of the original number of homes classified as being destroyed. This is as a result of ground truthing and a reclassification of damage levels in some instances by assessment teams.

⁴ Cost or Rebuild: BZD\$37,500; Cost of Repair: BZD\$12,500

1.2 Education

The Education Sector has sustained substantial damage to infrastructure and education materials/ equipment. Recorded losses are associated with water damage resulting from roof failure, infrastructure leaks and storm surge. **The Ministry of Education has quantified initial losses as being BZD\$407,000.** Classes are still suspended for some areas which were significantly impacted by Hurricane Richard. Annex 2 provides a detailed breakdown of affected facilities and types of damages experienced.

Approximate Cost of Damage to Physical Infrastructure: BZD\$222,000, and Approximate Cost of Text Books Damages inclusive of those from Government Book Store: BZD\$185,000

1.3 Health

Reporting sites of the Ministry of Health indicated they attended 50 cases with treatable conditions. Three persons (6.1%) were admitted of those who needed medical attention. These conditions were related to diarrhoea, fever, cough, vomiting, asthma, an obstetric bleeding and minor injuries. There were three deaths reported but these were not directly related to the storm. No damages were reported from national health facilities.

All health facilities are equipped with the appropriate medical supplies to deal with any emergency. In addition UNICEF has available 19, 020 packets of oral rehydration salts and 2,578 water containers and 8 health kits.

Due to the recent dengue outbreaks the existing stock of vector control supplies for this fiscal year has been depleted. It is urgent that the government obtain more supplies to address any potential breeding sites and control any rises in vector populations.

2. Damage in Productive Sectors

2.1 Agriculture

2.1.1 Overview

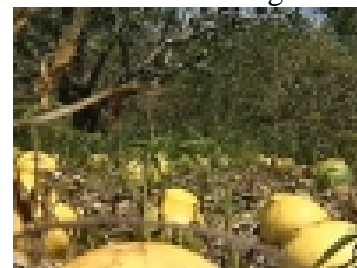
Agriculture, which employs over one-third of Belize's labor force, is vital to the country's economy, accounting for nearly 17 percent of the GDP in 2009. **Damages to the Agricultural Sector totals some BZD\$38.4 million.** Table 3 below provides a summary of losses reported per district.

Table 3: Summary of Damages

<i>District</i>	<i>Estimates Loss (BZ\$)</i>	<i>Crops most affected</i>
<i>Stann Creek</i>	<i>\$29.56 million</i>	<i>Citrus, plantains, coconut</i>
<i>Cayo</i>	<i>\$1.85 million</i>	<i>Assorted vegetables, plantain</i>
<i>Belize</i>	<i>\$1.4 1million</i>	<i>Assorted vegetables, citrus, plantain</i>
<i>Orange Walk</i>	<i>\$5.58 million</i>	<i>Papayas, coffee</i>
<i>TOTAL</i>	<i>\$ 38.40 million</i>	

2.1.2 Description, Analysis and Estimation of the Damage

The Stann Creek, Cayo, Orange Walk and Belize Districts reported significant losses in to the agricultural sector as a result of the winds associated with Hurricane Richard. The Citrus industry reported the largest amount of direct losses in the agricultural sector. These losses were attributed to the impact of storm winds on unharvested citrus crops. An assessment carried out by the Citrus Producers of Belize Limited indicates that some 1,500 acres of unharvested citrus (oranges and grapefruits) was lost. Field assessors from the Citrus Growers Association determined that approximately 75% of the grapefruit first crop and about 40% of the orange crop was stripped from the trees during the storm. This equates to a direct loss of \$29.1 million BZD by the industry⁵.



Ministry of Agriculture and Fisheries Extension Services also confirmed some ***BZD\$9,022,596.50 worth of damages to export and subsistence crops*** in the Stann Creek, Cayo, Orange Walk and Belize Districts. Annex 3 details losses reported by district. Apart from damages to crops, assessors also reported damages to livestock and agriculture infrastructure in the Belize District. Tables 4 and 5 below illustrate these damages.

Table 4: Infrastructure Damage- Agriculture Sector

Damages to Tunnel Structures	Type of Damage	Size (ft)	Cost (unit price)	Total Cost to repair
Taiwanese Community mile 25	22 structures totally destroyed	20X60X10	2000	44000
Rockstone	Plastic covering 1 structure	20X60X10	2000	2000
Belriv	1 tunnel structure	14X40X12	2000	2000
Taiwanese Community mile 25	Structure for growing water melons	50X100	5000	5000
Mile 26	3 cover structures	15X100X10	15000	45000
Hydroponics Structures mile 25	7 structures	10X50X10	???	???
Total Cost				BZ\$98,000.00

Table 5: Livestock Losses- Belize District

Livestock losses	Number Males	Number Females	Value
Sheep	3	10	2600
Cattle (beef)	4	1	5000
Pig	3	2	2500
chickens (layers)		120	1200
Chickens (broilers)	105		756
Fencing (Barbwire)	18 roles		3600
Total Cost			BZ\$15,656.00

⁵ Calculations: 3,500 exportable boxes/acres x BZ 15.00/box

Damages of protected cropping structures and production tunnels were also reported in the Cayo District, however, the exact value of losses have not yet been quantified.

Protected Cropping Structures:

1. Teakettle - Damaged
2. La Gracia – Roof Damaged
3. San Antonio – Side walls Damaged

Other Covered Structures – Tunnels:

1. Sta. Familia – Minor Damages
2. Ontario – 3 structures completely destroyed
3. Maya Green Growers – from the 9 structures, 2 were completely destroyed the other are to be assessed during the course of the week.
4. Springfield – the three largest ones were destroyed partially (covering blown off)

2.2 Tourism

2.2.1 Overview

Tourism is the single largest contributor to GDP and the largest source of foreign exchange earnings for Belize. In 2008 tourism contributed 20.07% to national GDP. More than 70% of Belize's tourism infrastructure is concentrated along its coast and cayes. Initial damage estimates of losses to the tourism sector total approximately BZD\$7.4 Million; BZD \$6.0Million as a result of direct losses and damage to infrastructure and equipment and BZD \$1.4 Million as an indication off loss revenue.

2.2.2 Description, Analysis and Estimation of the Damage

Hurricane Richard damaged a number of navigation aids marking the eastern channel utilized by Cruise Ships. Five of these aids remain missing, one displaced to another location and one recorded damages to its lighting structure. As a result of this Carnival Cruise ships slated to dock in the country have announced their inability to do so until navigation guides are in place. **Economic losses as a result of the inability of Cruise lines to dock in Belize have been calculated as being BZD\$1,093,480.** Estimated costs for the replacement of the navigation aids is BZD\$300,000.

30% of the tourism properties across the country have reported varying degrees of damages to infrastructure as well as loss of revenues due to cancellation. Significant losses to tourism infrastructure have been reported in the Belize City area. Two of three of Belize City largest hotels have reported significant damages to their marina infrastructure. The Princess Hotel and Casino along with the Radisson Fort George Hotel and Marina lost their commercial marina's, combined approx 1,700 ft of pier infrastructure. **Rough estimates of damages to tourism properties nationwide is BZD\$4.7 million.** An estimated BZD\$161,450 in lost revenues due to cancellations was recorded. Restoration of damaged facilities is crucial as the tourism season in Belize opens early November.

Popular tourism destination, **Old Belize, have reported initial losses totaling BZD\$1 million** to its facility. The facility suffered damage to roofing and docking infrastructure as well as erosion of beaches.

Table 6: Summary Damage- Tourism

TOURISM LOSSES		
Hotel Sector		
	DIRECT DAMAGES	REVENUE LOSS
Belize City & Soroundings	2,127,000	8,950
Western Highway/ Belmopan	102,600	9,000
San Ignacio Town	215,000	0
San Ignacio- Benque Viejo	0	23,500
Stann Creek	368,400	1,000
Placencia	0	9,000
Toledo	0	30,000
Off Shore Islands	1,844,800	0
Caye Caulker	20,000	5,000
San Pedro	0	75,000
SUB TOTAL	4,677,800	161,450
Tour Operators		
	DIRECT DAMAGES	REVENUE LOSS
San Pedro	0	29,000
Cayo	0	50,000
Caye Caulker	0	3,000
Belize City & Soroundings	0	75,000
SUB TOTAL	0	157,000
Cruise Destination		
	DIRECT DAMAGES	REVENUE LOSS
NICH Sites	62,500	0
Navigation Aids	300,000	1,093,480
SUB TOTAL	362,500	1093480
TOTAL LOSSES	5,040,300	1,411,930

2.3 Aquaculture/ Capture Fisheries

2.3.1 Overview

Capture Fisheries: In the Fisheries sector, Hurricane Richard caused major damages to Fishing Zone 5, which consists of the area between Caye Caulker and southern boundary of the South Water Caye Marine Reserve and Fishing Zone 1 which is composed of the Turneffe Atoll. Fishing Zone 5 is the most productive fishing area in the country of Belize. The coral reef ecosystem and especially to nursery, feeding and grow out areas for many commercially important fish species such as Spiny lobster (*Panulirus argus*) and Queen conch (*Strombus gigas*).

In 2009, some 2759 fishermen were employed in the capture fisheries sector. This means that approximately 13,000 Belizeans receive direct benefits from the fisheries sector. Lobster production amounted to 486,600

pounds with an estimated value of \$11.7 million despite low market prices resulting from the economic recession in the United States of America.

Estimated loss to the Aquaculture/ Capture Fisheries' Sector totals BZD\$4,276,500

2.3.2 Description, Analysis and Estimation of the Damage

No significant damages were sustained by the fishing cooperatives building infrastructure, freezing equipment and cold storage facilities. Fishery products held in storage at the cooperatives during the passing of the hurricane were not affected as mobile generators provided electricity to the freezing equipment until electricity supply was restored to the area where the cooperatives are located. The most significant negative effect to the capture fisheries sector was in the form of damages and losses of fishing gears and fishing camps as detailed below.

National Producers Fishermen Cooperative Soc. Ltd.

- a. Lobster traps – 7,500 Traps at a value of \$75.00 each = \$562,500.00
- b. Lobster shades – 4,600 shades at a value of \$70.00 each = \$322,000.00
- c. Fishing camps – 75 fishing camps (20 ft x 18 ft) at a value of \$8,000.00 each = \$600,000.00

SUBTOTAL = \$1,484,000.00

Northern Fishermen Cooperative Soc. Ltd.

- a. Lobster traps – 9,900 Traps at a value of \$75.00 each = \$742,500.00
- b. Lobster shades – 5,400 shades at a value of \$70.00 each = \$378,000
- c. Fishing camps – 84 fishing camps (20 ft x 18 ft) at a value of \$8,000.00 each = \$672,000.00

SUBTOTAL = \$ 1,792,500.00

The damages and losses of fishing gears including 17,400 lobster traps and 10,000 lobster shades amounts to losses of approximately 40% of the lobster fishing capacity in the fishing zones affected by Hurricane Richard. The loss in fishing capacity could translate into a **potential revenue loss of an estimated \$4.68 million** in the fisheries sector. The significant loss in lobster fishing capacity is expected to further impoverish the small-scale artisanal fishermen families affected by the hurricane.

Aquaculture: At this point there are no final figures associated with damages experiences by Aquaculture farms in the impact zone. The three principal farms in the area reported varying damages. Damages to Paradise Shrimp Farm, Fresh Catch Belize and Marine Farms Belize Limited are summarized below.

1. Paradise Shrimp Farms Limited:

- the roof structure of the shrimp hatchery
- headquarters for the field staff

- managers' house
- feed storage facility
- damage to feed in the storage facility
- damage to main intake pipe for the hatchery and
- the main intake canal for the farm.

The preliminary value to the losses have been estimated at BZD\$ 1 Million. All the shrimp stocks are in good condition, including the breeding stocks.

2. Fresh Catch Belize Limited:

- most of the power lines were damaged, including at least 20 lamp posts
- the generator house
- minor damages to the processing plant

All the grow-out fish stocks are in good condition given the low stocking density. At this stage, **no value has been estimated** for the infrastructural damages sustained.

3. Marine Farms Belize Limited:

The company presently has two production sites. One is the off shore grow-out site near Robinson Point and the other is the hatchery facility located on the mainland near Dangriga town.

The damages reported are for the cobia grow-out site. Most of the damages sustained were:

- At least 10 cages extensively damaged
- the escape of farmed cobia stocks.

No indicative loss estimates has been provided by farm managers as yet.

3. Infrastructure

3.1 Public Utilities

3.1.1 Electricity

Belize's primary electricity distributor (Belize Electricity Limited) reports that all generation sources and substations are intact. There are LV poles, distribution lines and conductors down throughout the hurricane impacted zones. In the aftermath of Hurricane Richard BEL reports that approximately 52,800 customers were without electricity. BEL has worked to restore electricity to 95% of its customer base. A small amount of communities along the western corridor, remain without electrical power.

Initial estimates from BEL indicates its losses/ recovery costs as being BZD\$250,000.

3.1.2 Water Supply

There are no reports of damages or losses to the water supply systems, however some systems remain none functional due to the absence of electricity. The Government of Belize and relief workers are providing potable water to those communities with disruptions in their system.

3.1.3.1 Communications/ Telecommunications

The various telecoms have not reported any significant damages to infrastructure; however a transmitter tower of a local media company (Channel 7) was completely destroyed. The monetary value for the replacement of the tower and dishes not yet been presented to NEMO.

3.2 Roads and Bridges

Damages to national road networks within the broad impact zone are reported as being minimal. Damages in road infrastructure are primarily due to road washouts, and shoulder erosion due to excessive waters crossing the road. There is reported scouring along Crooked Tree Causeway due to wave action. The Ministry of Works has indicated that all repair needs can be accommodated under their normal maintenance program.

3.3 Public Buildings

Minimal infrastructure damages (level-1 damages) to public structures have been reported in the aftermath of Hurricane Richard. Damages were restricted to minor wind and water damages. One health post in San Victor (Corozal) not used as shelter was broken into by villagers to be used as a shelter. There were no associated substantive damages to this facility. Infrastructural damages to schools have been reported under the education sector component of this document. One church has reported level-2 roof damage in Belize City.

Water damages have been recorded particularly in the Belize City areas. The central Court of Appeals has been significantly impacted by storm surge and window failure. Damages are restricted to damage to furniture and property of the courts.

4. Effects on the Environment

4.1 Marine and Coastal Habitats

The Sibun River, Mullins River, North Stann Creek and the Belize River received large amounts of sediment loading as a result of the Hurricane. These rivers delivered the sediments to the sea resulting in the visible occurrence of large sediments plumes along the Belizean coasts. This is a common product of storm events. Surface runoff and sediment upturn caused by the advancing storm is known to disrupt coastal ecosystems and can also affect negatively fisheries catch. The increased sediment loads in our coastal zone can pose a threat to fragile coral and sea grass communities. The sea grass beds (very important feeding habitat) found between the barrier reef and the mainland also suffered severe damage as a result of the strong currents and high wave action associated to the hurricane.

Significant damages to coastal mangrove stands were observed in the impact zone. Mangrove ecosystems is critical to coastline protection and the fisheries sector as they are known to support various life stages of various finfish species, crustaceans and a wide diversity of other marine organisms sustained major damage.

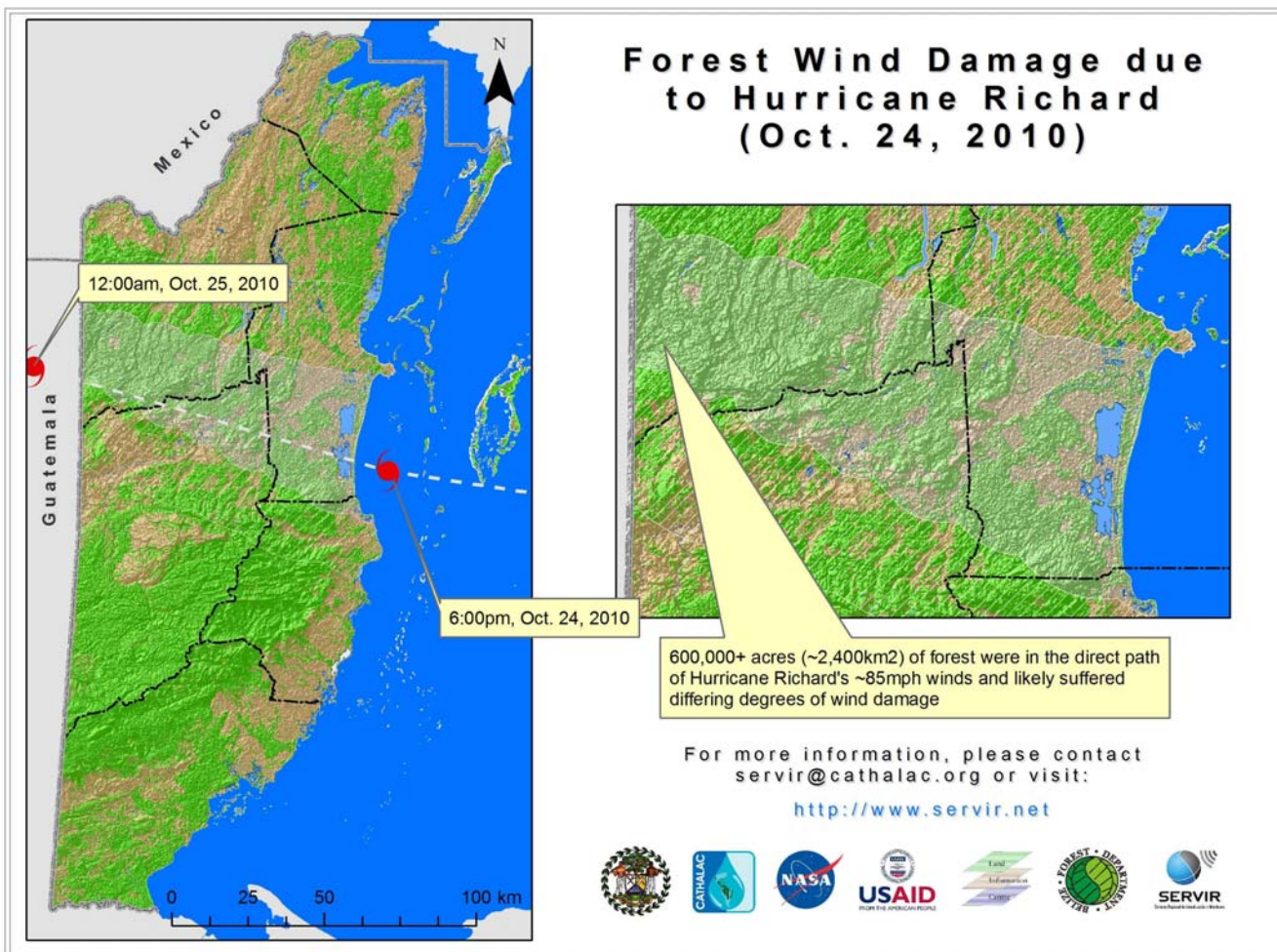
4.2 Forest and Natural vegetation



Some 600,000 acres of forests were impacted by Hurricane Richard. These forests were impacted to an average 85 miles per hour wind. An economic valuation of losses should be carried out by the Forest department.

Strong winds associated with Hurricane Richard caused significant damages to forest vegetation. The vegetation type most affected is the *Orbignya cohune* (Cohune Palm). Large stands of cohune trees blew over in the path of the storm.

Significant breakage of large trees was also visible. This was most acute in hilltop forests. Impacted forest stocks require active management by the forest Department to ensure effective rehabilitation of forest stands. The Illustration below prepared by CATHALAC shows the areas of suspected impacts based on the Track of the hurricane, with initial estimates of 600,000 + acres being impacted. A more detailed assessment using satellite imagery is being conducted.



IV. IDENTIFIED NEEDS AND POTENTIAL METHODS OF DELIVERY

The damages are dispersed over a wide geographic area lending itself to logistical difficulties, increased cost and time delays and inefficiencies should a centralized distribution approach be employed by responders, in view of these constraints it is recommended that as far as is practical supplies be purchased and distributed from local sources within each impact zone, to facilitate this NEMO has established a relief fund capable of accepting and tracking **cash donations in lieu of in kind donations**. The distribution structure of the national Red Cross also supports this mechanism.

Humanitarian Aide

- *Family packs*; food, water etc.
- *Hygiene Kits*
- *Non Food Items*; bedding, mattress, clothing, basic need household items (pots, pans), etc.
- *Access to physco-social support*.

Housing Infrastructure (homes/dwellings)

- *Home repair kits*; roofing, nails, hurricane straps, plywood, plycem, tarpaulins, screws, etc
- *Semi-permanent housing structures*
- *Cleaning kits*

Agriculture Sector

- *seed stock materials*
- *agricultural inputs*; particularly to support the re-establishment of subsistence farms.

Fisheries Sector (artisanal)

- *fishing vessels*
- *fishing camps*
- *fishing gears*

Education Sector

- *education packs*; school uniforms, basic school supplies (books, pencils, text books), etc.

Health Sector

- restocking of *dengue vector control re-agents*.

Annex 1: Housing Damage by Districts and Communities

District	Village/Settlement/Community	Total Population	Families / Households Impacted	Health/Social Concern	Houses Damaged	Houses Destroyed	Agriculture Damage	Description Of Damages	Major Needs
Belize	Belize City	66,800	268	Nutrition concerns for impacted population	182	26		level 1 and 2 roof and wall damage. Water damage to household items, some structures completely collapse	food and water, basic household items, basic school supplies, roofing and construction supplies
	La Democracia	84	22	4 persons with fever/4 children with cough	19	2	Home fruit trees damaged	Levels 1 and 2 Roof and wall damage; water damages to household items	Roofing and reconstruction materials
	Gales Point Manatee	247	30		14	16		Damage to roof and wall structures. Complete destruction of some residencies	Water, basic food and non food supplies, roofing and construction materials
	Double Head Cabbage	348	42		22	7	Damage to fruit tree an farm fencing, and livestock facilities	Damage to roof and wall structures. Complete destruction of some residencies; water damage to household items	Roofing and reconstruction materials
	Willow's Bank	156	5		3	2	Damage to fruit tree an farm fencing, and livestock facilities	partial roof loss, wall/ house collapse, damage to household items,	Roofing and reconstruction materials
	Rancho Dolores	171	5		5	0		Levels 1 and 2 roof damage	Roofing materials
	St. Paul's Bank	276	7		6	1		Roof and wall damage	Roofing and construction materials
	Hattieville	1,465	49		28	21		Roof and structural damage	Roofing and construction materials
	Gracie Rock	174	22		13	9		Roof, wall and structural damages	Roofing and construction materials
	Burmudian Landing	204	7		6	1	Fruit tree damage	damage to village council kitchen, preschool laterines and drinks bar at community center , primarily levels 1 and 2 damages to roofs, waer damage to household items	Roofing and reconstruction materials, non food relief supplies
Totals Belize		69,925	457	8 medical cases	298	85			

District	Village/ Settlement/ Community	Total Population	Families / Households Impacted	Health/ Social Concern	Houses Damaged	Houses Destroyed	Agriculture Damage	Description Of Damages	Major Needs
Cayo	Franks Eddy	199	21	0	12	6	Home fruit trees damaged and destroyed	Levels 1 and 2 Roof and wall damage; water damages to household items	Roofing and reconstruction materials
	More Tomorrow	170	15	3 children with fever and cough, 2 with flu	15	3	Loss of livestock (Cattle and chickens), loss of fruit trees and subsistence crops including corn, okra,	Primarily level 1 damage to roof	Food & water supplies, roofing materials, non food relief items
	St. Matthew	509	15		9	6		roof and wall damage, fallen trees result in damages to homes, St. Matthew's Government school reports level 1 roof damage	roofing and construction materials
	Belmopan	20,000	Maya Mopan: 30 San Martin:18 Cohune Walk: 4 New Site: 2 Central Site: 4 Industrial Site: 2 Salvapan: 8		42	26		roof and structure damage, water and wind damage to household items	food and non food relief supplies, roof and construction material, equipment for debris clearance
	SpringField		40	0	1	1	Major damages to seedlings and nurseries; 3 protected cropping structures destroyed; 5 acres of backyard crops damages (plantains, coconuts, noni, tamarind, pineapple, mangoes), 2 pig pens damaged	Level 1 damage to roof and stairs; 2 windmills destroyed, 1 windmill damaged to tail, 1 shed house destroyed;	Water, basic foods supplies, communication
	Armenia	2000	35	0	10	2	Loss of backyard crops (Citrus, banana, plantains, coconuts) Vegetable Crop Losses: 25,000 tomatoes, 15,000 sweet peppers, 30,000 heads of cabbage, 75,000 lettuce, 2 acres cassava, 4 acres zucchini, 1 acre cucumber, 1 acre green corn	Severe damage to agricultural produce in this farming community, homes suffered primarily level 1 roof damages.	Water, basic food and clothing items; materials/equipment for clearing debris, access to health care provider (none exists in the village); vegetable seeds and input for replanting/ restoration of livelihood
	Ring Tail	15	0	0	0	0	1 tatch storage she destroyed; 1,000 crates of grapefruit losted, 26 acres of orange affected, 5 acres of plantain losted, damaged to backyard fruit trees	Primary damages to agriculture crops	water and basic food supplies
	St. Margaret's/ Gilly Waight Farm & Green Hills Community		20	0	16	1	Losses to backyard crops,	Level 1 damage to Palacio's Resort, level 1 damage to community school and eating shed, loss of school's feeding programme building	Machinery/equipment for clean up and restoration, roofing and construction materials
	Esperanza	1,085	2	0	1	1	minor damage to backyard fruit trees and vegetables	Roof and ceiling damage, failure of 1 structure, water damage to household items	Food and non food supplies, roofing materials
	Cental Farm	187	1	0	0	1	damage to backyard fruit trees and vegetables	Complete loss of roof	roofing materials
	Georgeville	539	16	0	15	1		Roof and wall damage, water damage to household items	roofing and construction material
	Buena Vista	288	4	0	4	0		Roof damage, water damage to household items	roofing materials
	La Gracia	103	2	0	2	0		Roof damage to dwellings	roofing materials
	Selena	179	0	0	0	0	only minimal damages to agricultural crops reported		
	Duck Run 1, 2 & 3	721	8	0	5	3	Backyard fruit trees and vegetable	roof wall and structural damages; Roof damage to St. Joseph RC School, Roof damageto Fuente de Luz Church	roofing and construction material
	Spanish Lookout	1,786		0	4	1	Loss of 2 protected cropping units, loss of roof and walls of farm sheds, Damage to roof and rollup doors on 2 businesses, loss of chicken	Damage to roof of Health Clinic	Spanish Look out damage quantified by community leaders as being \$208,100.
	Santa Familia	853	8	0	8	0		Levels 1 and 2 Roof and damage, water damage to household items	non food supplies, roofing materials
	Bullett Tree	1,294	20	0	20	0		Levels 1 and 2 roof damage, damage to household items	non food relief items, roofing and construction materials
	Billy White Village	243	2	0	1	0	loss of water tank	roof damage	roofing materials
	Seven Miles Community		2	0	2	0		Level 1 roof damage	
San Marcus		1	0	1	0	damage to backyard fruit trees and vegetables	Roof damage to dwellings	roofing materials	
San Jose Succutz	1,812	2	2 reported cases of asthma	2	0	minor crop damage, damage to backyard fruit trees and banana			
Yalbac Community	53	1	0	1	0		Roof damage to dwelling and to Yalbac Primary School	roofing materials	
San Ignacio/ Santa Elena	19,900	1	0	1	1		Levels 1 and 2 roof and wall damages	roofing materials	
Totals Cayo		51,936	292	7 medical cases	180	53			

District	Village/Settlement/ Community	Total Population	Families / Households	Health/ Social	Houses Damaged	Houses Destroyed	Agriculture Damage	Description Of Damages	Major Needs
Stann Creek	Mullins River	198	16	0	9	7		Level 1 and 2 roof damages to homes	Roofing and construction materials
	Dangriga	12,000	114	0	83	31		Level 1 roof and wall damages, water damage to household items	Roofing and construction supplies
	Pomona	1,100	1	0	0	1		level 1 roof and wall damages, water damage to household items	Roofing and construction supplies
	Hope Creek	850	4	0	0	4		level 1 roof and wall damages, water damage to household items	Roofing and construction supplies
	Middle Sex	302	2	0	0	2		level 1 roof and wall damages, water damage to household items, water damage to household items	Roofing and construction supplies
	Humming Bird Community	323	4	0	0	4		level 1 roof and wall damages, water damage to household items	Roofing and construction supplies
Totals Stann Creek		14773	141	0	92	49			

Annex 2 : Preliminary Damages to School

Preliminary Assessment of Damages to Schools as a result of Hurricane Richard					
No	Schools	Location	District	Damages Sustained	Replacemnt Cost
1	Buttonwood Bay Nazarene	Coney Drive, Buttonwood Bay	Belize City	Water damages to celotex	\$5,000.00
2	Queen Street Baptist	1 Corner Eve Street & Queen Street	Belize City	Water damages to sheet rack ceiling, six computers, six printers batten windows, charts, school supplies and kitchen commodities	\$25,000.00
3	St. Joseph R.C.	3 Simon Lamb Street	Belize City	Bathroom roof system and plumbing waste line.	\$2,000.00
4	Muslim Community Primary	Corner C. A. Blvd & Fabers Road	Belize City	Aluminum windows needs to be replaced,	\$1,500.00
5	Wesley College	Yarborough Road	Belize City	Replacement of pump house with equipment support to one classroom building missing, general landscaping	\$10,000.00
6	Wesley Lower primary School	38 Albert Street	Belize City	General landscaping	\$1,500.00
7	Anglican Cathedral College	Albert Street	Belize City	General Landscaping	\$1,500.00
8	Queen Square Anglican	Dolphin Street	Belize City	General landscaping	\$1,500.00
9	National Youth Cadet Corp	Mile 21 Western High way	Belize District	Lost of roof structure to four buildings, loss of structural stability to two storey timber buildings.	\$75,000.00
10	Hattieville Government Primary School	Mile 17 Western Highway	Hattie Ville Village Belize District	Roof System experienced water penetration	\$8,000.00
Nr	Schools	Location	District	Damages Sustained	Replacemnt Cost
11	Pilgrim Fellowship Mennonite primary School	Mile 16 Western Highway Hattieville Village	Belize District	Feding program Shed loss roofing, main school building loss two timber windows	\$1,500.00
12	Gwen Lizarraga High School	Racoon Street	Belize City	Loss of ten sheets of zinc, metal fascia, two external doors to be replaced, replacemnt of ceiling , metal members for soffit installation.	\$20,000.00
13	St Marys Anglican Primary School	Angel Lane Lane	Belize City	Fascia board and ceiling damages	\$3,000.00
14	Gales Point Government Primary School	Gales Point Village	Belize District	Feeding Program Shed roof system was displaced	\$3,000.00
Nr	Schools	Location	District	Damages Sustained	Replacemnt Cost
15	St.Jude RC Primary School	Camalotte Village	Cayo District	Damage to one 600 gallons rotoplast water tank and replacement of four sheets of zinc	\$1,500.00
16	Cotton Tree RC Primary School	Cotton Tree Village	Cayo District	Replacement of 8 sheets of zinc	\$1,000.00
	St.Mathews Government Primary School	St.Mathews Village	Cayo District	Replacement of 4 sheets of zinc	\$500.00
	St.Michaels RC Primary School	Los Flores / Belmopan City	Cayo District	Replacemnt of doors and windows	\$3,500.00
17	Our Lady of Guadelupe RC Primary School	Ring Road/Belmopan City	Cayo District	Damages to roof system of shed	\$8,000.00
Nr	Schools	Location	District	Damages Sustained	Replacemnt Cost
18	St.Margaret RC Primary School	Humming Bird Highway	St. Margaret Village	Structural damage to one classroom timber building 20'-0" x30'-0", replacement of 14 sheets of zinc.	\$37,000.00
19	Our Lady of Fatima RC Primary	San Ignacio Town	Cayo District	Replacement of 8 sheets of zinc	\$1,000.00
Nr	Schools	Location	District	Damages Sustained	Replacemnt Cost
20	Delille Academy	Dangriga Town	Stann Creek District	Windows were displaced from main school building	\$2,500.00
21	Christ the King Anglican Primary School	Dangriga Town	Stann Creek District	Damage to roof system and timber floor	\$8,000.00
22	Kids First Primary School	Dangriga Town	Stann Creek District	Roof damage	\$2,000.00
Approximate Cost of Damages to Physical Infrastructure:					\$222,000.00
Approximate Cost of Text Books Damages inclusive of those from Government Book Store:					\$185,000.00
Grand Total:					\$407,000.00

Annex 3: Agriculture Losses by District

Orange Walk					
Crop	Location	Growth Stage	Acres	Economic Loss BZ\$	Remarks
Papaya	Indian Creek	Productive	85	4,462,500.00	3500 boxes/acre
Papaya	Indian Creek	Vegetative	45	540,000.00	12,000/acre
Papaya	Indian Creek	Vegetative	30	180,000.00	6,000/acre partial damage
Assorted Vegetables	San Carlos	Vegetative	6	18,000.00	3,000/acre
Coffee	Gallon Jug	Productive	100	384,000.00	\$16/lb, 600lbs per acre
Sub Total				\$5,584,500	
CAYO					
Crop	Acres	Stage	Estimated Loss BZ\$		
Plantain	120	Bearing	621,000		
Tomatoes	8	Bearing	384,000		
Sweet pepper	6	Bearing	192,000		
Corn (Milpa)	50	Harvesting	24,850		
Watermelon	14	Harvesting	112,000		
Lettuce	2	Harvesting	32,550		
Cabbage	6	To be harvested	240,000		
Cucumber	3	Harvesting	25,000		
Okra	3	Harvesting	21,780		
Cilantro	1.5	Harvesting			
Cassava	1	Harvesting	580		
Hot Pepper	6	Young	42,000		
Sub Total				\$1,686,760	
Stann Creek					
Crop	Stage	# Acres	Unit Value	Total Value	
Plantain	Mature	38	\$4,280.00	\$162,640.00	
Cassava	Tuber form	41	\$580.00	\$23,780.00	
Cocoyam	8 mths	18	\$580.00	\$10,440.00	
Coconut	Bearing	23	\$5,300.00	\$121,900.00	
Assorted Fruit Trees (Cashew, mallow apple, guava, avocado, soursop)	Bearing trees	12	\$5,600.00	\$67,200.00	
Pineapple	7 mths old	7	\$5,450.00	\$38,150.00	
Barbed Wire		75 rolls	\$125.00	\$9,375.00	
Fence Post		650	\$7.00	\$4,550.00	
Ginger	6 mths old	5	\$3,800.00	\$19,000.00	
Sub Total				\$457,035	
Belize					
Crops	Acreages Damaged	Stage of Production	Variety	Expected Income	Remarks
Sweet Pepper	3.5	Harvesting	Lido	\$144,900.00	Wind Damage/flood
Tomatoes	1.5	flowering	improved	\$93,300.00	Wind Damage/flood
cabbage	2	Head formation	Rotonda	\$10,400.00	Wind damage/flood
Lettuce	1.25	Head formation	improved	\$19,375.00	Wind Damage/flood
Cassava	3	Tuber formation	Local	\$1,740.00	Wind Damage
Onions	4	young plants	Yellow granex	\$3,368.00	flood
pasture	30	grazing	improved	\$14,910.00	flood
Corn yellow	22	flowering	improved	\$10,934.00	Wind Damage/flood
Rice	8.5	Mature	Local	\$7,046.50	Wind Damage/flood
Rice	30	growing	improved	\$3,120.00	Wind Damage/flood
Yams	3	Tuber formation	local	\$1,740.00	Wind Damage/flood
Hot pepper	8	mature		\$57,960.00	Wind Damage/flood
Hot pepper	6	seedling stage		\$8,610.00	Wind Damage/flood
Plantain	45	bearing	Local	\$359,640.00	Wind Damage/flood
citrus	155	bearing		\$496,000.00	fallen fruits only
Back yard Fruit trees	6	bearing		\$48,000.00	coconuts, breadfruit, lime, citrus, soursop
Guava plants	2	bearing		\$11,600.00	Wind Damage
Sugar cane	2	bearing	local	\$1,658.00	Wind Damage
Sub Total				\$1,294,301.50	
TOTAL				\$9,022,596.50	