
CAYMAN ISLANDS

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





UNITED NATIONS



Economic Commission for Latin America and the Caribbean
Subregional Headquarters for the Caribbean

Distr. LIMITED
LC/CAR/L.193
2 April 2009
ORIGINAL: ENGLISH

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PREFACE

Hurricane Paloma struck Cayman Brac and Little Cayman severely. Its consequences have reverberated throughout the Cayman Islands and have placed a strain on the economy and fiscal pressures on government.

Although the humanitarian crisis posed by Hurricane Paloma may seem weak when compared to the impact of Ivan four years ago on Grand Cayman, the consequences nevertheless present the need, beyond the humanitarian response, for a rapid assessment of the damage (impact on assets) and losses (effects on economic and social flows) to determine its macroeconomic, social and environmental consequences and its implications for the country's fiscal stance.

At the request of the Government of the Cayman Islands, and with the support of the United Nations Development Programme (UNDP), such an assessment was undertaken by an Economic Commission for Latin America and the Caribbean (ECLAC)-led mission in accordance with its well-established and accepted disaster evaluation methodology. (ECLAC, 2004, www.eclac.cl/mexico.)¹

This assessment will complement and expand on the emergency and humanitarian needs identified previously by the government and particularly by the Department of Planning and the Department of Children and Family Services.

The result of such an assessment provides a quantitative approximation to the overall damage and reconstruction costs of the event and looks into the effect on the country's macroeconomic performance as compared to the pre-hurricane targets. The final section of the report outlines some strategic considerations and priorities for projects and actions. These may require additional resources.

Baseline data for the conduct of the Macro Socio Economic Assessment are drawn from official government data sets including: the Population and Housing Census 1999, the National Assessment of Living Conditions 2006/2007, the Labour Force Survey 2007, and other relevant data sets from the Office of Economics and Statistics.

Mission components

ECLAC prepared, with a team of experts and consultants, a multi-sector, integrated damage and loss report. This report was made possible by the cooperation, coordination and support provided by the relevant government authorities.

In the process appropriate dialogue and coordination was made with the relevant national institutions. These are, namely, The Office of Economics and Statistics; The Monetary

¹ This methodology has been applied since the mid-1990s in the Caribbean to assess the impact of earthquakes, hurricanes and tropical storms in Belize, Dominica, Grenada, Guyana, Haiti, Jamaica, Saint Lucia, St Kitts and Nevis, Suriname and the Turks and Caicos Islands. The ECLAC DALA methodology has been used for over 30 years to assess such large-scale disasters as Hurricane Mitch in Central America, major earthquakes in Central America and Mexico, and the El Nino effect in the Andean region. More recently it has also come into use in Asia following the Tsunami of 2004.

Authority; the Budget and Management Unit; The Department of Tourism; The Department of Environment, The Port Authority, the Public Transport Board, Planning, Communications, Works & Information Technology; Education, Human Resources and Culture, Health Services, Culture and Community Services, District Commissioner.

The mission was undertaken from the 16-23 January 2009 and comprised the following ECLAC staff and consultants:

- Asha Kambon, Coordinator and Social Sector Specialist – the affected population and the social subsectors of housing, health and education.
- Michael Hendrickson, Macroeconomist, undertook the economic impact and the consequences on public finance.
- Dr. David Smith, Coastal Engineer and Infrastructure Sector Specialist, examined the impact to roads, telecommunications, ports and public utilities; and
- Hopeton Peterson, Sustainable Development Specialist, who looked into the productive sectors with particular emphasis for the tourism sector, commerce and the related environment impact.

The national counterpart team was coordinated by the Hazard Management Authority of the Cayman Islands, under its Director, Dr. Barbara Carby.

The mission team expresses its gratitude and recognizes that the assessment would not have been possible without the support from this group led by Dr. Barbara Carby, and the task force pulled for this exercise. Special mention must be made of the support provided by the permanent secretaries, deputy permanent secretaries, directors of governmental departments, particularly the Director of Planning, the Director of the Department of Children and Family Services, and the private sector institutions and civil society who gave of their time to meet with members of the team in order to verify and clarify data and provide new information.

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Executive summary

On the morning of 8 November 2008, the center of Hurricane Paloma passed directly over the two islands, Little Cayman and Cayman Brac, with maximum sustained winds of 145 mph, resulting in severe damage to the infrastructure. Hurricane Paloma produced 17.77 inches of rain on Cayman Brac, with 6.05 inches reported on Grand Cayman. A storm surge of 4 to 8 feet is estimated to have occurred on Cayman Brac, with 2 to 4 feet estimated on Little Cayman.

The data suggest that 2,483 persons or 4.6% of the Cayman Islands population was affected by Hurricane Paloma. In light of the trajectory of the Hurricane and the distribution of the population in the Cayman Islands, it was not surprising that the proportion of the population affected by Hurricane Paloma was small. Of those affected, 179 or 7.8% were severely affected. Less than 1% of the population of Grand Cayman was affected while the population of Cayman Brac was the hardest hit, with 2,458 persons or 97% of its population affected. No lives were lost as a direct result of Hurricane Paloma.

The total impact of Hurricane Paloma on the Cayman Islands amounted to \$154.4 million, the equivalent of 7.4% of GDP. Of the total, damage at \$124.5 million represented almost 80% of the total impact, suggesting that the hurricane was largely a stock event, which should limit the fall-out in GDP. Although in aggregate the total impact was much smaller than the \$2861.1 million (183% of GDP) for the impact of Hurricane Ivan in 2004, this reflects the large relative size of the separate economy of Grand Cayman in the total GDP of the Cayman Islands. Therefore, given that the two smaller islands, Cayman Brac and Little Cayman, bore the brunt of the disaster, the impact on these two more vulnerable islands was quite severe. Moreover, the impact of a disaster should not be measured solely by the monetary impact. Therefore, given the disruption to the lives of vulnerable communities and the severe impact on the environment, even if not fully quantifiable, the real effects of the disaster were much more than the monetary impact.

Using the two affected islands, Cayman Brac and Little Cayman, the per capita impact at \$57,295 was quite significant, highlighting the heavy burden of reconstruction and rehabilitation for affected citizens in these two islands. Indeed, if Cayman Brac alone is used, the per capita impact pushes up to almost \$61,000 somewhat similar to the \$75,000 for Hurricane Ivan. Furthermore, if the GDP of Cayman Brac and Little Cayman were used instead of the total GDP of the Cayman Islands, the total impact as a percentage of GDP, might have been similar to that of Ivan. The total impact was more than one third of exports of goods and services and over 73% of government debt.

The Cayman Islands' population by all standards enjoys a good quality of life. The poverty head count index was estimated to be 1.9% with the additional 1.8% identified as having fallen below the vulnerability line of CI\$4,979 per year. When the population was distributed by district and socio-economic status, the results indicated that Cayman Brac and Little Cayman possessed the highest proportion of the poor 7.0% and vulnerable 4.0%. Data from the National Assessment of Living Conditions 2006/2007 suggests that although women comprise a smaller proportion of the population (49.9%) than men, they are over represented among the poor and

vulnerable, accounting for 53.8% of the poor and 51.5% of the vulnerable and therefore were expected to be among those who felt the brunt of the impact of the Hurricane.

Women in the Cayman Islands also comprise 35.5% of all heads of households, suggesting that women share a considerable burden of the psychological stressors of disasters as heads of households. One such effect of the psychological stress is the fear of increased vulnerability to violence in the public and private sphere. Following a natural disaster these fears are increased.

In the productive sector, comprising tourism, commerce and agriculture, total damage and losses were estimated at approximately CI\$20.43 million. Damage to all three sectors accounted for approximately 61.0% of the overall total. However, the tourism sector accounted for the largest overall share (65.9%) or CI\$13.4 million of the total value of impact on the productive sector, with the commercial sector accounting for another 33% or CI\$6.8 million. Agriculture accounted for 1%. In the tourism subsector, due to the extent of the damage experienced in Cayman Brac, the entire room stock – hotels, condominiums, guest houses and villas had to be withdrawn from operations. In fact, as at 15 January 2009 there was still no tourist accommodation available in Cayman Brac. It is projected that a majority of the hotels in this resort island will resume operations in April 2009.

Hurricane Paloma had a total impact on the infrastructure sector which amounted to CI\$19.0 million. Damage at the time of the event accounted for CI\$10 million or 53% of the effect, with losses accounting for the remaining CI\$8.9 million. Government buildings accounted for the largest proportion or 45.3% of the overall effect within the sector, with telecommunications accounting for another 20.5% and electricity 16.5%, suggesting that these three, together, were the most significant subsectors of the infrastructure sector affected by Hurricane Paloma. Roads accounting for 1% and water supply, 0.3%, were the least of the subsectors affected.

In regards to the social sector, the report suggests that the total effect on the social sector caused by Hurricane Paloma amounted to CI\$108.3 million of which 94% was accounted for in damage and the remainder 6% in losses. Within the social sector, 94.6% of the impact could be attributed to damage and loss in the housing sector. The health subsector suffered minimal effect, less than 1% (0.8%), and the remaining 4.6% is attributed to the effect on the education subsector.

The proportion of houses damaged or destroyed by Hurricane Paloma falls way below what had occurred in 2004 following Hurricane Ivan, in which 83% of the total housing stock or 13,535 units were affected. Hurricane Ivan had devastated Grand Cayman leaving Cayman Brac and Little Cayman virtually unscathed. The reverse has occurred with Hurricane Paloma. On this occasion Cayman Brac and Little Cayman were severely hit, with some 90% of Cayman Brac's housing suffering some degree of damage with 7% being destroyed and the remainder 3% being unscathed. The impact on Little Cayman was a full 100% of houses being affected but none suffering major damage. It is interesting to note that following Hurricane Ivan 4% of the housing stock was completely destroyed whereas in the case of Paloma about 7% was destroyed.

In regard to the environment the report notes that one of the most noticeable impacts of Hurricane Paloma was the destruction of vegetation in Cayman Brac and to a lesser extent in Little Cayman. Fortunately, there was no significant damage from storm surges as was experienced during Hurricane Ivan in 2004. The hurricane significantly affected the environment through the generation of vast amounts of solid waste. In addition, coastal ecosystems also received some minor impacts.

The report points to some short-term recommendations for achieving disaster risk reduction. Among them were recommendations to:

- (a) Improve data collection and management in the post-disaster scenario;
- (b) Assist in the prioritization of action required for the short-term preparation and improvement of conditions before the next tourism season begins - in that process set standards that encourage rebuilding with mitigation including maintenance schedules;
- (c) Provide greater support for counseling to assist young people and members of other vulnerable groups in coping with the psycho social stresses following the effects of Hurricane Paloma; and
- (d) Monitor the waste disposal site to reduce negative impacts from the ill effects of the wastes disposed as a result of Hurricane Paloma.

Strategic mitigation approaches to advance sustainable livelihoods and development were also recommended. Key among these were:

- (a) Strengthen the mechanisms for inclusion of sister islands in Planning and management of risk reduction processes;
- (b) Consider contributing to insurance in the private market for most vulnerable and low income home owners so as to reduce the fiscal burden by spreading the risk in the private sector;
- (c) Design financial mechanisms to encourage reconstruction with mitigation of homes; and
- (d) Uniform application and enforcement of an approved building code in the design of structures should be encouraged. For private homeowners, it may be appropriate to promote types of hurricane resistant construction that can be adopted relatively easily (i.e. use of hurricane straps, pitch of roof line, etc.)

BACKGROUND

A. Description of the event

Hurricane Paloma was the 17th tropical cyclone, and the eighth and final hurricane of the 2008 Atlantic hurricane season. Reaching Category 4 hurricane status on 8 November 2008, with maximum sustained wind speeds of 145 mph, it tied with Hurricane Ike as the second most intense hurricane of the season. Both of these systems were ranked behind Hurricane Gustav. The following table summarizes the tropical cyclone activity for the 2008 hurricane season.

Table 1: Summary of tropical cyclones for 2008 Hurricane season

Name	Dates	Maximum wind (mph)
TS ARTHUR	31 May - 1 June	45
MH BERTHA	3 - 20 July	125
TS CRISTOBAL	19 - 23 July	65
H DOLLY	20 - 25 July	100
TS EDOUARD	3 - 6 August	65
TS FAY	15 - 26 August	65
MH GUSTAV	25 August - 2 September	150
H HANNA	28 August - 7 September	80
MH IKE	1 - 14 September	145
TS JOSEPHINE	2 - 6 September	65
H KYLE	25 - 29 September	80
TS LAURA	29 September - 1 October	60
TS MARCO	6 - 7 October	65
TS NANA	12 - 14 October	40
MH OMAR	13 - 18 October	125
TD 16	14 - 15 October	30
MH PALOMA	5 - 10 November	145

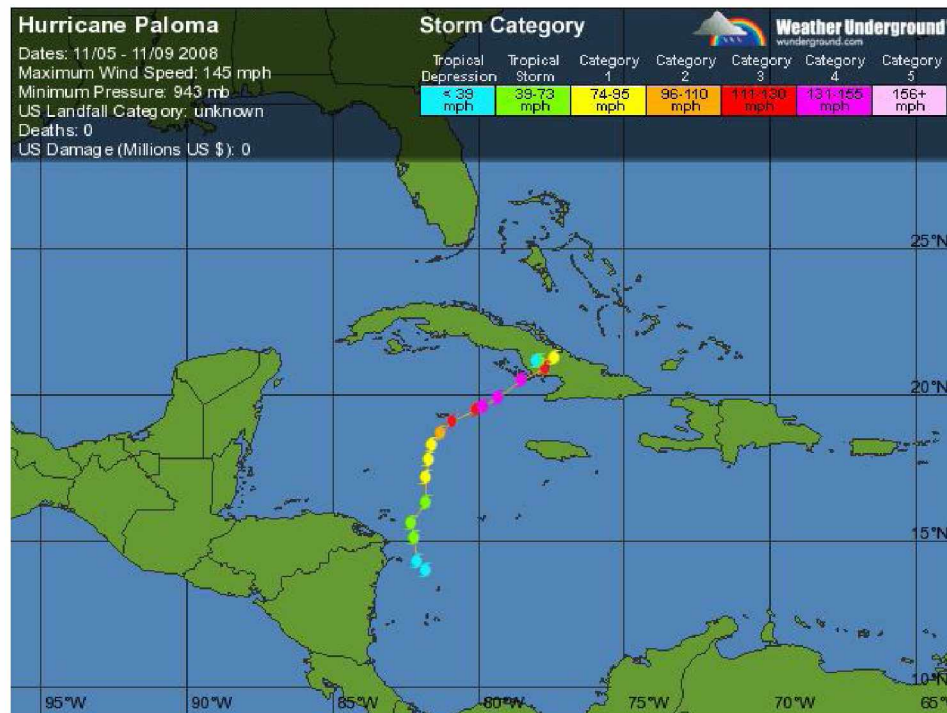
Notes: TD – Tropical Depression; TS – Tropical Storm; H – Hurricane; MH – Major Hurricane
Source: National Hurricane Centre

Along its entire path, Hurricane Paloma affected the Cayman Islands and Cuba; with very little impact on Grand Cayman, but severe impacts on the sister islands of Cayman Brac and Little Cayman. It was the third and final major hurricane to hit Cuba in 2008, a year in which it was the first time that three major hurricanes struck Cuba in one season. No direct casualties or fatalities were reported in association with Hurricane Paloma in the Cayman Islands. It is estimated that the hurricane was responsible for US\$609 million in damages in the Caymans and US\$1.4 billion in Cuba, for a total of US\$2.09 billion.

The path of Hurricane Paloma is shown on the following page. The hurricane developed from a tropical disturbance that originated off the eastern coast of Nicaragua. This type of genesis and path is typical of the late-season storms that affect the Caribbean region. On 5 November 2008, the disturbance developed into a tropical depression. In the early hours of 6 November 2008, approximately 200 miles southwest of Grand Cayman, the depression strengthened into Tropical Storm Paloma. Paloma tracked northward and strengthened into a Category 1 hurricane by the evening of 6 November. The hurricane strengthened gradually on 7

November, and Paloma became a Category 2 hurricane that afternoon. In the late hours of 7 November, Paloma continued to strengthen, at a more rapid pace, and reached a Category 3 hurricane that evening while passing approximately 80km south east of Grand Cayman. Hurricane Paloma caused only minor damages on the island of Grand Cayman.

Map 1: Hurricane track for tropical cyclone Paloma



Source: www.wunderground.com

After strengthening to a Category 3 hurricane, Paloma took a north-easterly turn and directed itself towards Little Cayman and Cayman Brac. Early on 8 November 2008, Paloma strengthened into a Category 4 hurricane. On the morning of 8 November, the center of Paloma passed directly over the two islands, Little Cayman and Cayman Brac, with maximum sustained winds of 145 mph, resulting in severe damage to the infrastructure there. After passing over Little Cayman and Cayman Brac, Paloma weakened to a 125 mph Category 3 hurricane. It made landfall near Santa Cruz del Sur, Cuba, in the evening hours of 8 November. After making landfall, Paloma continued northeastward for a short time, then slowed and turned toward the northwest. The cyclone weakened rapidly over Cuba and substantially slowed its movement. Paloma became a tropical storm at around 6:00 am on 9 November 2008 and further weakened into a tropical depression by 18:00 hours. In total the storm lasted five days; with the tropical depression forming on 5 November and dissipating on 9 November 2008. A timeline of the hurricane history and advisories, as they relate to the Cayman Islands is shown in table 2, and a satellite image of Paloma near the time of the cyclone's peak intensity is shown in map 2.

Hurricane Paloma produced 17.77 inches of rain on Cayman Brac, with 6.05 inches reported on Grand Cayman. In Cuba, Paloma produced rainfall totals of 5 to 10 inches across portions of Camagüey, and 2 to 3 inches in Las Tunas. A storm surge of 4 to 8 feet is estimated

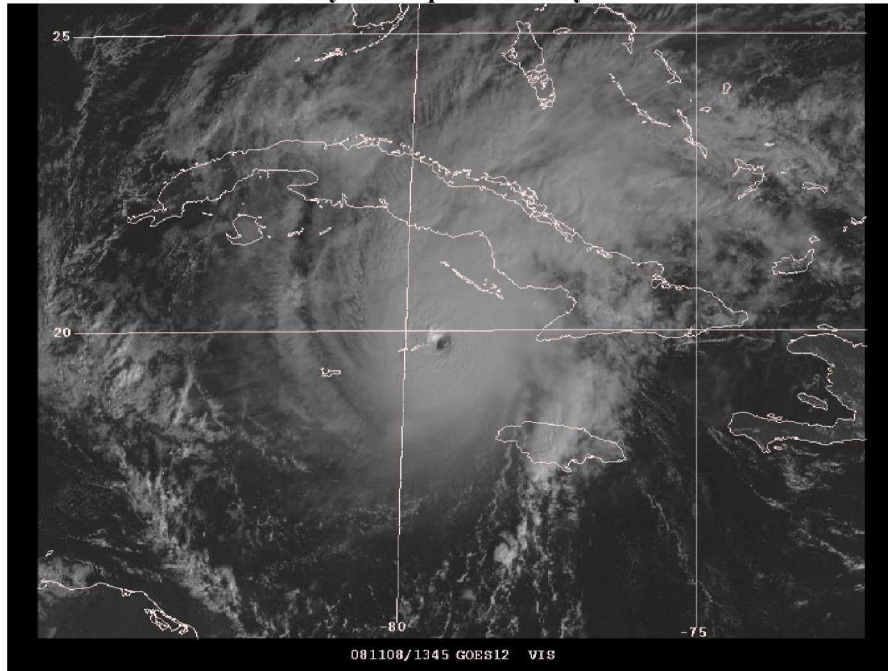
to have occurred on Cayman Brac, with 2 to 4 feet estimated on Little Cayman. No storm surge height estimates were received from Cuba, however the Cuban Meteorological Service reported that storm surge penetrated inland 0.8 n mi in Santa Cruz del Sur and 0.4 n mi in Guayabal.

Table 2: Timeline of Hurricane Paloma history and advisories as they relate to the Cayman Islands

Nov 5, 2008	16:00	Tropical Depression Seventeen formed
	18:00	
	21:00	
Nov 6, 2008	0:00	
	3:00	Tropical Depression Seventeen upgraded to Tropical Storm Paloma
	6:00	
	9:00	Hurricane Watch issued for Grand Cayman, Little Cayman and Cayman Brac
	12:00	
	15:00	Hurricane Warning issued for Grand Cayman, Little Cayman and Cayman Brac
	18:00	Hurricane Paloma up-graded to Cat 1 Storm
Nov 7, 2008	21:00	
	0:00	
	3:00	
	6:00	
	9:00	
	12:00	
	15:00	Hurricane Paloma up-graded to Cat 2 Storm
18:00	Hurricane Paloma up-graded to Cat 3 Storm	
Nov 8, 2008	21:00	
	0:00	
	3:00	Hurricane Paloma up-graded to Cat 4 Storm Cat 4 Hurricane Paloma hits Little Cayman and Cayman Brac
	6:00	Cat 4 Hurricane Paloma hits Little Cayman and Cayman Brac
	9:00	
	12:00	
	15:00	
18:00	Hurricane Paloma down-graded to Cat 3 Storm	
21:00	Hurricane Warning removed for Grand Cayman	
Nov 9, 2008	0:00	Hurricane Warning removed for Little Cayman and Cayman Brac
	3:00	
	6:00	
	9:00	
	12:00	
	15:00	
	18:00	
21:00		
0:00		

Source: National Hurricane Centre Tropical Cyclone Report.

Map 2: GOES-12 visible satellite image of Paloma at 1345 UTC 8 November 2008, near the time of the cyclone's peak intensity



Source: NHC Tropical Cyclone Report.

1. Emergency actions

Three factors affected the timeliness and effectiveness of the warning system in the Cayman Islands in response to Paloma: the late season nature of the hurricane, its rapid development to category 4 status and uncertainty about the course it would take. The national emergency management team informed citizens in Cayman Brac and Little Cayman to leave work early and complete their preparations, once policy-makers became aware that the sister islands were under threat.

The Red Cross activated the Community Disaster Response Teams (CDRTs) in each district. The emergency volunteers were also put on alert in the Brac and first aid personnel were sent to the national shelters to support the shelter management team.

In terms of relief and assistance in the wake of the hurricane, the sister islands were well supported by Grand Cayman. This, despite the considerable difficulties encountered in moving personnel and equipment by air and by sea, was as a result of inadequate capacity in the area of air transport and interruption in delivery due to difficult sea conditions. The government provided food and household items for persons affected, particularly those in shelters. In addition, tarpaulins, roofing materials and a number of generators were distributed based on need. The Red Cross provided relief supplies to Cayman Brac in the amount of CI\$60,000. The shipment included 680 tarpaulins, hygiene kits and cleaning materials. In addition, 500 tarpaulins were also sent to the Brac by air. The Red Cross also dispatched first aid personnel and volunteers to help in the distribution and management of the relief operation in Cayman Brac.

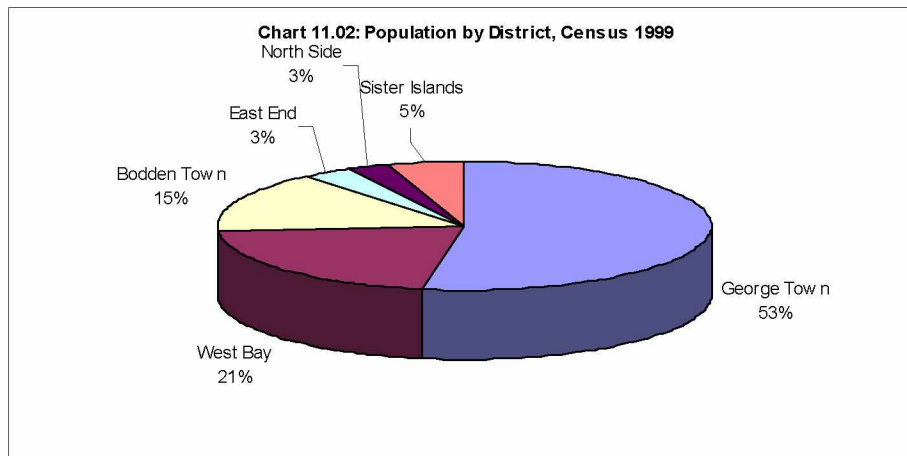
Fosters Supermarket provided about \$18000 worth of food items for the relief effort. Meanwhile, church groups, including the Adventists and First Baptist Church provided tarpaulins and household items to aid in the relief effort.

I. AFFECTED POPULATION

Hurricane Paloma struck the entire Cayman Islands on 8 November 2008. Grand Cayman felt the slight brush of Paloma, which actually pummeled Cayman Brac and Little Cayman with winds and rainfall, and made life difficult in its aftermath. No loss of life however occurred. One person suffered injury sufficient to cause hospitalization.

The population of the Cayman Islands, based on the latest Labour Force Survey (LFS), comprises 53,886 persons, approximately 40%, or 21,519, of whom are non Caymanian, as detailed in table 3. According to the last census data, 5% of the population resided in the sister islands of Cayman Brac and Little Cayman, as illustrated in figure 1, with the balance of the population spread through the remaining five Districts of Grand Cayman.

Figure 1: Cayman Islands: Population by District, Census 1999



Source: Cayman Island Population Census 1999, ESO

The average household size in the Cayman is not large, with approximately 2.5 persons. Women comprise 27,155 persons or 50.3 % of the population, and 35.5% of households are headed by women.

Table 3: Selected Characteristics of the Cayman Islands (2007)

Characteristics		Caymanian	Non-Caymanian	% non-Caymanian
Total Population	53,886	32,367	21,519	40%
Males	26,773	15,585	11,188	42%
Females	27,115	16,781	10,331	38%
Average Household size	2.54			
Number of Households	21,215			
Proportion of FHH	35.5%			

Source: LFS Survey 2007; estimated number of households based on average HH size

The Cayman Islands' population by all standards enjoys a good quality of life. The poverty headcount index was estimated to be 1.9% with the additional 1.8% identified as having fallen below the vulnerability line of CI\$4,979 per year (see table 4). It is important to note that the Poverty Headcount Index for the Cayman Islands is significantly lower than that of other Caribbean countries, such as St. Kitts and Nevis which has a similar population and land area but has a poverty headcount index of 30.5% and 32.0%, respectively. When the population was distributed by district and socio-economic status, the results indicated that Cayman Brac and Little Cayman possessed the highest proportion of the poor 7.0% and vulnerable 4.0%.

In 2007, the Gini coefficient, as reported in the National Assessment of Living Conditions, was 0.40 pointing to a fairly high level of income inequality. When disasters strike it is the poor and most vulnerable who tend to be the worst affected as they are without access to adequate resources, which in turn increases their susceptibility and reduces their ability to rebound as quickly as their more fortunate counterparts in the society.

Table 4: Cayman Islands: Distribution of Population by District and Socio-Economic Status

District	% Poor	% Vulnerable	%Non Poor/ Non Vulnerable
George Town	2.2	2.4	95.4
West bay	1.7	1.1	97.2
Bodden Town	0.0	0.0	100.0
North Side	0.0	2.5	97.5
East End	1.2	1.2	97.6
Cayman Brac/Little Cayman	7.0	4.0	89.0
Total	1.9	1.8	96.3

Source: Cayman Islands Assessment of Living Conditions (2006/2007)

Table 5 details the severely affected and affected by District. The data suggests that 2,483 persons or 4.6 % of the Cayman Islands population was affected by Hurricane Paloma. In light of the trajectory of the Hurricane and the above data, it was not surprising that the proportion of the population affected in the Cayman Islands by Hurricane Paloma was small. Of those 2,483 affected, 179 or 7.2% were severely affected. Less than 1% of the population of Grand Cayman was affected while the population of Cayman Brac was the hardest hit, with 2,458 persons or 97% of its population affected. There were no reports of persons in Little Cayman being severely affected, although many families spent the night of the storm in the shelter provided.

It is important to note that although Hurricane Paloma hit both Cayman Brac and Little Cayman it was Cayman Brac with its high proportion of poor and vulnerable whose population was the most negatively affected.

Table 5: Cayman Islands: Affected Population

District	1999		Estimated Pop at time of disaster ¹	Number of people severely affected ²	Number of people affected ³	Total Number of People Affected	% of the pop affected
	Number	Percent					
George Town	20,626	52.9%	28506				
West Bay	8,243	21.1%	11370				
Bodden Town	5,764	14.8%	7975		25	25	0.31%
East End	1,371	3.5%	1886				
North Side	1,079	2.8%	1509				
Cayman Brac	1,822	4.7%	2533	179	2279	2458	97.1%
Little Cayman	115	0.3%	162	...			
Total	39,020	100.1%	53940	179	2304	2483	4.6%

- Notes:
1. Estimated population based on the proportion of population residing in each District at the time of the 1999 Population Census.
 2. Severely affected population are those persons who are left after the disaster without shelter or livelihood.
 3. Affected population are defined as those persons who may have suffered injury, who lived in households that were damaged or whose livelihoods were disrupted.

Source: ECLAC based on official government data.

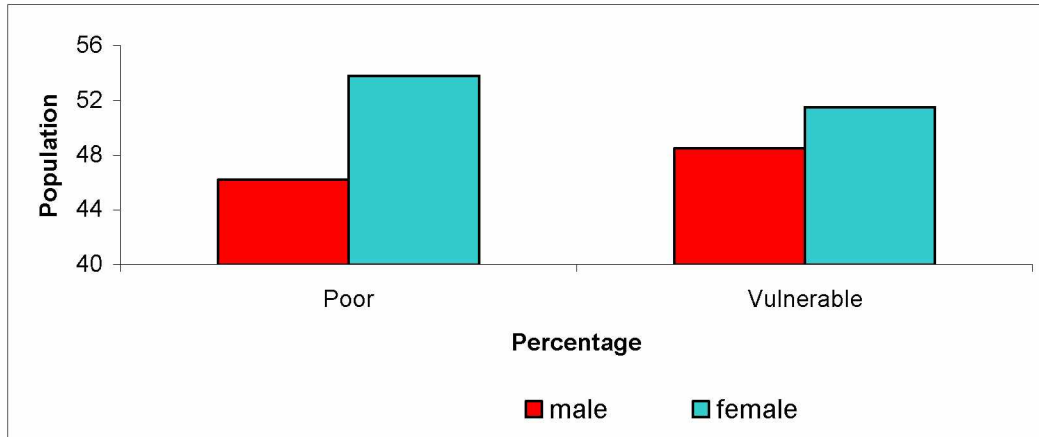
A. Key social dimensions of disasters

1. Vulnerability of women and children

The literature suggests that there are differences in the way that women and girls and men and boys are affected by events such as natural disasters. One factor which influences the outcomes is the different status held by these groups in the society before the disaster. These differences may in turn influence susceptibility to the impacts of the events and capacities and opportunities for recovery.

Although poverty is not the only dimension of vulnerability it is often one of the easier dimensions to measure. In the Cayman Islands, data from the National Assessment of Living Conditions 2006/2007 suggests that although women comprise a smaller proportion of the population (49.9%) than men, they are over represented among the poor and vulnerable as illustrated by figure 2, accounting for 53.8% of the poor and 51.5 % of the vulnerable.

Figure 2: Cayman Islands - Distribution of poor and vulnerable population by sex



Source: ECLAC based on official data.

The data also suggested that the living conditions of women in the lowest quintile were likely to be worse than that of their male counterparts. The report suggested that one of the common characteristics of poverty is the psychological stress which it places on family life. As was reported earlier women in the Cayman Islands head 35.5% of the households suggesting that women share a considerable burden of the psychological stressors of disasters as heads of households. One such effect of the psychological stress is the fear of increased vulnerability to violence in the public and private sphere. Following a natural disaster these fears are increased.

Box 1: Gender issues relevant to women and their families

- (a) Female headed households (FHH) comprise 35.5% of heads of households in Cayman. FHH 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 needs with fewer resources;
- (b) Women also suffer from greater time poverty – their productive and reproductive roles leave them with little time for personal development and participation in governance and decision making around issues of recovery and reconstruction; and
- (c) Women and children are at risk of violence as the toll of the effects of natural disasters exacerbates the household conditions of poverty which can lead to domestic violence, alcoholism and breakdown in family structures.

Source: ECLAC based on official government data.

Usually children are quite resilient in similar stressful situations that cause adults great difficulty, however it is not unusual to observe some differences. Box 2 highlights issues of concern for children following an event such as Hurricane Paloma. The vandalism which is reported to have occurred by youth at a school in Cayman Brac may be as a result of such anxiety. Post trauma counseling for children, adolescents and young adults to assist them to

cope with the psycho social trauma may be helpful following an event such as the impact of Hurricane Paloma on Cayman Brac.

Box 2: Social issues relevant to children in a natural disaster situation

- (a) Children's reactions to disasters and terror events will vary with age;
- (b) Children under five years of age may experience nightmare, separation anxiety and fears and even regressive behaviours;
- (c) Children of adolescent age, may include unusual disruptive behaviours, withdrawal, decrease in school performance and grades and difficulty concentrating.

Source: The Elements of Disaster Psychology: Managing Psycho Social Trauma. James I. Greenstore (2007).

Box 3: Psychosocial trauma and disasters

The term psychosocial, relates social conditions to a person's mental health. Following catastrophic events such as earthquakes, hurricanes, tsunami or volcanic eruptions, people may experience physical or psychological trauma. Psychological trauma may result in realistic or unrealistic stresses and fears being aroused, which can overwhelm individual and communities' ability to cope. It is important to remember that people react differently to catastrophic events some coping better than others.

Psychosocial trauma or the manner in which a natural event, such as a hurricane, can impact on a person's social conditions (their livelihoods or living conditions) and concomitantly their mental health may influence family dysfunction, loss of employment and deterioration of living conditions.

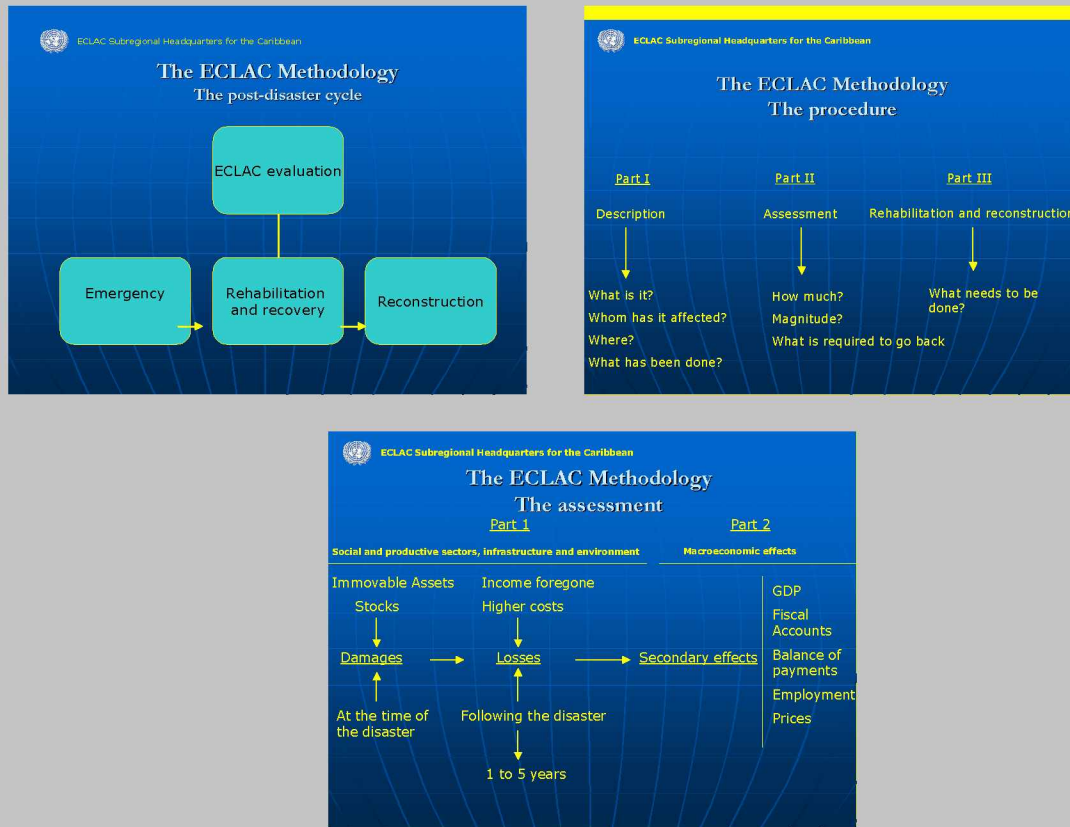
Source: ECLAC adapted from Greenstore (2007).

The Government of the Cayman Islands was not unmindful of the social dimensions of the impact of Hurricane Paloma on the population, and the Department of Children and Family Services responded. Some of the costs associated with that response have been captured in the social sector under housing, as staff services (see table 14).

II. DESCRIPTION OF DAMAGE AND LOSSES BY SECTOR

Box 4: Damage assessment: The ECLAC Methodology

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



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.

Subregional Headquarters for the Caribbean.

A. Productive sector

Hurricane Paloma impacted the main productive sectors of the economy, namely, tourism, agriculture and commerce. While all three islands sustained some level of impact, the sister islands of Cayman Brac and Little Cayman received the brunt of the impact due to the path taken by the hurricane. This chapter details the economic impact on the tourism, agriculture and commercial sectors, based on an assessment of damage and losses undertaken. The discussion also includes sectoral analysis of the external implications of the damage and losses resulting from the hurricane.

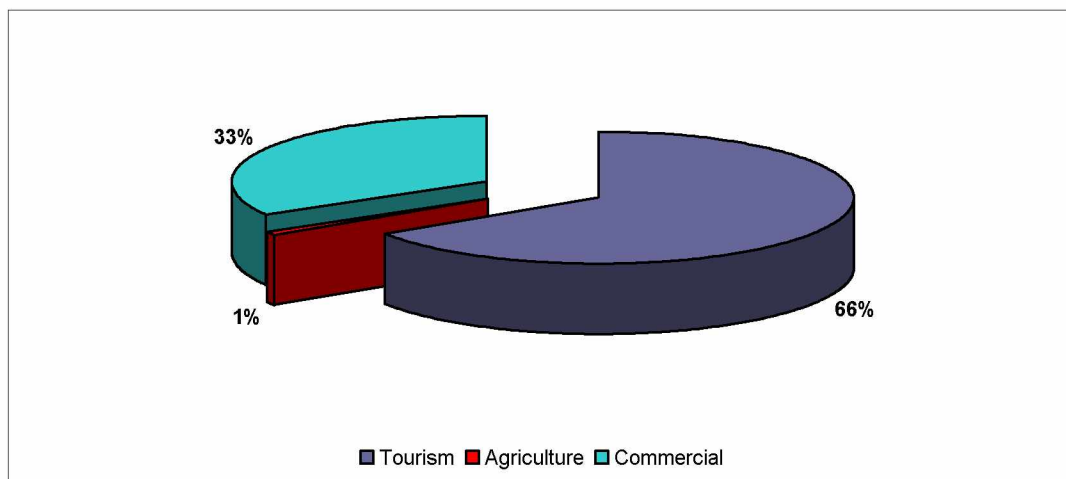
Total damage and losses were estimated at approximately CI\$20.43 million (table 6). Damage to all three sectors accounted for 61.0% of the overall total. However, the tourism sector accounted for the largest overall share (65.9%) or CI\$13.4 million of the total value of impact on the productive sector, with the commercial sector accounting for another 33% or CI\$6.8 million and the agriculture accounting for 1% (see figure 3).

Table 6: Cayman Islands: Total effect on productive sectors

Subsector	Damage	Losses	Total
Tourism	8,122,984.00	5,336,975.04	13,459,959.04
Agriculture	32,620.00	121,059.00	153,679.00
Commercial Sector	4,313,735.80	2,500,000.00	6,813,735.80
TOTAL	12,469,339.80	7,958,034.04	20,427,373.84

Source: ECLAC estimates based on official data

Figure 3: Sectoral breakdown of damage and losses



Source: ECLAC based on official data.

1. Tourism

Tourism is one of the two major economic sectors of the Cayman Islands' economy. In 2004, the sector accounted for 50% of GDP. It is also among the country's leading exports, in 2008, it generated income of \$442.4 million. In 2008, the industry employed approximately 9000 persons, representing 32.9% of total employment or one in every 3.0 jobs.

Overall, Hurricane Paloma did not cause significant damage to the tourism sector because Grand Cayman, where most of the tourism activities and infrastructure are located, was spared the brunt of the storm. However, it had a particularly crippling impact on economic activities on the sister islands of Cayman Brac and Little Cayman, both of which are highly dependent on tourism. This is of significance given the context within which the hurricane occurred. Hurricane Paloma was the third of three hurricanes to affect the Cayman Islands in the 2008 hurricane season, the others being Hurricanes Ike and Gustav. Hurricane Paloma was the most serious of the three. In addition, Hurricane Paloma struck at a time when the tourism sector, like that of other Caribbean territories, was struggling to survive a deteriorating world tourism market. The sector had recorded a four-month declining trend, beginning in September, which started to reverse the three-year long recovery process following the devastation of the tourism infrastructure occasioned by Hurricane Ivan in 2004, and the consequent negative performance of the sector in that year (see table 7).

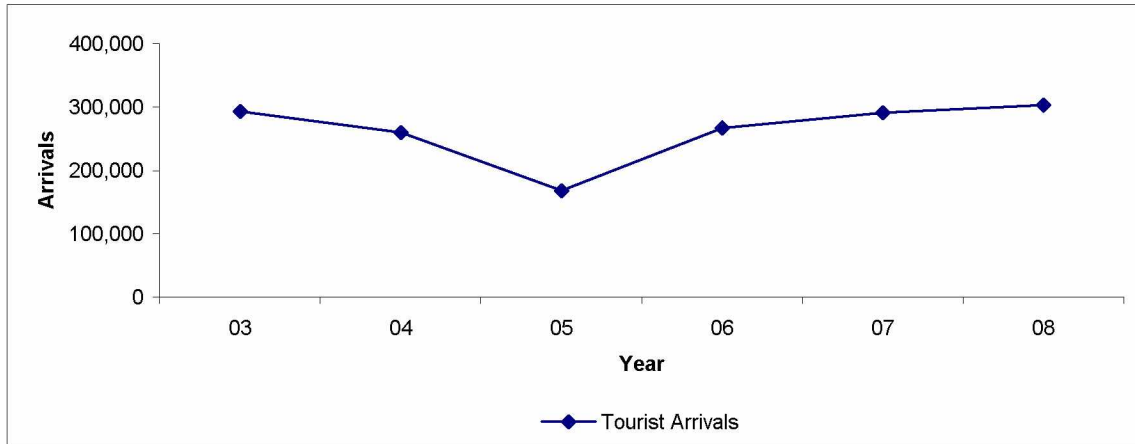
Table 7: Stay-over tourism arrivals by month (2000 – 2008)

Month	2000	2001	2002	2003	2004	2005	2006	2007	2008
Jan	26,879	28,953	24,545	24,727	25,689	9,601	20,163	23,726	25,845
Feb	33,678	34,008	28,608	28,270	32,022	13,202	25,004	27,947	30,380
Mar	39,099	41,558	39,378	34,421	37,248	18,810	31,493	35,146	38,425
Apr	31,908	35,566	26,768	27,807	33,903	15,423	28,403	27,003	29,978
May	28,789	27,023	23,229	20,909	25,502	12,061	21,172	23,427	25,722
Jun	32,056	29,986	27,017	24,662	26,890	14,008	24,251	25,837	27,971
Jul	34,004	32,255	28,844	26,491	33,118	16,610	24,256	26,895	30,008
Aug	24,937	25,765	23,961	22,422	23,191	11,917	18,064	19,481	21,629
Sep	16,033	11,940	11,333	11,336	4,982	8,494	10,156	11,457	10,330
Oct	21,684	15,898	16,151	18,879	1,968	11,104	14,634	15,102	14,710
Nov	29,214	23,070	23,903	22,745	4,215	14,979	22,276	25,227	19,731
Dec	35,806	28,049	29,060	30,848	11,201	21,592	27,386	30,255	28,150
TOTAL	354,087	334,071	302,797	293,517	259,929	167,801	267,258	291,503	302,879

Source: ECLAC based on official data

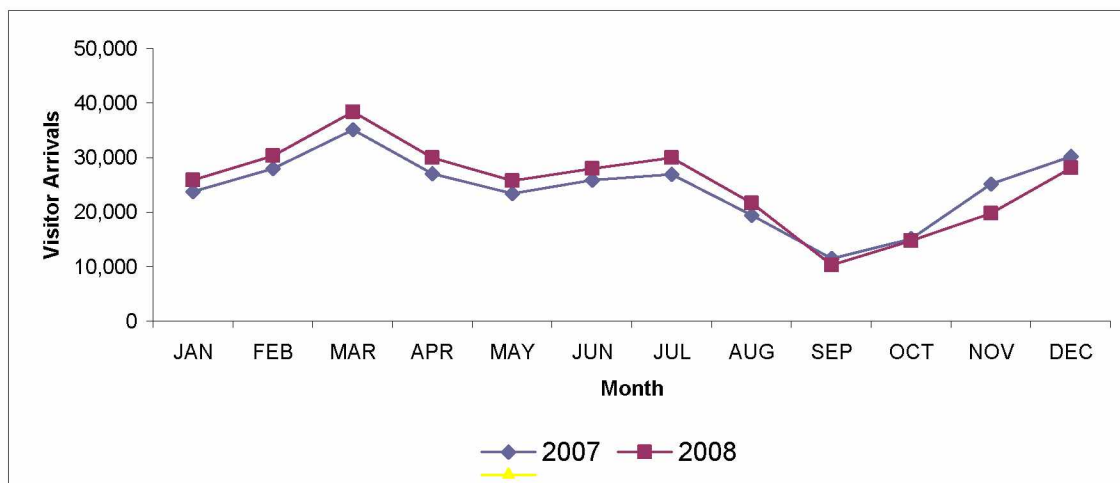
The decline which began in September, believed largely to reflect the worsening global economy (in particular the United States which provides some 80% of visitors to the Cayman Islands), was likely to have been exacerbated by the passage of hurricanes. All three events resulted in visitor evacuations, property and infrastructure damage, and closure of hotels. The government has expressed cautious optimism about the short-term outlook for the sector, with a good level of advance bookings already secured for the winter season. This optimistic outlook may be due in part to the fact that the Cayman Islands have been outperforming many of the other regional destinations and also because stay-over arrivals in 2008 increased overall by approximately 4.0% compared with 2007.

Figure 4: Tourist arrivals (2003-2008)



Source: ECLAC based on official data.

Figure 5: Tourist arrivals by month, 2007-2008



Source: ECLAC based on official data

(a) Damage

Most of Hurricane Paloma's impact on the tourism infrastructure was through wind damage. Due to the path taken, the brunt of the impact was felt in the sister islands of Cayman Brac and Little Cayman. Cayman Brac which took an almost direct hit sustained significant damage. All of the properties on this island suffered varying degrees of damage to their infrastructure and equipment. These included:

- (a) The roof of some hotels were damaged or lost while others suffered structural damage;
- (b) Damage to gift shops and equipment;

- (c) Considerable damage to vegetation; and
- (d) Beaches were littered with debris.

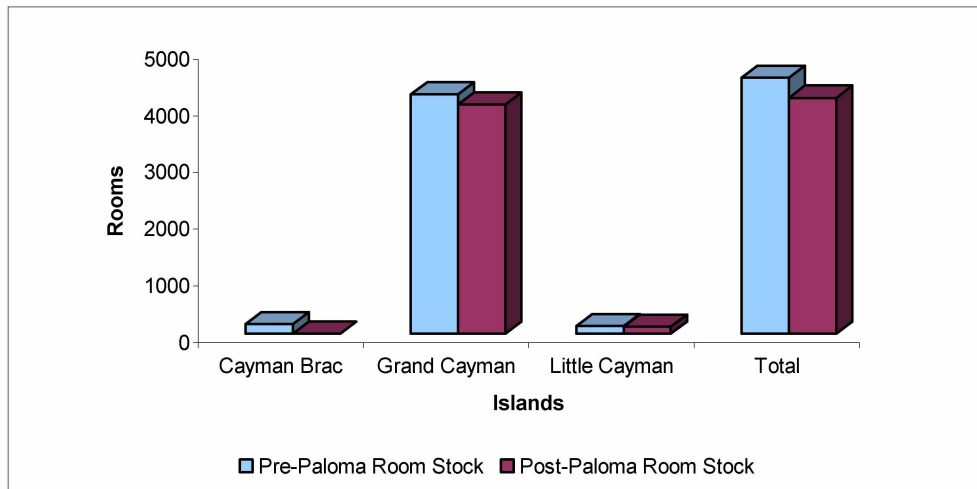
Due to the extent of the damage experienced in Cayman Brac, the entire room stock – hotels, condominiums, guest houses and villas - had to be withdrawn from operations. In fact, as at 15 January 2009, there was still no tourist accommodation available in Cayman Brac. It is projected that a majority of the hotels in this resort island will resume operations in April 2009. In effect, the island would have foregone most of the tourism income for the entire high season. It should be noted, however, that the economic impact of the hurricane on the Cayman Brac was to a certain extent lessened by the fact that the hurricane occurred in the slow season when several properties would have been closed for renovation.



Compared with Cayman Brac, Little Cayman emerged from the passage of the hurricane with relatively little damage to hotel properties. Damage to most properties included minor damage to roofs, fencing and recreational infrastructure. In fact, the main issue for the resort was the loss of electric power and blocked roads due to downed power lines. On average, all the affected hotels were out of operation for only three weeks and Little Cayman benefited by accommodating some of the tourists originally destined for Cayman Brac.

In the pre-Paloma scenario, Cayman Islands had a complement of 4509 rooms, 1981 in apartments, 376 in guest houses and 2152 in hotels. However, due to the extent of damage (particularly in Cayman Brac) the available room stock declined by 354 rooms.

Figure 6: Pre & post Paloma room stock



Source: ECLAC based on official data.

(b) Losses

Losses caused by Hurricane Paloma to the Cayman Islands tourism sector included:

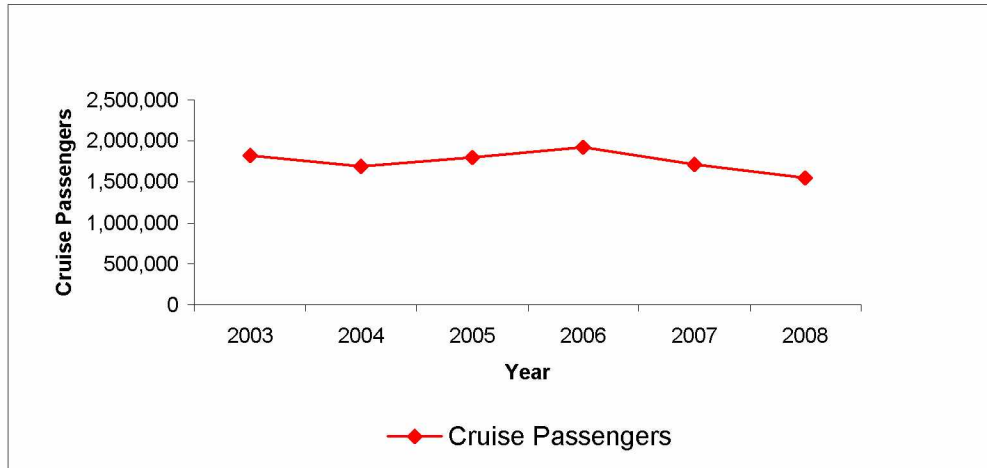
- (a) Lower hotel occupancy (on Cayman Brac and Little Cayman);
- (b) Lower tourist expenditure, including food and beverages, local transport, and recreation);
- (c) Expenditure to promote tourism to counteract negative press;
- (d) Cost for purchasing emergency generators; and
- (e) Loss of cruise ship tax.

There was decline of approximately 8% in the number of hotel rooms, particularly in Cayman Brac and Little Cayman. Hotel operations in the latter resumed after three weeks while loss of business will continue in Cayman Brac for an estimated three months into 2009. It was estimated that \$4.0 million was lost due to reduced hotel occupancy.

There were also losses in tourist expenditure. The estimates were calculated using information provided by the Cayman Island Department of Tourism which indicated that on average, a tourist remains in the country for 3.2 days and spends approximately \$160.72 per day. Assuming that there would have been about 1650 visitors to Cayman Brac during November and December 2008, an estimated \$0.85 million was lost by that island.

The Botanic Park, a major tourist attraction suffered considerable plant damage as a result of Hurricane Paloma leading to the closure of the facility for eight days. Total damage and loss to the facility was estimated at \$15,055.

Cruise ship tourism: There was no damage in the cruise ship subsector. However, the subsector suffered loss of expenditure due to the cancellation of three cruise ship visits to Grand Cayman with a projected passenger load of 4,976. Assuming that 90% or 4,528 of cruise visitors would have de-boarded at Grand Cayman and that each would have spent \$52.48 on average, the total income lost as a result of the cancellations is estimated at \$237,629.44. In addition, applying the head tax of \$1.64 per person, an estimated \$8,160.64 of tax income was lost. Thus, an estimated \$237,629.44 was lost from cruise ship business.

Figure 7: Cruise ship passenger arrivals (2003-2008)

Source: ECLAC based on official data

Table 8: Cruise ship passenger arrivals

Month	2003	2004	2005	2006	2007	2008
Jan	180,915	207,411	170,961	211,678	224,880	195,217
Feb	171,848	192,840	201,761	180,675	203,734	176,154
Mar	171,629	230,840	252,586	253,825	217,690	182,622
Apr	178,249	190,631	166,289	182,848	170,239	153,049
May	111,645	118,514	126,530	112,374	130,555	101,312
June	116,292	128,390	110,633	112,190	95,966	93,120
July	132,933	122,967	86,539	115,483	109,196	108,514
Aug	111,875	119,367	122,562	144,179	99,753	87,381
Sept	113,258	41,596	118,466	110,971	69,802	69,372
Oct	159,589	0	65,651	128,754	94,588	105,366
Nov	163,955	149,456	176,587	160,373	137,234	117,221
Dec	206,791	191,281	200,434	210,247	162,029	163,725
TOTAL	1,818,979	1,693,293	1,798,999	1,923,597	1,715,666	1,553,053

Source: ECLAC based on official data.

(c) Total damage and losses

The total value of the estimated impact (damage and loss) to the tourism sector caused by Hurricane Paloma was \$13,459,954.04 (table 9). This accounted for approximately 65.9% of the total damage and loss to the productive sector (table 6)

Table 9: Cayman Islands summary of impact on tourism

Tourism Damage & Losses	Damage	Losses	Total
Hotel Buildings	8,122,984.00	0.00	8,122,984.00
Decline in Hotel Occupancy		4,000,000.00	4,000,000.00
Hurricane Related Expenditure		70,089.00	70,089.00
Cruise Ship		237,629.44	237,629.44
Diving		27,600.00	27,600.00
Tourist Expenditure		848,601.60	848,601.60
Attractions		15,055.00	15,055.00
Tourism Accommodation Tax		138,000.00	138,000.00
TOTAL	8,122,984.00	5,336,975.04	13,459,959.04

Source: ECLAC based on official data.

2. Agriculture

Agriculture in the Cayman Islands operates with a number of constraints including low rainfall, poor and shallow soils, and inadequate irrigation. The agricultural sector, including fisheries, plays a relatively minor role in the economy of the Cayman Islands. This is exemplified by the fact that the sector contributes well under 1% of GDP and employs approximately 1.8% of the labour force. Nonetheless, the sector is important in that it provides food for domestic consumption including the supply of some products to tourism-catering businesses. A variety of crops are grown including tree crops, bananas, plantains, vegetables, and root crops. In addition, some farmers raise livestock – cattle, goats, pigs and chicken. Agriculture is predominantly undertaken in Grand Cayman and, to a much lesser extent, in Cayman Brac. Table 10 provides information on crop production in Grand Cayman.

Damage and losses in the agriculture sector were estimated at \$153,679.00, the majority of which was contributed by losses. Much of this reflects estimated loss of income from crops that were ready to be harvested at the time of the hurricane and crops that were totally destroyed. Estimates of damage and losses on agriculture are conservative as no assessment of the impact of agricultural damage and losses were obtained for Cayman Brac which was extensively impacted by the hurricane and which has some agricultural production.

Table 10: Crop production in Grand Cayman

Crop	Percentage
Avocados	1.73
Bananas	38.08
Breadfruit	0.72
Cassava	1.23
Coconuts	0.03
Citrus	15.29
Leafy Vegetables: (calaloo, pak choi)	6.86
Mangoes	22.45
Papaya	1.21
Plantains	2.6
Pumpkins	5.4
Sweet Potatoes	0.32
Tomatoes	0.94
Melons	0.97
Yams	2.17

Source: ECLAC, from official data, 2004

(a) Crops

There was extensive damage to crops in Grand Cayman. Most of the crops were affected by wind damage and in some cases flooding. Primary damage to the sector was to bananas, plantains and pepper (hot and season) production. This pattern of damage was observed consistently throughout the island, although the percentage of damage observed appeared highest in East End and North Side areas, and lowest in the district of West Bay. In the case of bananas and plantains, damaged plants, on some of the farms which were affected by the wind, had ribbon-like leaves but were not completely blown down; some of these crops were rehabilitated. On average, damage to bananas and plantains were estimated to have resulted in loss of income for between two to four months. Fruit drop was only evident on a few farms as only late varieties of avocados were present on trees.

(b) Livestock

In general, there was limited impact on livestock. This may have been related to the preparation in anticipation of floods at this time of the year. As such, animals were removed to secure areas.

3. Commerce

The commercial sector is an important component of the Cayman Islands' economy as it accounts for roughly 14% of GDP and 14.5% of employment. Most of the damage in this sector occurred in Cayman Brac where an estimated 42% of businesses either received major damage or were totally destroyed. This included establishments such as supermarkets, bakeries, small shops, bars, real estates, beauty salons, car rental, gas stations retail outlets, variety stores, and restaurants.

Most businesses that were affected suffered severe roof damage, a problem which was exacerbated in many instances by the poor roof design, and the age of some buildings.

Some businesses that were not severely damaged were back in business within one or two days and restaurants in particular, were quick to respond to the increased demand for cooked food. Overall, most businesses were back in operation within 30 days. This was particularly true for smaller businesses that were not insured and which might not have had alternative means of income. In addition, businesses generally operated under considerable constraints, including reduction of their hours of operation, as well as having to incur additional costs for the use of emergency electrical generators.

As is the case in many jurisdictions, in post-disaster situations larger businesses that are insured are better able to cope and resume operations, whereas the small businesses face greater risks. The reality among businesses in the Cayman Islands is that a considerable number of them, though insured, were grossly underinsured. This resulted in their insurance payout being much less than they anticipated. Total damage and loss in the commerce sector was estimated at \$ 6,813,736.00.

B. Infrastructure sector

Hurricane Paloma had a total effect on the infrastructure sector which amounted to CI\$19.0 million. Damage at the time of the event accounted for CI\$10 million or 53% of the effect, with losses accounting for the remaining CI\$8.9million, as detailed in table 11.

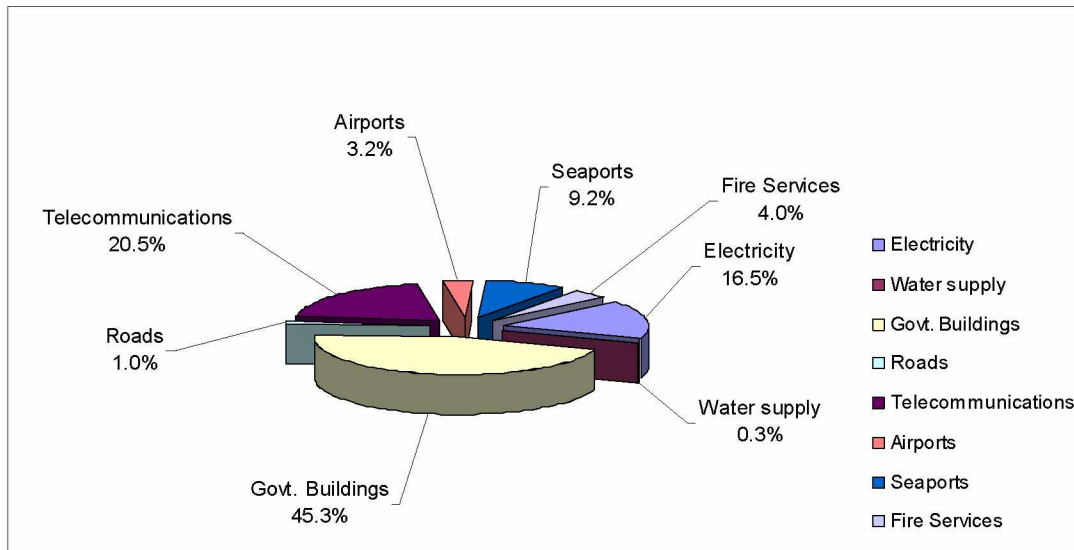
Government buildings accounted for the largest proportion or 45.3% of the overall effect within the sector, with telecommunications accounting for 20.5% and electricity 16.5%, suggesting that these three together were the most significant subsectors affected by Hurricane Paloma. Roads accounting for 1% and water supply, 0.3% were the least of the subsectors affected as illustrated by figure 8.

The details are discussed in the following sections.

Table 11: Summary of damage and losses caused by hurricane Paloma in Little and Cayman Brac CIS

Sector and Subsector	Damage and losses		
	Total	Damages	Losses
Infrastructure	19,080,988	10,091,989	8,988,998
Electricity	3,145,933	2,511,667	634,267
Water supply	55,000	40,000	15,000
Govt. Buildings	8,652,500	2,889,167	5,763,333
Roads	195,833	0	195,833
Telecommunications	3,912,750	1,799,583	2,113,167
Airports	604,971	420,906	184,065
Seaports	1,750,000	1,666,667	83,333
Fire Services	764,000	764,000	

Source: ECLAC estimates based on official data.

Figure 8: Distribution of the impact on the infrastructure sector of Hurricane Paloma

Source: ECLAC estimates based on official government data.

1. Water storage, treatment and supply

The two water companies that were affected are Water Authority – Cayman (WAC) and The Cayman Water Company (CWC). A brief description of the damage and losses occasioned by these two entities was presented in an evaluation report prepared by the Hazard Management Cayman Islands (HCMI). This is summarized as follows:

(a) WAC

In Cayman Brac, the WAC facilities were impacted through the loss of roll-up doors to the Reverse Osmosis (RO) desalination plant building and also through damage to some of the building sheetrock. In addition, the windshield of their tanker truck was damaged by flying debris. Due to a loss of mains power, the Authority had to secure generators to run the RO plant and the distribution pump, thereby incurring losses. No damage occurred to the actual plant or to wells, although damage occurred to sections of pipeline due to the uprooting of trees.

This utility has a customer base of approximately 100 (pipeline and truck customers), and the latter category of customers typically use small storage tanks, which thereby required the WAC to have to truck water frequently after the hurricane. It is noteworthy that the utility did not charge for trucked water for approximately one to two weeks after the hurricane, a gesture that was valued at approximately CI\$5,000 per week. The customer base is typically residential, with a few commercial customers, and presently there is more capacity than demand.

The cost of repairs and assistance to staff was estimated to be approximately CI\$40,000, with losses of CI\$10,000. There was no damage to the WAC systems in Grand Cayman.

(b) CWC

There was no significant physical damage to CWC systems or plant as a result of Hurricane Paloma. CWC lost two business days preparing for Paloma and one day of business closure immediately following the passage of the hurricane. CWC also expended resources (staff overtime) putting systems back to normal on the Saturday following Hurricane Paloma's passage. The losses associated with this were estimated to be CI\$5,000.

Estimate of damage and losses for this subsector were developed from the figures given above.

The computed damage and loss figures are given as:

(a)	Estimate of Damage (Total)	CI\$40,000
(b)	Losses (Total)	CI\$15,000

For future hurricane events of a major nature, it may be prudent to adopt measures so as to reduce the vulnerability of the water supply systems.

2. Electricity generation and transmission

Electricity in Cayman Brac and in Little Cayman is provided by the Cayman Brac Power and Light Co. Ltd (CBPL). This utility suffered damage to both its generating and its distribution capabilities. As a result of this event, and in terms of its generating capacity, CBPL will have to replace two of its generators, at a cost of US\$750,000. These generators were damaged when the roof overhead was torn off and water came in. Doors at the back of the facility were also destroyed, leading to some structural damage. Relative to the transmission capacity, approximately 400 poles were down in both islands.

Damaged door at rear of CBP&L facility



Downed Utility Pole



One week after the hurricane, some 100 customers were reconnected. This increased to approximately 300 customers by the end of the second week and 600 by the end of the third week. By the 20 December 2009, CBPL management estimated that approximately 1200 customers had been reconnected, and by the time of the ECLAC visit in the third week of January 2009, some 1500 customers had been reconnected. There is a remaining group of condominiums that represents 10% of the customer base that will likely not be reconnected until June 2009.

The costs incurred as a result of Hurricane Paloma were obtained from a combination of discussions with the General Manager of the CBPL, and from estimations based on similar events in the Turks and Caicos Islands (where more base information was forthcoming). Losses were evaluated from the customer numbers and based on an indication of the gross annual revenue for the company. These values are summarized as follows.

(a) The total cost of the estimated damage for the electricity generation sector, based primarily on damage to equipment, was CI\$2,511,667; and

(b) The total cost of the estimated losses for the electricity generation sector, based primarily on loss of income and cost of fuel was CI\$634,267.

3. Telecommunications

Telecommunication services (land lines and mobiles) are provided by Cable and Wireless, and mobile services provided by Digicel. The sector is overseen and regulated by the Information and Communications Technology Authority (ICTA). In addition to the telephone service providers, there is a television provider, WestStar, which suffered extensive damage to its towers, head-end satellite dishes and equipment, and customer premises equipment including antennas and receivers. Of these, Radio Cayman was back in operation within a day, while some of the other stations were back up within a week or so. Some others were still not back in operation up to the time of the ECLAC mission. In addition, the Cayman Islands Government also provides telecommunications services to fire and police officers, officials of the Emergency Operations Centre (EOC) and other relevant personnel.

(a) Cable and Wireless/LIME

A summary of the damage suffered by the Landline Internet Mobile Entertainment (LIME) was obtained through interviews with two officials of the company. The following points were noted:

(a) Most of the damage that occurred was to overhead cables, aerial copper and fibre cables that were damaged when the CBPL utility poles went down;

(b) Replacement cable had to be imported primarily from the United States, and some from the United Kingdom;

(c) Because power was off, significant losses were incurred from the usage of fuel that was needed to power generators;

(d) By comparison, losses for mobile services were small, as they were down for about three days. In addition, whatever losses were incurred, were offset by the increased number of calls through the system. Damage to wireless infrastructure occurred to some towers;

(e) By the time of the ECLAC team assessment, recovery of fixed line infrastructure was up to 40% and projections were that it would be back to 80% by the end of March 2009, and completed by April 2009;

(f) Two bucket trucks were deployed in Cayman Brac and one in Little Cayman, and a further four were anticipated to be sent over; and

(g) In summary, services were off for two to three weeks.

Bucket trucks in use in Cayman Brac



(b) Digicel

The Human Resources Manager for Digicel was interviewed. He and his senior team members indicated that damages occurred to telecommunications equipment first during Hurricane Gustav, which was a Category 1 storm and then Hurricane Paloma. Specifically:

(a) During Hurricane Gustav, damage occurred mostly to fencing, and one or two sites were down for about two days;

(b) During Hurricane Paloma, five out of eight sites in Cayman Brac went down, with three remaining in operation. On Little Cayman, one out of two sites went down. The sites were run by generator until 7 January 2009, and were taken off generator power on a phased basis. All ten sites were back in operation after a two-week period; and

(c) During that two-week period, a number of personnel were sent over to Cayman Brac from Grand Cayman by air. Approximately three seats were booked every day during that period.

A listing of items which resulted in expenditure after Hurricane Paloma is given. These were provided by Digicel.

Transportation: Grand Cayman - Cayman Brac

Helicopter

Cayman air flights

Car rental

Truck rental for portable generators

Shipping for equipment too large for plane

Manpower Used in Repair/Recovery Operations

Digicel engineers

Electrical contractors

Riggers

Equipment Used in Recovery

Antennas

Brackets

Generators

Cables

Brackets

Tools

Diesel

Fencing

Vulnerability reduction measures being implemented by the company include:

- (a) The use of stabilizers to reduce the vulnerability of the stations; and
- (b) A request to the government to have Digicel personnel included in the first wave emergency team, for future events.

(c) Cayman Islands Government

An interview was held with a representative of the Ministry of Communications, Works and Infrastructure of the Cayman Islands Government. This department of the government provides telecommunications services to the government, and in particular the fire,

police, EOC and other critical communications users. They have their own towers, specifically one in Cayman Brac and one in Little Cayman. There was some damage to equipment on Cayman Brac and none in Little Cayman. Damaged equipment included: tower and external hardware; co-axial cable; bolts; paint; safety cables; etc.

Despite this damage, there was no loss of communications during the event, and it is of interest to note that there was a reported increase in communications usage of 68 times the regular rate of usage. Loss of income related primarily to the purchase and use of diesel for generators.

(d) Telecommunications damage and losses

Total estimates of damage and losses for the telecommunications sector were obtained from interviews and information provided:

(a) Total estimate of damage was CI\$1,799,583; and

(b) Total losses related to Hurricane Paloma for this subsector were estimated to be CI\$2,113,167.

4. Transportation/Roads

In general, there was little or no damage to the transportation and roads subsector as a result of Hurricane Paloma. Losses related primarily to preparation activities that were undertaken by the National Roads Authority (NRA) in Grand Cayman and by the Public Works Department (PWD) in Cayman Brac. Interviews were carried out with an official at the NRA, and with the Works Manager for PWD, Cayman Brac.

Losses incurred by NRA involved primarily the mobilization of clean-up crews and the actual cleaning up of debris from the roads. In Cayman Brac, the PWD was primarily responsible for securing all government buildings and property prior to the storm. In all, three days were spent preparing for the hurricane, and a total of 75 staff members were involved in this exercise. Very little or no damages occurred to the roads on Cayman Brac.

The total estimates for this subsector did not include damage but only losses, which is given as follows:

(a) Total estimate of losses was CI\$195,833.

5. Airports

Information on the status of the airport in Cayman Brac was obtained through a telephone interview with the Head of the Air Traffic Control, Cayman Islands. He outlined a number of areas where damage and losses occurred to that airport due to the passage of the storm system, as follows:

- (a) Damage to the roof and ceiling of the building;
- (b) Damage to the perimeter fencing;
- (c) Damage to meteorological equipment, the automatic weather station;
- (d) Damage to navigational aids – non-directional beacons; mast for the wind sock; and runway lights; and
- (e) Damage to air conditioning units;

Losses included:

- (a) Minimal loss of landing fees;
- (b) Replacement of signage;
- (c) Clean up;
- (d) Replacement of damaged parts – fencing; meteorological equipment;
- (e) Staff costs; and
- (f) Fuel to power generators for a two-month period.

The terminal was back in operation within five days of the passage of Hurricane Paloma.

Total estimates for this sector are given as follows:

- (a) Total estimate of damage was CI\$420,906; and
- (b) The total losses for this subsector were estimated to be CI\$184,065.

6. Seaports

Damage to seaports was reported through an interview with officials of the Port Authority. Only minor damage occurred to the main port in Grand Cayman, however, significant damage occurred to the port in Cayman Brac. A summary of damage and losses occasioned follows:

- (a) The warehouse and office structure at Cayman Brac were completely destroyed and would need to be rebuilt. Previously, the offices were in the warehouse, however, the plan now is to relocate them outside of the warehouse in their own building in the future construction;
- (b) The hurricane shifted anchors and moorings and these had to be moved back into place;

(c) As is usually done after equipment is exposed to salt air, the port equipment (both in Grand Cayman and Cayman Brac) was to be serviced;

(d) There is a crane in Cayman Brac, however, this equipment suffered no damage; and

(e) Once per week, a barge service operates between Grand Cayman and Cayman Brac. This carried mainly containers. Because the port was down for about 1.5 to 2 weeks, charges had to be suspended and there was a consequent loss of revenue.

Port in Cayman Brac: Note that crane and jetty was undamaged



Total estimates of damage and losses for this subsector are summarized as follows:

(a) Total estimate of damage was CI\$1,666,667; and

(b) The total losses related to Hurricane Paloma for this subsector were estimated to be CI\$83,333.

7. Fire services

An interview was held with the Chief Fire Officer based in Grand Cayman. Mr. Bodden indicated that one of their fire trucks suffered some electrical damage, as it had to be driven through seawater that had ponded on the runway, in order to rescue tourists and locals who needed to be taken off the island to Grand Cayman. At the time of the UNECLAC mission, it was uncertain whether or not the truck would have to be replaced, or could be repaired.

In terms of structural damage, the fire station, which is beside the airport, suffered extensive roof damage, through the loss of its outer roofing materials. It was therefore down to the tar paper following the passage of the hurricane. Aside from this, there was only minor structural damage to the building itself. Immediately after the event, personnel were sent from

Grand Cayman to Cayman Brac to help out. This resulted in some losses occurring. In addition to providing assistance, the staff members that were sent over were able to relieve some of the staff in Cayman Brac, who had been on duty since the hurricane. Due to the fact that the Fire Station was able to use one of the airport generators for electricity, no extra expenses (losses) were incurred from this.

Fire Station with one of their fire trucks



Roof of fire station covered by Tarpaper



The total estimate of damage for this subsector is summarized as follows (note that no losses were recorded):

- (a) Total estimate of damage was C\$764,000.

8. Government buildings

A telephone interview was held with the Director of Development and Planning for the PWD, Grand Cayman. He indicated that when Hurricane Paloma hit, it was determined that the PWD in Cayman Brac did not have adequate resources, so assistance was provided from Grand Cayman. This took the form of approximately 12 skilled trades people being sent over to Cayman Brac. In addition, a team of six people went to Cayman Brac three days after the hurricane to carry out a damage assessment of all government buildings. It was determined that practically all buildings on Cayman Brac (between 90-100% of all buildings) had suffered some damage, to varying degrees. In addition to carrying out a very detailed damage assessment of the building stock, the government provided generators to assist in the recovery process. It is estimated that of an estimated CI\$8 million, approximately 40% was allocated to the response phase and 60% to recovery.

Buildings that stand out in the assessment process include the Aston Ruddy Centre and Hospital. It is estimated that this complex alone accounted for approximately CI\$1.2 million of the budget allocated. Another building that is worthy of note is the Seaman's Center, which was used as an unofficial shelter by a number of people (over 100 estimated). During the night of the hurricane, the roof of this building collapsed, coming within a fraction of causing casualties to the people within. These people were moved over to the Aston Ruddy on the morning following the hurricane. A visit to the Seaman's Center revealed that the roof of this structure is inadequately reinforced and/or supported to withstand hurricane winds, leading to the conclusion that the government needs to take an active role in the setting and enforcement of construction standards, particularly as it applies to buildings that may be used as shelters by the general population.



Aston Ruddy Centre exterior and interior after the hurricane



Seaman's Center exterior and interior after the hurricane. Note failure of roof inside

The total estimate of damage and losses for this subsector is as follows:

- (a) Total estimate of damage was CI\$2,889,167, which included damage and repairs to buildings in both Cayman Brac and Little Cayman; and
- (b) Total estimate of losses was CI\$5,763,333, which included payment to workers, labour component of all repairs and costs associated with the response phase.

C. Social sectors

The ECLAC Damage and Loss Assessment (DALA) methodology as part of its estimation of the social sector takes account of the subsectors of housing, education and health. The housing subsector estimates damage and losses to all structures used as dwellings within the Cayman Islands, whether privately or publicly-owned. The education subsector incorporates estimates of sporting facilities, museums, historical buildings and libraries in addition to publicly and privately owned educational facilities. The health subsector consists of all health facilities publicly or privately owned and their estimation of damage and losses

Table 12 details the extent of damage and loss in each subsector of the social sector. The total effect to the social sector caused by Hurricane Paloma amounted to CI\$107.7 million of which 94% was accounted for in damage and the remainder 6% in losses.

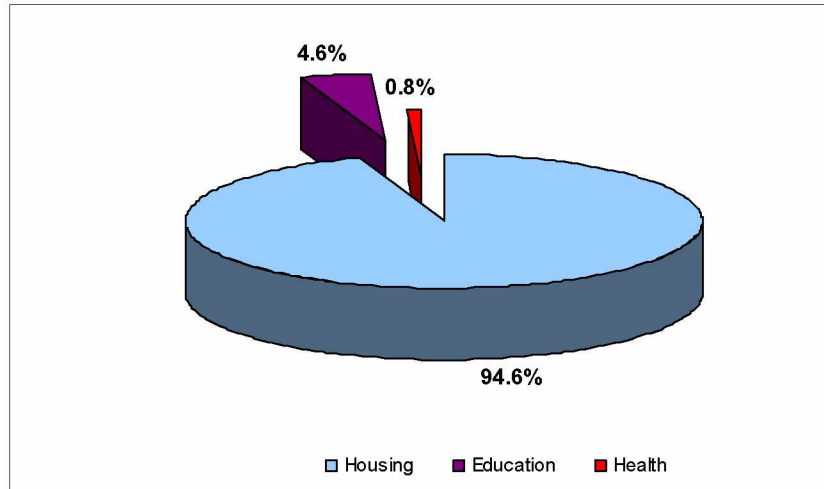
Table 12: Cayman Islands: Total effect on the Social Sector

Sub sector	Damage	Loss	Total
Housing	95,423,812.49	6,516,333.57	101,940,146.06
Education	4,377,782.97	536,735.08	4,914,518.05
Health	444,454.90	420,181.06	864,635.96
Total	100,246,050.36	7,473,249.71	107,719,300.07

Source: ECLAC estimates based on official Government data

Figure 9 illustrates the distribution of the effects to the subsectors, within the social sector, suggesting that the lion share of the effect, 94.6%, could be attributed to damage and loss in the housing sector. The health subsector suffered minimal effect, less than 1% (0.8%), and the remaining 4.6% is attributed to the education subsector

Figure 9: Distribution of the effect of the impact of Hurricane Paloma on the subsectors within the Social Sector



Source: ECLAC based on official data.

1. Housing

Hurricane Paloma, a category four hurricane on the Saffir –Simpson Scale, reached top wind speeds of nearly 140mph and brought 5-10 inches of rain during its time in the Cayman Islands. As expected, such wind force tore of roofs, damaged windows and doors and tore down the most vulnerable houses.

At its conclusion, approximately 5% of the housing stock in the Cayman Islands were either damaged or destroyed. The government’s initial damage assessment recorded, as detailed in table 13, that a total of 71 houses were destroyed and 988 were damaged. An examination by district suggests that less than 1% of the damage occurred in Grand Cayman, with the vast majority occurring in Little Cayman and Cayman Brac.

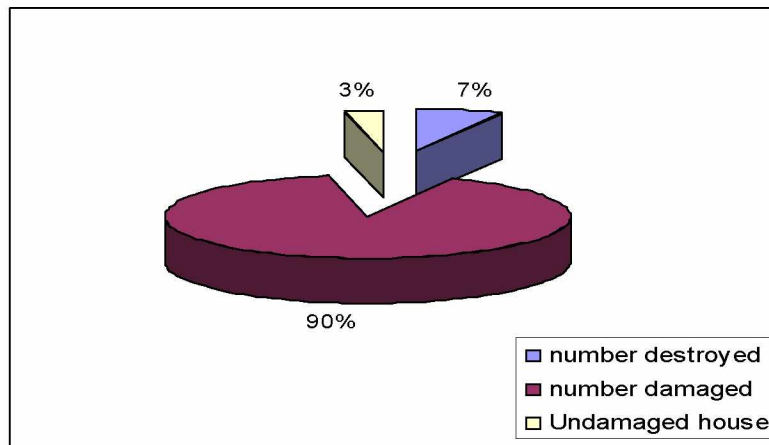
Table 13: Cayman Islands, Housing stock damaged and destroyed by district

District	Estimated Number of houses at the time of the disaster	Estimated number of houses destroyed	Estimated number of houses damaged	Total destroyed and damaged	Percentage destroyed or damaged
George Town	11402				
West Bay	4548				
Bodden Town	3190		11	11	0.34
East End	754				
North Side	604				
Cayman Brac	1013	71	912	983	97.00
Little Cayman	65		65	65	100.00
Total	21576		988	1059	4.91

Source: Estimated number of houses based on household size of 2.5; ECLAC estimates of damage based on official Government data

The proportion of houses damaged or destroyed, by Hurricane Paloma, falls way below what had occurred in 2004 following Hurricane Ivan, in which 83% of the total housing stock or 13,535 units were affected. Hurricane Ivan had devastated Grand Cayman leaving Cayman Brac and Little Cayman virtually unscathed. When an examination of the impact of Hurricane Paloma by island is undertaken, another picture emerges. The reverse has occurred with Hurricane Paloma. On this occasion Cayman Brac and Little Cayman were severely hit.

Figure 10 illustrates the distribution of the impact of Hurricane Paloma on Cayman Brac, suggesting that some 90% of its housing had suffered some degree of damage with 7% being destroyed and the remainder 3% being unscathed. The impact on Little Cayman was a full 100% of houses being affected but none suffering major damage. It is interesting to note that following Hurricane Ivan 4% of the housing stock was completely destroyed whereas in the case of Paloma just about 7% was destroyed.

Figure 10: Cayman Islands - Distribution of housing stock in Cayman Brac following Hurricane Paloma

Source: ECLAC based on official data.

The housing stock in the Cayman Islands is generally of a sound quality with an average of just about 16% having been built before 1970, making the majority less than 30 years old. However in the case of Cayman Brac some 30% were built before 1970. In addition, because Cayman Brac is home to a significant proportion of the poor found in Cayman Islands, we can assume that the poor housing conditions characterized in the Cayman Islands National Assessment of Living Conditions (2006/2007) would hold true for much of the Cayman Brac as well. The report indicated that some 30% of the poorest had material of the outer walls of their homes made of wood /timber in comparison to 5.9% of the wealthiest. In the case of Cayman Brac, 48.2% of the outer walls of the majority of houses were wood and timber. The most common roofing used in Cayman Brac was sheet metal (55.4%) and shingles (38.5%).

The Cayman Islands National Assessment of Living conditions (2006/2007) reported that rented homes accounted for 43% of all tenures and that 47.7% of all households owned the homes in which they lived. Of these, only 23.5% were owned with a mortgage. The data suggest two things, that private ownership of property is high and that rental of properties is high.

Insurance companies suggest that even though insurance policies are considered necessary and many times are not optional, clients are cutting back on property insurance to save money. Often, once the mortgage is paid, homeowners cut back on the cost of insurance and shift those resources to other uses. Following Hurricane Ivan it was estimated that 30% of residences were not insured and significantly more were under-insured. Even if this situation remained unchanged, it suggests that households and particularly poor and vulnerable households would have difficulty in rebuilding their accommodation without external assistance.

Table 14 presents the summary effect on the housing sector. Of the CI\$101.9 million, the damage to dwellings either destroyed or requiring repair accounts for CI\$95.4 million or 94% of the total effect with the losses, CI\$6.5 million, accounting for 6% of the total effect. Loss of rental income, accounted for 71% or CI\$4.6 million of the overall losses.

Table 14: Cayman Islands: Summary effect on the Housing Sector (CIS millions)

Total Effect	101,940,146.06
Total Damage	95,423,812.49
i. Value of Damage to Houses requiring repair	80,320,000.00
ii. Value of damage to totally destroyed houses	12,409,945.80
iii. Value of Damage to furnishings	2,693,866.69
iv. Imported component	85,881,431.24
Total Losses	6,516,333.57
i. Removal of debris	1,185,301.34
ii. Additional cost for the generation of electricity	640,224.00
iii. Loss of rent	4,651,730.04
iv. Clearing of septic tanks	6,325.00
v. Cost of staff services, including airfare and subsistence	32,753.18

Source: ECLAC estimates based on official Government data.

Import component at 90% of value of total damage; Rental losses estimated for three month period.

2. Education

Education in the Cayman Islands is provided by a network of some 27 schools servicing over 7000 students. Data for 2007 enrolment as detailed in the compendium of statistics 2007, suggests that females make up 49% of the total school population and that the government provides 63% of all school places, with the private sector providing for the other 37%. The details are presented in table 15.

Table 15: Cayman Islands Enrolment by Sector, Type of School and Sex – 2007

	Recept.	Primary	Middle	Secondary	Total	Schools
Government	42	2,350	1,120	1,125	4,637	17
Private	363	1,379	512	438	2,692	10
All Schools	405	3,729	1,632	1,563	7,329	27
Males	197	1,950	823	782	3,752	
Females	208	1,779	809	781	3,577	

Source: Cayman islands Statistical Compendium, 2007

The Cayman Brac and Little Cayman school population accounts for 4.2% of the national school population, or 305 students. The details of the enrolment of students by the two districts affected are presented in table 16.

Table 16: Cayman Islands: Enrolment in schools by districts affected by Hurricane Paloma

Cayman Brac	
Cayman Brac HS	171
Creek Primary	31
Spot Bay Primary	47
West End Primary	53
	302
Little Cayman	
Education Service	3
Grand total	305

Source: Ministry of Education

All schools and the Teachers' Centre in Cayman Brac suffered moderate to major damage, except the school in Little Cayman which suffered minor damage. Table 17 presents an overview of the damage. Cayman Brac High suffered extensive damage not only to its facilities but to its equipment and furnishings such as computers, desks and chairs. Unfortunately it was also Cayman Brac High which suffered the effects of vandalism upon its repair.

Table 17: Cayman Islands: Damage Assessment of Public Education Facilities by District²

District	Type of damage	
	Moderate to Major	Minor
Cayman Brac		
Teachers Centre	x	
Spots Bay Primary	x	
Creek Primary School	x	
Cayman Brac High School	x	
West End Primary School	x	
Little Cayman		
Primary		x

Source: Reports from PWD

Table 18 presents the summary effects of Hurricane Paloma on the education subsector. The total effect amounts to CI\$4.9 million of which 89% or CI\$4.3 million accounts for damage and the other 11%, or CI\$0.5 million accounts for losses.

Of the total damage, damage to libraries, museums and historical buildings accounted for CI\$2.3 million or 52.6% while damage to schools accounted for CI\$1.7 million or 39.8%. Other damage was negligible. Of the total loss, the vandalism to the school accounts for, CI\$0.21 million or 40.5% and the cost of sanitizing school walls CI\$0.3 million or 51%. Losses incurred for the generation of electricity was less than 1% due to the fact that there was no cost for the purchase of generators as generators which had been used for Ivan and Gustav were made available without cost.

Table 18: Cayman Islands: Summary Effects of Hurricane Paloma on the Education Sector

Total Effect	4,914,518.05
Total Damage	4,377,782.97
i. Damage to schools	\$1,744,019.00
ii. Damage to sporting facilities: swimming pools	25,390.00
iii. Damage to Ministry facilities	77500
ii. Damage to school materials and furnishings	229,703.97
iv. Damage caused to Libraries, Museums and historical buildings	2,301,170.00
Imported component	3,940,004.67
Total Loss	536,735.08
i. Losses due to removal of debris	10,182.00
ii. Losses incurred for the generation of electricity	357.58
iii. Incurred through use of facility as shelter	32,689.70
iv. Losses incurred for sanitizing	276,184.35
v. Losses incurred from vandalism of Cayman Brac High School	217,321.45

Source: ECLAC estimates based on information received from official sources; value of imported component estimated at 90%

² Assessments on all education facilities were conducted by a team from the Ministry of Education, Training, Employment, Youth, Sports and Culture. Preliminary estimates were undertaken by the PWD.

3. Health

Of the three components of the social sector, the total effect to the health subsector accounts for less than 1% of the total effect to the sector. This may be attributed to the robustness of the sector, to its high level of preparedness and to the decentralization of its services.

There are two government-run hospitals in the Cayman Islands, one in Grand Cayman, the Cayman Islands Hospital, and the other, the Faith Hospital, in Cayman Brac. The Faith Hospital is an 18-bed hospital, staffed by 52 health care professionals, including five doctors, one dentist, and 25 nurses. The Faith Hospital provides 18% of the hospital bed space available in the Cayman Islands. The proportion of other health services provided in Cayman Brac are detailed in table 19.

Table 19: Cayman Islands: Health services in Grand Cayman and Cayman Brac in 2007, by selected health services

Selected Health Services	Grand Cayman	Cayman Brac	Proportion of services provided by Cayman Brac
Beds Available	101	18	18%
Major Operations	1200	15	1%
Minor Operations	1521	104	7%
Outpatient & Casualty Visits	81221	15812	19%
District Clinic Visits	37581	503	1%
Home Visits	5800	3291	57%
Dental Clinic Visits	22798	2114	9%

Source: Statistical Compendium 2007

The impact of Hurricane Paloma was felt mainly by Faith Hospital which suffered damage to its roof, windows, doors and fencing. Rain water entered the buildings causing carpet and floor damage, to its dental clinic, kitchen and sterilizer room. Electrical wiring and air conditioning equipment also suffered damage. The ambulance bay experienced some moderate ruin, resulting in damage to the ambulance and utility vehicle.

Although the event did not affect Grand Cayman's health infrastructure as it affected Cayman Brac and Little Cayman, the health institutions on Grand Cayman were mobilized in the event that a more critical response was required. A proportion of the losses in the health sector arise from the mobilization of staff which could not have been avoided.

Table 20 presents the summary effects on the health sector. Total effect on the sector amounted to CI\$0.8 million of which damage amounted to CI\$ 0.4 million or 51% and losses 49% or CI\$ 0.4 million. Of the losses, 79% could be attributed to additional cost of staff services.

Table 20: Cayman Islands: Summary effects on the Health Sector

Total Effect	864,635.96
Total Damage	444,454.90
i. Damage to Health facilities	429,519.90
ii. Damage to equipment and furnishings	14,935.00
iii. Imported component	400,009.41
Total Losses	\$420,181.06
ii. Addition cost of generation of electricity	3,834.00
ii. Cost for the removal of debris and demolition	27,020.00
iii. loss due to transfer of patients to other facilities for care	0.00
iv. Losses due to forgone income	11,194.70
v. Losses due to mobilization of services	32,616.00
vi. Additional cost to staff services	330,823.56
vii. Additional cost of communications	6,992.80
viii. Additional cost of medical supplies	7,700.00

Source: ECLAC estimates based on information received from official sources. Import component estimated at 90% of value

D. The Environment

1. Overview

One of the most noticeable impacts of Hurricane Paloma on the Cayman Islands was the destruction of vegetation in Cayman Brac and, to a lesser extent, in Little Cayman. Fortunately, there was no significant damage from storm surges as was experienced during Hurricane Ivan in 2004. Another way in which the hurricane significantly affected the environment was in the generation of vast amounts of solid waste. In addition, coastal ecosystems also received some minor impacts.

An environmental survey was carried out by the Department of the Environment (DOE) after the passage of Hurricane Paloma. This revealed significant damage to natural reserve forest areas on Cayman Brac, however, the damage was sufficiently limited so that mainly only leaves were lost from trees (95% defoliation observed in forest). The survey included an assessment of endemic species and it was found that, for the most part, all endemics were intact. From a spatial perspective, the damage was found to increase eastwards along Cayman Brac. As a result of this, and for a period of two months after the hurricane, the DOE assisted the native bird population by sending feed from Grand Cayman to Cayman Brac. The feed, which was donated by local grocery stores, was in most cases suspended from the tree canopy, in order to prevent an insurgence of rodents. It is of interest to note that the schools on the island were involved in the bird feeding programme.

Surveys carried out on the reefs revealed that there was some sanding of corals, but, in general there was only very minimal damage to the coral reef system. Minor displacement was observed to the mooring systems at the various dive sites, and these point anchors had to be re-set.

The largest component of the environmental subsector in terms of losses was that of solid waste. Overall, approximately 675,000 tonnes of solid waste were delivered to the landfill on Cayman Brac for processing. Losses under this heading were due to heavy equipment leasing, equipment purchase, labour, accommodation and miscellaneous expenditures. Processing of solid waste resulting from this event is still ongoing.

2. The terrestrial environment

The topography of Cayman Brac is dominated by a tilted elevated plateau referred to as The Bluff (see image below, provided by the Dept. of the Environment) which is dominated by xeromorphic (describes plants or plant parts that are adapted for survival in dry conditions, e.g. spiny leaves that reduce surface area and therefore water loss) semi-deciduous forest; and a tropical dry forest. Some of the forest has been cleared for agriculture but a considerable portion of it remains undisturbed. On the eastern portion, (the most elevated end of the Bluff), the forest gives way to mixed evergreen deciduous vegetation. Approximately 113 hectares of Bluff forest are protected as the Brac Forest Reserve, owned by the National Trust. The forest is important for endemic species, and is the breeding habitat for the endemic Brac Parrots (*Amazona leucocephala hesterna*). The Brac Parrot is particularly vulnerable as it has the smallest geographical range of any Amazona Parrot. With increasing development intrusion on the Bluff, the area has therefore come under intense pressure. This situation was exacerbated by Hurricane Paloma, which impacted natural habitats by stripping most of the natural vegetation of its foliage.

The DOE undertook two assessments of the impact of the hurricane on the Brac Parrot Reserve and Bluff Forest; the Eastern Bluff Shrubland; and on rare and single site species. The initial survey was carried out on 13-14 November 2008, while a follow-up survey was undertaken one month later on 10-11 December 2008.

Based on the assessments undertaken by the DOE, the condition of the ecosystems was found to be as follows:

3. Brac Parrot Reserve and the Bluff Forest

In the northern half of the Brac Parrot Reserve, approximately 30% of the trees had fallen, and almost all trees lost their leaves. Canopy cover immediately after the hurricane was estimated at about 5% (including fine twigs). This should increase steadily as fresh leaves emerge on the trees. The value of the area as a parrot habitat was therefore temporarily reduced. It was estimated that about 1% of the trees (Red Birch, or *Bursera simaruba*) were bearing fruit. The southern portion of the Reserve fared a little worse, with greater tree fall and approximately 70% of the understorey damaged. However, fruiting Silver Thatch Palms *Coccothrinax proctorii* could be found, especially in the more open secondary forested areas. The following table gives a summary.

Table 21: Summary of ecosystem damaged

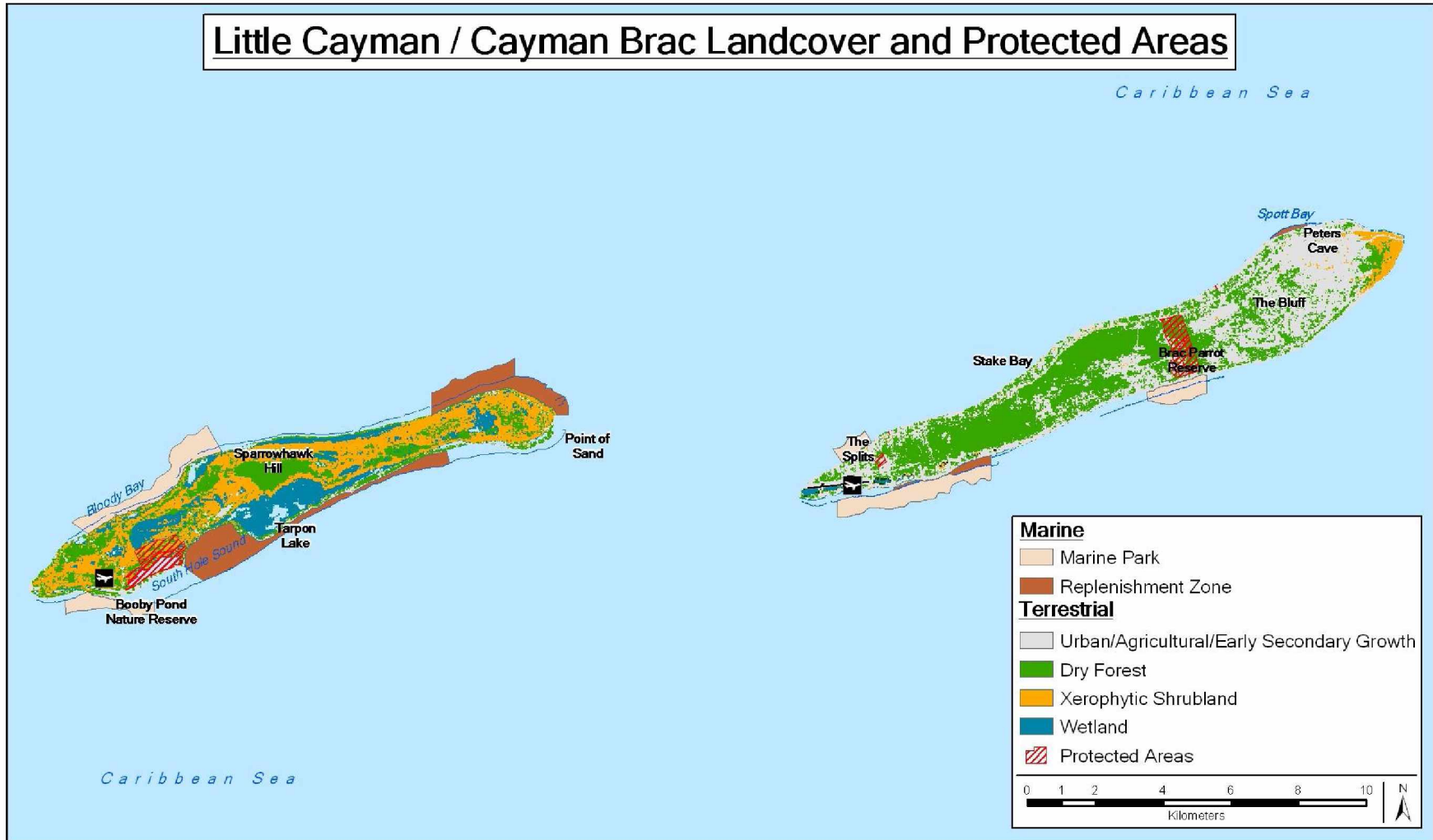
Ecosystem	Affected area (%)	Estimated damage
Brac Parrot Reserve	95	Moderate/Severe
Bluff Forest	95	Very Severe
Eastern Shrubland	100	Very Severe
Salt Water Pond	<10	Insignificant

Source: ECLAC based on official data from the DOE

A ground survey estimates that 10-20% of trees had fallen, with greater damage localized. The extent of damage appears to have increased markedly from the west to the east of the island. An additional aerial survey carried-out, with the assistance of the Mosquito Research and Control Unit, confirmed that severe damage was ubiquitous throughout the forested Bluff.

The follow-up survey of the Parrot Reserve and the Bluff Forest indicated a rapid recovery, occurring in a west to east direction. The understorey was found to be green in places and the canopy had begun to produce fresh leaves; in addition, some fruits had emerged.

Map 3: Little Cayman/Cayman Brac land cover and protected areas



Source: Map created by the Department of Environment, Cayman Islands Government using 1989 land cover information provided by Fred J. Burton, National Trust for the Cayman Islands.

4. Eastern Bluff Shrubland

The Eastern Bluff shrubland was the worst affected habitat. It was estimated that approximately 90% of the flora in this area had been severely damaged and much of the flora had been stripped of its leaves. *Agave caymanensis* were still rooted, but they had been severely damaged, with the leaves shredded. Dildo Cacti, *Pilosocereus swartzii* had been broken off close to the ground. Whilst the damage looked severe, it is expected that most plants will recover and re-shoot. The heads of some Silver Thatch Palms were damaged, and this may affect the recovery of the plants. The damage here was probably exacerbated by the exposed nature and open structure of the shrubland habitat, combined with the salt spray which would have been forced over and across the Bluff during the storm.

The follow-up assessment indicated that the robust native plants of the exposed eastern-most bluff had begun to recover.

5. Saltwater Pond Trail

The Saltwater Pond Trail is immediately to the east of The Splits protected area (see image above). Plants found on this diverse shrubland did not suffer any major damage. There was some minimal tree fall but, in general, most of the plants only lost their leaves. On the follow-up survey, the recovery in this area was found to be rapid, with many plants leafing, flowering and fruiting.

6. Rare and endemic species

(a) **Verbesina caymanensis** - known only from one location, on the northern near vertical face of the Bluff. Numerous specimens of the endemic *Verbesina caymanensis* have survived but with some damage. Plants inhabiting exposed areas of the cliff were stripped of leaves and remained only as bare stems. Some were also found to be flowering. The hurricane damage may result in vigorous colonisation by the invasive *Bryophyllum pinnatum* which is extensive in the area and successfully weathered the storm. It is important that this species is kept in check, to prevent out-competition of *Verbesina caymanensis* for limited growing space;

(b) **Ink Berry Scaevola plumieri** - One location was examined, and two plants were recorded, both were damaged by the hurricane, but remain rooted. New leaves could be seen emerging, five days after the storm;

(c) **Epiphyllum phyllanthus var. plattsii** - This colony of plants is intact and in place, growing low down in the rocky limestone karst formation;

(d) **Consolea millspaughii var. caymanensis** - A known specimen located near to the edge of Captain Mabry's Drive has been found intact. No specimens were found at the location on the south-eastern coastal platform. Another larger specimen is known to exist on the Bluff edge on the south side of Stake Bay though it is not known whether this plant has survived; and

(e) **Banara caymanensis** - Specimens of this species were found at the known location situated near the Bight Road.

The destruction of the habitats by the hurricane disrupted the nesting sites for some bird species and reduced the availability of food for others. In response to the reduced availability of food for the birds, a bird feeding programme was established as a joint programme between the DOE and Wildlife Rescue.

7. **Solid waste and debris clean-up**

Hurricane Paloma generated a considerable amount of waste material, particularly in Cayman Brac. A telephone interview with the Assistant Director of the Department of Environmental Health indicated that the management of debris has been a full-time operation since the passage of Hurricane Paloma, with the exception of the period during 18 December 2008 to 3 January 2009, when a break was taken. All collected debris was taken to the landfill on Cayman Brac for disposal. It is of interest to note that Hurricane Paloma generated a debris pile (including vegetation) some 21 acres in area by 12 feet tall (volume estimated by the United States Army Corps of Engineers). This is estimated to be equivalent to the total amount of landfill that would have been generated over the entire 27-year life of that landfill. As a result of this, a new landfill site will have to be opened, and fortunately, one such suitable area was identified several years ago, which has been subject to the appropriate Environmental Impact Assessment (EIA) and screening processes. This new landfill site has a 100 acre area.

During the ECLAC mission, it was found that for the period 18 November 2008 to 13 December 2008, a total of 675 tons of waste was collected and broken down. This included 80 tons of vegetative waste, 113 tons of metals and 482 tons of other mixed debris waste.

The estimates of damage and losses for this sector are given as follows:

(a) Total damage has been estimated to be CI\$502,083. This includes replacement of displaced dive site moorings, and damage to a mulching machine that was destroyed by fire; and

(b) Total losses for this sector have been estimated to be CI\$1,262,500. This amount comprises: the temporary bird feeding programme; the solid waste clean-up programme (including heavy equipment leasing, equipment purchase, labour, accommodation and miscellaneous expenditures).

III. THE MACROECONOMIC EFFECTS

A. Summary damage and losses

The total impact of Hurricane Paloma on the Cayman Islands amounted to \$154.4 million, the equivalent of 7.4% of GDP. Of the total, damage at \$124.5 million represented almost 80% of the total impact, suggesting that the hurricane was largely a stock event, which should limit the fall-out in GDP. Although in aggregate the total impact was much smaller than the \$2861.1 million (183% of GDP) of the impact of Hurricane Ivan in 2004, this reflects the large relative size of the separate economy of Grand Cayman in the total GDP of the Cayman Islands. Therefore, given that the two smaller islands, Cayman Brac and Little Cayman, bore the brunt of the disaster, the impact on these two more vulnerable islands was quite severe. Moreover, the impact of a disaster should not be measured solely by the monetary impact. Therefore, given the disruption to the lives of vulnerable communities and the severe impact on the environment, even if not fully quantifiable, the real effects of the disaster were much more than the monetary impact.

Using the two affected islands, Cayman Brac and Little Cayman, the per capita impact at \$57,295 was quite significant, highlighting the heavy burden of reconstruction and rehabilitation for affected citizens in these two islands. Indeed, if Cayman Brac alone is used, the per capita impact pushes up to almost \$61,000 somewhat similar to the \$75,000 for Hurricane Ivan. Furthermore, if the GDP of Cayman Brac and Little Cayman were used instead of the total GDP of the Cayman Islands, the total impact as a percentage of GDP, might have been similar to that of Ivan. The total impact was more than one third of exports of goods and services and over 73% of government debt.

Summary of total impact by type:	CIS millions	Per cent
Damage	124.5	80.0
Losses	29.9	20

Total impact in relation to key macroeconomic variables:

- (a) 7.4% of GDP;
- (b) 25.3% of Tourism GDP;
- (c) 33.2% of exports of goods and services;
- (d) 73.4% of central government debt; and
- (e) \$2,865 per capita impact.

A disaggregation of the impacts by sector showed that the disaster was primarily a social event, as 69.8% (\$107.7 million) of the effects were felt by that sector. Again, the impacts in the social sector were quite lopsided, as the housing sector accounted for over 94.6% (\$101.9 million) of the impact in the sector, and 66% of the total impact overall. The housing sector on

Cayman Brac was particularly hard hit, with 97% of the stock damaged or destroyed, while on Little Cayman, although almost houses were affected, the damage was minor to moderate.

Infrastructure was the next most affected sector with estimated damage and losses of \$19.1 million, equal to 12.4% of the total impact. Within the infrastructure sector, telecommunications, electricity and seaports were most affected. Electricity generation and distribution were disrupted by the hurricane due to damage to two costly generators and the downing of a number of poles in Cayman Brac and Little Cayman. The seaport on Cayman Brac was badly damaged, with the warehouse and office building completely destroyed.

Fortuitously, the productive sectors were spared the severe fallout from the hurricane, with impact contained to an estimated \$20.4 million. Tourism the second engine of growth alongside financial services suffered damage and losses to the tune of \$13.5 million (8.7% of total impact). The effects on the tourism plant were mitigated by the minor damage suffered by the mainstay island, Grand Cayman, which, unlike during Ivan, was little impacted by the hurricane. Nevertheless, the impact on Cayman Brac and Little Cayman was quite severe. Indeed, in Cayman Brac all tourism properties- hotels, guest houses and villas-had to close as a result of the damage suffered. This led to a short-term collapse of the sector in the island, pulling down general economic activity and incomes. Meanwhile, wholesale and retail were set back to the tune of \$6.8 million, with significant disruption to small traders and businesses, which would require assistance to restart operations. Also, impacts were contained in the small and fledgling agriculture sector.

Although time and other constraints prevented a full assessment of the impact on the environment, initial effects were estimated at \$7.2 million. The environment was badly affected with significant damage to terrestrial, buffer zones and the marine environment. Trees suffered widespread defoliation and uprooting and ponds/Salinars and other buffer areas were damaged in a number of areas. Reefs and other marine ecosystems were also damaged by the hurricane.

Table 22: Summary Damage and losses from Hurricane Paloma on the Cayman Islands

Sector and subsector				
	Damage and losses			
	Total Impact	Damage	Losses	% of total
	CIS thousands			Impact
Total	154408.7	124509.7	29899.0	100.0
Productive sectors	20427.4	12469.3	7958.0	13.2
Agriculture	153.7	32.6	121.1	0.1
Wholesale & Retail Trade	6813.7	4313.7	2500.0	4.4
Tourism	13460.0	8123.0	5337.0	8.7
Social Sectors	107719.3	100246.1	7473.2	69.8
Housing	101940.1	95423.8	6516.3	66.0
Education and culture	4914.5	4377.8	536.7	3.2
Health	864.6	444.5	420.2	0.6
Infrastructure	19081.0	10092.0	8989.0	12.4
Electricity	3145.9	2511.7	634.3	2.0
Water Supply	55.0	40.0	15.0	0.0
Government buildings	8652.5	2889.2	5763.3	5.6
Roads	195.8	0.0	195.8	0.1
Telecommunications	3912.8	1799.6	2113.2	2.5
Airports	605.0	420.9	184.1	0.4
Seaports	1750.0	1666.7	83.3	1.1
Fire Services	764.0	764.0	0.0	0.5
Environment	7181.1	1702.3	5478.8	4.7

Source: ECLAC, calculations based on national data provided.

1. Macroeconomic impact of Hurricane Paloma

(a) Introduction

Hurricane Ivan in 2004 was a major point of departure for recent growth and development in the Cayman Islands. The hurricane devastated Grand Cayman, the main host of the tourism product which is a key engine of growth and activity in the islands. Indeed with an estimated cost of over 183% of GDP, the hurricane could have easily set back development gains by more than a decade. Nevertheless, a pragmatic and forward-looking reconstruction programme, with a focus on building back better, saw an early return to stable growth in activity in the islands in the aftermath of the hurricane. Hurricane Paloma in 2008 therefore met the islands in a more resilient state overall, although the late season nature, rapid development of the

hurricane and a problem with early warning meant that sister islands, Cayman Brac and Little Cayman, were caught off-guard as to the scale and intensity of the hurricane.

2. The macroeconomic performance prior to Hurricane Paloma

The Cayman Islands grew on average by 4.4% between 2005 and 2007. After the collapse in 2004 (growth of 0.9%) on account of Hurricane Ivan, growth rebounded by 6.5% in 2005 and remained closer to trend in the next two years. This recovery was driven by robust construction, reflecting rebuilding and rehabilitation of public and private properties, hotels, road and other infrastructure. Growth was also bolstered by the revival of tourism, financial services and distribution. However, since 2005, the Cayman Islands seem to be entering a steady, maturing growth stage, with growth averaging around 3.7%. Growth has been fuelled by financial services, which are estimated to contribute 36% of GDP, employ 9.0% of the labour force and account for over 21% of government revenue and about 25% of exports of goods and services. Tourism, the other major plank of the economy, contributes around 27% of GDP, accounts for 33% of employment or one out of three jobs and 42% of exports of goods and services.

Despite the fall-out in the global economy, the Caymanian financial services sector posted positive growth in 2007. Growth was boosted by the strong performance of mutual funds (up 15.7%), stock exchange listings and insurance licenses. This was partly offset by declines in banks and trusts linked to consolidation in the international banking sector. Moreover, performance was adversely affected by the 11.1% contraction in cruise passenger arrivals that pulled down visitor spending by over 6%, in spite the 9% increase in stay-over arrivals. Construction, another important driver of activity, slowed with the completion of important rebuilding projects. Building permits were down by 15.5% and planning approvals plunged to \$505.2 million, as the economy returned to trend construction prior to Hurricane Ivan.

3. Prices, wages and employment

During the first nine months of 2008, inflation averaged 5.1% spurred mainly by non-tradables, including housing (7.3%), transport and communications (5.4%) and education and medical (4.4%). The spike in housing prices stemmed from higher utilities, rent, maintenance and insurance costs. In addition, the increase in food prices eased to 5.0% from 5.5% for the similar period last year. This probably reflects the rapid transmission of lower food prices from the United States to the very open Caymanian economy, unlike in other Caribbean countries, where prices have remained sticky upwards.

4. Fiscal performance

There was some slippage in fiscal performance in 2007, as dynamic growth in spending surpassed modest revenue growth leading to an overall deficit of \$39.1 million, equal to 1.8% of GDP, relative to strong surplus of \$67.3 million or 3.3% of GDP in 2006. Expenditure accelerated by 27% to \$552 million, propelled by a sharp spike in capital spending reflecting outlays on capital acquisition/equity investment and capital development, including land

acquisition, construction of the East West arterial road and commencement work on the new Government Administration Building.

On the other hand, revenue growth was contained, due to a decline in proceeds from international trade and transactions, which was only modestly offset by other heads, including taxes on domestic good and services and on sales of goods and services.

5. Money and banking

Notably, in spite of the over 2% growth in GDP, the broad money supply (M2) contracted by almost 13% in 2007, compared with 2006. The decline stemmed from a sharp fall in net foreign assets, reflecting growth in foreign liabilities linked to non-resident deposits and might have reflected the uncertainty in international financial markets. On the other hand, domestic assets grew by 6.1% in tandem with higher credit to households for property acquisition, vehicle purchase and education, among other areas, and increased borrowing by the government for budget programmes. Borrowing costs declined marginally, as the prime lending rate fell by one percentage point to 7.25%, in line with the fall in the United States Federal funds rate, highlighting the integration of the Cayman economy with that of the United States. In keeping with the lower cost of funds to the public, the savings deposit rate also fell by 0.10 percentage points to 1.11%.

6. Trade and payments

Merchandise exports also expanded by almost 12% to \$21.5 million in 2007, bolstered by increased exports of rum and re-exports. Similarly, service exports rose by 3.6% to \$442.9 million, mainly linked to higher stay-over visitor expenditure. With these developments, the balance of payments current account deficit narrowed by 6.7% to \$376.8 million, equal to 17.6% of GDP. By contrast, merchandise imports declined by 0.8% to \$881.8 million, largely associated with a fall-off in consumer goods imports, as fuel and intermediate goods imports were up based on higher prices and increased purchases of construction materials, respectively. With the changes in net exports, the current account deficit narrowed by 6.7% to \$376.8 million.

B. Macroeconomic performance in 2008 before the disaster

1. Output

Reflecting its strong linkage with the global economy, growth in the Cayman Islands slowed to 1.5% in 2008, from 2.2% in 2007. Tourism activity softened as constant growth in arrivals in the dominant stay-over market (8.8%) was offset by a 14.1% contraction in the cruise passenger arrivals. Moreover, although air arrivals rose to 240,288 visitors, average visitor expenditure was likely to have fallen with the gathering global economic slowdown, particularly from the mainstay United States market, but also from Europe and Canada. Nevertheless, hotel occupancy levels improved during the period rising to 64.6% from 61.7% for the similar period last year. However, the average length of stay for hotels fell from 4.7 days to 4.4 days, reflecting the downside impacts of the global slowdown. On the policy front, an integrated marketing

strategy has been put in place based on unity in diversity, with the three islands marketed as one idyllic destination, with individual product offers.

Meanwhile, cruise passenger arrivals slipped by 14.1% to 1,166,741 relative to the first three quarters of 2007. In keeping with this, the number of cruise ship calls fell by 14.7% to 430. In a welcomed development, however, the Nickelodeon Family Cruise made its inaugural visit to Grand Cayman during the year. The addition of the Nickelodeon brand will help to diversify the cruise market making it more resilient.

Underscoring its links with and sensitivity to global developments, the financial services sector was affected by the global financial crisis and slowdown. As a result, the sector turned in a mixed performance. Activity increased in insurance companies, mutual funds and trust companies, but declined in banks, trust licenses and company registrations. Probably reflecting the lower impact on the financial crisis on insurance business, total insurance licences in the Cayman Islands increased by 2.2% (17) jumping from 784 at September 2007 to 801 at September 2008. While Class 'A' insurance licences were flat at around 28, Class 'B' (captive) licences increased by 17 to 773. Premiums for these captive insurance companies expanded by around US\$133 million to reach US\$7.6 billion at the end of September 2008.

Importantly, the Cayman Islands maintained its dominance of the global mutual funds industry, posting a 9.7% increase (to 10,291) in mutual funds year-on-year to September. Similarly, trust companies grew by 2.2% to 141, reflecting growth in Class "B" licences as Class 'A' licences fell. On the other hand, the flight to quality and worldwide consolidation in the banking sector led to a 2.8% (to 279) decline in the number of banks and trust companies licensed in the Cayman Islands. Company registrations fell by over 10%, linked to declines in exempt and non-resident company registrations, which surpassed the increase in resident and foreign companies.

Construction has been a crucial driver of non-tradable activity in recent years associated with a boom in residential, commercial and government properties. During the first nine months of 2008, both building permits and project approvals-indicators of construction activity-were dynamic. Building permits amounted to \$419.9 million, an expansion of over 24%, driven by a large increase in government projects, but also higher residential and commercial construction. Government projects leapt in value from \$5 million to almost \$63 million and included construction of a new secondary school and an office complex. Similarly, commercial construction permits values rose to \$149.1 million. The housing market in the Cayman Islands seems to have been insulated from the fall-out in the United States, as permits increased by 21% to \$93 million, largely reflecting work on the Frank Hall Government housing development. Residential building permits expanded to \$192.4million, reflecting confidence in the sector. Meanwhile, total project approvals grew by 6.6% to 920, while total value expanded by 17% to \$403.2 million.

Bucking the trend in the United States, the real estate market in the Cayman Islands remained dynamic during the first nine months of 2008. The number of properties transferred rose by 8.9%, while their value increased from \$420.6 million to \$517.9 million. There was

robust growth in leasehold transfers stemming from dynamic sales of new luxury condominiums—again suggesting limited impact of the United States mortgage crisis.

2. Prices, wages and employment

Inflation increased to 5.2% for the first nine months of 2008, relative to the similar period last year. Reflecting international price developments, inflation was driven by food, fuel and housing prices (7.3%), partly linked to cost of building materials; transport and communications (5.4%); food prices (5%); and household equipment (6.1%), among others. Food price hikes resulted from higher costs of fruits and vegetables, oils and fats and cereals. While transport costs were bolstered by spikes in travel and household vehicle prices. Nevertheless, underscoring the tapering off of some commodity prices in the wake of the global slowdown, third quarter inflation was below the average year-on-year rate at 2.4%.

Labour demand remained robust, as evidenced by the 5% growth in work permits to 24,672. The distribution of work permits varied by category of workers. The professional category registered the largest increase of 15.7% to reach 2,822 at September 2008. Meanwhile demand for trade/technical and skilled workers, the largest category of workers, was lower as reflected in the smaller increase in work permits issued. Work permits for unskilled workers were up by 5.3%, while those for administrative and managerial workers declined. It seems that the construction sector had already filled its demand for workers, as work permits in the sector fell by 4.8%, in spite of the increase in building permits and construction activity. Similarly, in the financial services sector work permits increased by 12% to 2,282 allocated mainly to the insurance subsector. On the other hand, work permits in the tourism and related sectors increased by over 11%, reflecting higher activity in the sector.

3. Fiscal performance

Highlighting the need to strike a delicate balance between economic development requirements and fiscal rectitude, government's fiscal strategy is premised on three important pillars: fiscal responsibility, the development of social and economic infrastructure and strengthened economic management. In keeping with prudent fiscal management, government has targeted a medium-term fiscal surplus, which will be used to partly defray the costs of some projects in the capital programme.

4. Trade and external payments

During the first half of 2008, merchandise imports grew by 2.1%, to \$457.6 million, reversing the decline in 2007. This growth largely reflected higher import payments for oil and petroleum products as a result of higher prices and also larger import volumes.

C. Performance of the economy with the disaster

The brunt of the fall-out from Hurricane Paloma was on the stock of assets of the country, including housing, tourism plant, infrastructure and small businesses, among others. As a result, the impact on total GDP was smaller than usual for a hurricane of this magnitude because the

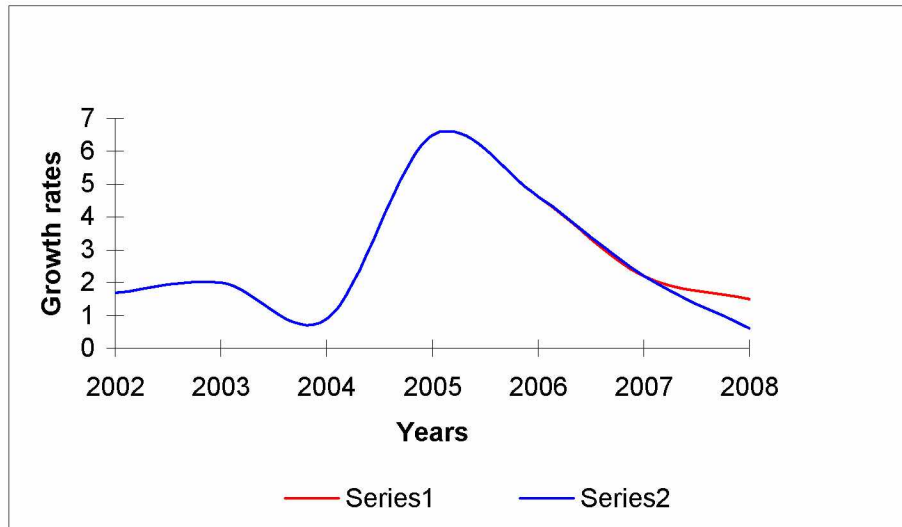
main contributor, Grand Cayman, suffered minor damage. Nevertheless, the impact on Cayman Brac, especially, and to a lesser extent, Little Cayman, would result a significant loss in their combined GDP. This would lead to significant per capita reconstruction costs in these islands, occasioning a heavy burden for residents and a considerable fall-out in welfare. Further, assets would need to be rehabilitated in a timely manner to avert future fall-out in productive capacity and GDP. Home repairs and reconstruction, business rehabilitation and general reconstruction would present a major challenge for the residents of Cayman Brac who have lower per capita incomes than Grand Cayman and are already strained in a difficult global economic environment. Also, although the scale of impact of Paloma was small compared with Hurricane Ivan in 2004, given that the brunt of its effects was felt by the poorer segments of the population during a difficult time in the world economy, the socio-economic consequences would far outweigh the financial costs.

In comparing Paloma with Ivan it is important to consider the structural differences between the economy of Cayman Brac and Grand Cayman. Grand Cayman was able to recover relatively quickly after Ivan because it has a more diversified and efficient economy based on financial services, tourism and business and real estate services. This spreading of the base of its economy plus dynamism in the leading sectors, even after Ivan, facilitated recovery. On the other hand, Cayman Brac is for all intents a monocultural economy based mainly on tourism, with the public sector playing an important role in providing services and employment. As a result, the State would have to play a much more significant role in stimulating recovery in Cayman Brac, particularly since the world tourism market is quite soft due to the global recession. This would increase the demands on the budget in an already tight fiscal environment.

1. Impact on GDP

The losses from Paloma that impact on value added and GDP were contained at around \$33 million. As a result, real GDP will grow by 0.6% in 2008, instead of the projected 1.5%, representing a loss in growth of 0.9%. Usually, events of this nature tends to result in an absolute contraction in GDP, as was the case with Hurricane Ivan, but the relatively small scale of the loss of income has limited the fall-out in GDP. Differential impacts will be felt by sectors according to the lost value added and the extent of extent of damage. The transport and communication sector is expected to contract by 1.8%, reversing the projected growth of 1.8%. Telecommunications networks and road transport were disrupted by the intense winds of the hurricane.

Figure 11: Real GDP growth rates for the Cayman Islands Pre and Post Hurricane Paloma



Source: ECLAC, based on official data

The tourism sector is projected to decline by some 1.4%, reflecting damage to some hotels, guest houses and disruption of service in dive tourism. This would turn around the previous forecast for small positive growth in the sector in 2008. Wholesale and retail trade is expected to decline by 0.7%, as a number of small shops and other businesses lost sales during closure and incurred contingent repair costs. Similarly, real estate, renting and business was projected to contract by 0.5%, relative to previous projected growth of 1.5%, as a number of houses and other properties suffered important damage from the hurricane. Other services are forecasted to contract by 2.1% partly associated with damage to the environment and effects on other services. Meanwhile, electricity and water are expected to contract by 0.2%, representing an absolute decline of 2.2%. Two electricity generators were badly damaged and have to be replaced, while downed power lines affected electricity distribution, and the water plant was damaged by the hurricane. The small agriculture sector was also affected and growth is projected to decline by 0.5%, as subsistence crops, fishing boats and equipment and fishing sites were damaged.

On the other hand, construction activity is expected to increase by 7%, an accelerated pace, compared with the prior 3%. Home repair has started in earnest, as persons whose properties were uninsured have started rebuilding. Homeowners who meet the means criteria have also been assisted by the National Recovery Fund.

The Cayman Islands National Recovery Fund provides an instructive model for the design of recovery funds in the region. Set up in the aftermath of Hurricane Ivan, the fund provides timely housing assistance to persons whose homes have been damaged. To ring-fence the process, the Fund has specific criteria, including- homes must be uninsured, preference is given to residences with children, the elderly and infirm and a means test is used to ensure that persons cannot self-finance their repairs and rehabilitation. Since its inception, the Fund has

assisted over 4,500 persons and has embarked on an active assistance programme for persons affected by Hurricane Paloma.

2. Prices, wages and employment

Inflation was expected to decline in the last quarter of 2008, as global commodity prices soften. Hurricane Paloma is expected to affect prices in two opposite directions. In the first place, the reduced growth is expected to weaken demand in some sectors, however, the pick up in construction activity would have fuelled demand. Price increases in construction would be reinforced by shortages in the domestic agriculture and fishing subsector. There on balance, inflation is expected to be marginally higher than 5.2% in 2008. Wage levels would have remained stable, although government would have incurred higher costs for clean-up and other relief and rehabilitation operations. Employment would have been affected by the slowdown in activity in the wake of the hurricane, as a number of small businesses were closed or only operating part time. Nevertheless, this would have been offset by higher employment in the construction sector.

3. Fiscal operations of central government and debt

Central government finances, which had weakened in 2007 due mainly to large project outlays, is expected to worsen in 2008 as a result of the hurricane. The hurricane is expected to lead to a contraction in revenues and growth in expenditure, especially capital spending on reconstruction and rehabilitation, leading to a turnaround from a projected surplus of \$10.7 million equal to 0.5% of GDP to a deficit of \$22 million, equal to 1.0% of GDP. Instead of the projected growth of 3%, current revenue is estimated to contract by 1.8% to \$519 million.

Revenue was expected to be squeezed by an almost 3% decline in taxes on international trade and transactions, as even though imports would have grown significantly, the six months duty waiver offered on furniture and appliances for persons affected would have led to a decline in receipts. Growth in proceeds from taxes on domestic goods and transactions was expected to slow to 6.6% compared with the budgeted 15%, as with a number of businesses affected, and the disruption in the country, collections from work permits and stamp duties were expected to decline. Receipts from the non-coercive head were projected to fall by 2%, reflecting lower returns from sale of goods and stagnant investment revenue.

On the other hand, total expenditure was expected to accelerate, reaching almost 25% of GDP from a budgeted 23% of GDP. Spending was expected to be propelled by a further 5% increase in capital spending, from an already high budgeted growth of 35%. Capital spending would be driven by road and other infrastructure repairs, home construction and repairs and rehabilitation works to affected government properties. Current outlays will also fuel spending, as increased wage costs for clean-up and rehabilitation operations and transfers and subsidies drive up total spending.

Table 23: Cayman Islands Fiscal Operations (CIS millions)

	2003	2004	2005	2006	2007	Pre-Paloma 2008	Post-Paloma 2008
Total revenue	326.2	336.4	426.9	500.4	513.0	528.5	519.2
Current revenue	326.2	336.0	426.9	500.4	513.0	528.5	519.2
Coercive revenue	286.7	303.2	376.3	442.5	448.0	463.1	454.8
Taxes on international trade & transactions	117.6	132.2	171.9	187.0	178.6	178.5	182.2
Domestic taxes on goods & services	146.1	144.8	171.5	193.7	223.2	238.0	229.9
Taxes on property	17.3	22.3	21.4	47.2	37.2	44.7	40.9
Fines	1.3	0.8	0.9	1.6	1.7	1.9	1.8
Other taxes	4.4	3.1	10.6	13.1	7.3		0.0
Non-coercive revenue	39.5	32.8	50.6	57.9	64.9	65.4	64.0
Sale of goods & services	33.8	30.7	49.1	53.8	58.4	61.5	60.4
Investment of revenue	5.7	2.1	4.3	0.1	6.2	3.0	3.0
Other operating revenue			1.6	4.0	0.3	0.9	0.5
Extraordinary revenue			-4.5	0.0	0.0		0.0
Capital revenue	0.0	0.4	0.0	0.0	0.0		0.0
							0.0
Total expenditure	305.2	378.1	430.3	433.1	552.0	517.8	541.3
Current expenditure	283.7	349.2	339.4	384.3	435.4	454.0	474.8
Personal costs	138.9	159.0	163.8	182.6	213.5	212.4	217.8
Supplies & consumables	61.3	88.0	89.5	109.0	101.0	120.2	126.3
Subsidies	58.8	70.4	59.7	66.9	88.1	89.3	96.9
Transfer payments	18.8	24.5	17.0	16.9	23.2	22.0	23.7
Interest payments	5.9	7.3	9.5	8.9	9.6	10.1	10.2
Extraordinary expenses			39.4	7.2		3.0	4.5
Other executive expenses			3.0	2.0		60.8	62.0
Capital expenditure & net lending	21.5	28.9	48.5	39.6	105.9	143.9	150.9
Capital acquisition (now equity investments)	7.7	10.0	40.8	20.5	60.4	33.4	32.6
Capital development (now executive assets)	13.5	19.2	6.7	19.1	45.5	110.5	118.3
Net lending	0.3	-0.3	1.0	0.0	0.0		0.0
Current balance	42.5	-13.2	87.5	116.1	77.4	74.5	44.4
Overall balance	21.0	-41.7	-3.4	67.3	-39.0	10.7	-22.1
Financing	-21.0	41.7	3.4	-67.3	39.0		
Net borrowing	12.4	13.8	27.6	-4.5	35.9	111.9	
Disbursements	136.9	23.3	39.0	10.0	52.3	129.8	
Loan repayments	-124.5	-9.5	-11.4	-14.5	-16.4	-17.9	
Change in cash (minus = increase)	-33.4	27.9	-24.2	-62.8	3.1	-28.5	

Source: ECLAC calculations based on national data.

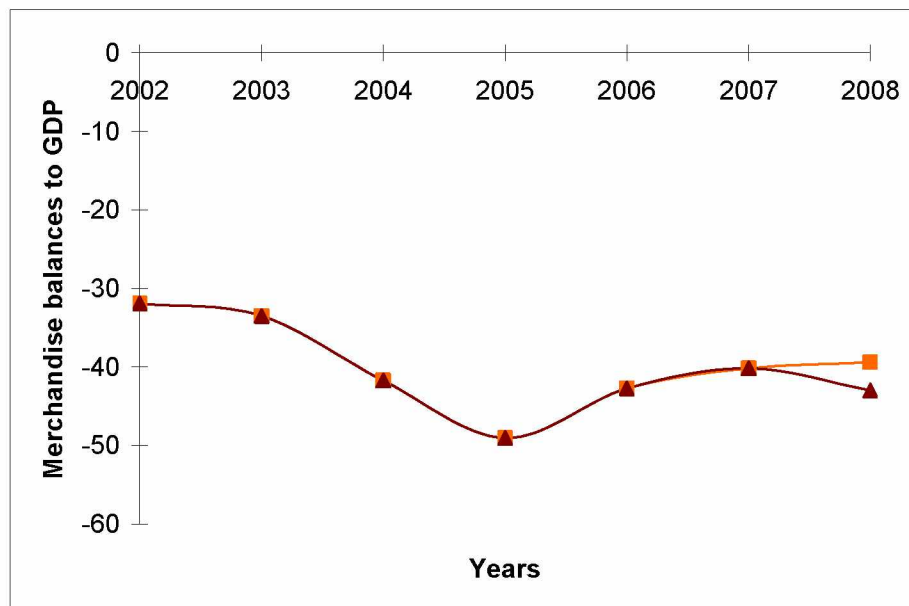
4. Money and banking

Growth in broad money is expected to slow by around 6% as a result of the disaster. The slowdown in real output and reduced income will dampen deposit inflows into the banking system. Meanwhile credit is expected to expand to meet home repairs, purchase of household items and general reconstruction and rehabilitation. Banks that are highly leveraged on the domestic front are expected to draw down on foreign assets to meet the increased loan demand, especially in an already difficult environment that has been affected by the global crisis.

5. Trade and external payments

The structural merchandise deficit of the balance of payments is expected to widen from \$886.3 million to \$938.6 million. Exports are projected to grow by 1% as the bulk of rum and other exports would have been shipped prior to the hurricane. Meanwhile, imports are projected to grow by 6% to \$962.7 million, instead of the 3% projected growth prior to the hurricane. Higher imports included food products and household items for relief and recovery, building materials and capital goods, including light and heavy equipment for reconstruction and rehabilitation.

Figure 12: Merchandise trade balances to GDP for the Cayman Islands Pre and Post Hurricane Paloma



Source: ECLAC, based on official data.

On the services account, visitor arrivals and receipts are expected to post a moderate decline. A number of hotels were damaged leading to cancellation of some bookings. In addition, dive tourism in Little Cayman was affected as the main reef dive site suffered some damage. With the complementary effects of the reduced exports and higher imports, the current account deficit is expected to widen, but should be offset by capital inflows.

D. Short- to medium-term economic challenges and policy options

1. The fiscal stance and challenges

Fiscal management in the Cayman Islands has been largely prudent over the years. The deficit averaged \$15.2 million between 2004 and 2007, with a sizeable surplus generated in 2006. This average deficit was quite modest in an economy that is still developing and needs to undertake infrastructure and social programmes to catalyze socio-economic development. As expected, Hurricane Paloma would exacerbate the deficit as finances would be impinged both by a decline in revenues and accelerated spending on relief, reconstruction and rehabilitation.

In this regard, it would be advisable for the authorities to carefully prioritize reconstruction and rehabilitation spending to ensure the speedy recovery of the economy, while at the same time maintaining the outlook for a sound medium-term fiscal position with small deficit or, rather, even a surplus on the overall account. With the prior uncertain prospects for the economy, the government had requested line ministries to cut spending lines by 6%. This might not be realistic for some ministries, such as works, in the wake of the hurricane; nevertheless management needs to be as prudent as possible to eliminate any unnecessary spending.

Given that the bulk of the damage and losses was in the housing sector, there is need for a prudent mechanism to determine which homeowners can undertake their own repairs and which would need government assistance. The criteria used by the National Recovery Fund is a useful benchmark, by which assistance is based on a means test such as a person's inability to rebuild and their lack of insurance coverage. Such a criterion would help to determine persons who are genuinely in need of assistance, and reduce the costs to the government, thereby containing the fiscal burden.

2. Other policy issues

Real sector activity in the Cayman Islands is confronting a challenging environment in the wake of Paloma and the global economic crisis. There is a need for both short-term and medium- to longer-term measures to tackle these challenges. In the short term, the tourism sector will be affected by both events. Indeed, some analysts are predicting that tourist arrivals to the Caribbean could fall by one third as a result of the global slowdown. Hotel owners and other tourist businesses along with the government should work to bring damaged properties quickly back on stream to provide the perception in the market that the country is fully open for business. In addition, both parties should muster what resources are available to double-down and provide a big marketing push into major markets to maintain tourism arrivals and visitor spending. This should include more creative tourism packages that offer top value for money, without too much discounting that could affect the high value added brand.

In the financial services sector, there is a need to strive to counter the Organization for Economic Cooperation and Development (OECD) measures to further tighten regulations on offshore financial centres such as the Cayman Islands, which are already compliant with very prudential standards.

In the medium to longer term, the tourism product in the Cayman Islands is challenged to continually innovate and keep ahead of market developments to remain competitive and viable. A number of tourism properties, especially smaller ones, were damaged during the hurricane. This adversity should be used as an opportunity to rethink the reconstruction, product niche strategy and marketing arrangements for the tourism sector, particularly for the smaller hotel sector. This category of hotels should rebuild to as high a standard as financing would allow with the future in mind. In addition, they should focus on branding that creates a ready perception in the minds of clientele of product quality expectation, price and ancillary services offered. This should prove a strategic marketing tactic, particularly in the very discriminating tourism market in the wake of the global recession.

Over the medium term, the financial services sector needs to rethink its strategy to attract new areas of business, but at the same time ensuring that prudential regulation and standards are met in these activities.

IV. CONSIDERATIONS TO THE RECOVERY AND RECONSTRUCTION PROCESSES

A. General considerations

One of the noted challenges posed by climate change in the Caribbean will be more frequent and intense weather events. Thus, following the frequency of disasters in the Caribbean it has become apparent that risk management measures are a key element in assisting a country in safeguarding its development achievements and in being able to reduce the extent of social, economic and environmental damage and losses, following events such as that presented by Hurricane Paloma.

Risk management measures include planning, organizing, regulating, and intervening physically and socially so as to reduce the conditions of risk within a particular community. In order to achieve the necessary levels of success, such measures work best when conducted in collaboration between State entities, private sector establishments and communities. Risk management suggests moving towards generating long-term measures that not only mitigate the conditions of existing risk but introduce mechanisms to prevent its reappearance. By taking such action governments can identify and encourage measures that address adaptation to climate change at one and the same time.

In light of the effects of Hurricane Paloma on Cayman Brac and Little Cayman it may be useful for the policy makers of the Cayman Islands to consider the following for action:

- (a) Identify a champion at the highest level for national statistics and develop a team that will ensure consistent data management;
- (b) Improve data collection and management in the post disaster scenario³;
- (c) Develop and maintain an up-to-date inventory of small businesses, particularly in the sister islands. Such an inventory can be developed through periodic surveys of business establishments;
- (d) Private sector telecommunications service providers should be included in the team which immediately follows the first responders, to any island in the Cayman Islands that has been badly hit;
- (e) The use of updated and more robust telephone poles should be encouraged, in order to reduce the vulnerability of this utility to hurricane events;
- (f) It is recommended that the desalination plants in Cayman Brac and Little Cayman be equipped with adequate stand-by generating power and with fuel storage tanks;

³ ECLAC provided training in the area of data collection and management for assessment of damage and losses following a natural disaster three years ago. Many of the trained personnel have since moved on, consideration should be given to train new personnel.

(g) On an ongoing basis at the start of, and throughout, the hurricane season, maintenance personnel should ensure that all stand-by generators are serviced and in working condition, and that tanks are fully stocked;

(h) Assist in the prioritization of action required for the short-term preparation and improvement of conditions before the next tourism season begins. In that process set standards that encourage rebuilding with mitigation, including maintenance schedules;

(i) Consideration should be given for incentives to encourage the establishment and use of a 'business interruption insurance' among small businesses;

(j) Provide greater support for counseling to assist young people and members of other vulnerable groups in coping with the psycho social stresses following the effects of Hurricane Paloma; and

(k) Follow up monitoring of the waste disposal site to reduce negative impact to sensitive wetlands and to safeguard the natural and human environment from the ill effects of waste disposed as a result of Hurricane Paloma.

B. Strategic mitigation approaches to advance sustainable livelihoods and development

(a) Strengthen the mechanisms for inclusion of the sister islands in planning and management of risk reduction processes;

(b) Upgrade and revitalize the tourism product in Cayman Brac in order to better share the burden of employment between government and private sector;

(c) Consider contributing to insurance in the private market for most vulnerable and low income home owners so as to reduce the fiscal burden by spreading the risk in the private sector;

(d) Encourage property owners who can afford it to ensure, and ensure adequately, so they do not suffer serious effects of under insurance;

(e) Design financial mechanisms to encourage reconstruction with mitigation of homes;

(f) Ensure restoration and safeguarding of heritage sites and government buildings;

(g) Where environmentally sensitive areas and natural reserves are adjacent to planned development areas, it is strongly recommended that a vegetative buffer be mandated. This buffer should be a minimum of 30m wide;

(h) Ensure that only buildings that have been designed and/or inspected and approved for such use by a structural engineer should be used as shelters;

(i) Uniform application and enforcement of an approved building code in the design of structures should be encouraged. For private homeowners, it may be appropriate to promote types of hurricane resistant construction that can be adopted relatively easily (i.e. use of hurricane straps, pitch of roof line, etc.);

(j) The planning regulations should be expanded to include the concepts of “set back” and “step-up” for all construction in the coastal zone, in order to reduce the vulnerability of these structures;

(k) All critical facilities and/or all infrastructure being sited adjacent to the coastline should be designed to withstand, at a minimum, the 1 in 50 year hurricane;

(l) Ensure all development planning takes into account the expected impact of climate change and the expected increase in extreme weather events; and

(m) Design mechanisms that build resilience of the poor and reduce vulnerability on the sister islands so as to increase the capacity of the poor and vulnerable to withstand the effects of harsh and extreme weather events. The portion of female headed households may need to be taken into account.



UNITED NATIONS



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