ECONOMIC COMMISSION FOR LATIN AMERICA AND THE CARIBBEAN (ECLAC)
UNITED NATIONS DEVELOPMENT PROGRAMME (UNDP)
PLANNING INSTITUTE OF JAMAICA (PIOJ)

20 October 2004
LC/MEX/L.636
LC/CAR/L.22

ASSESSMENT OF THE SOCIOECONOMIC AND ENVIRONMENTAL IMPACT OF HURRICANE IVAN ON JAMAICA

CONTENTS

The Economic Commission for Latin America and the Caribbean (ECLAC) has made this assessment at the request of the Government of Jamaica in close cooperation with the United Nations Development Programme (UNDP) and with the assistance of the Planning Institute of Jamaica. Several agencies of the United Nations contributed information for this assessment, namely FAO and PAHO.

This report is provided to the Ministry of Finance for its reconstruction planning strategy and to contribute to identifying the financial needs and implication for the country.

The assessment was made following the standard ECLAC methodology for the socioeconomic and environmental assessment of disasters (ECLAC, 2004). The mission comprised the following experts and consultants:

- Ricardo Zapata (ECLAC), Focal Point on Disaster Evaluation, overall coordination;
- Roberto Jovel (UNDP), senior consultant in charge of technical supervision, and assessment of productive and infrastructure sectors;
- Esteban Pérez (ECLAC Sub regional Headquarters for the Caribbean), macroeconomic analysis;
- Asha Kambon (ECLAC Sub regional Headquarters for the Caribbean), social sectors and gender perspective;
- Alicia Acosta (ECLAC Sub regional Headquarters in Mexico), agricultural sector;
- Michael Hendrickson (ECLAC Sub regional Headquarters for the Caribbean), government finances;
- Stephen Hodges (UNDP consultant), infrastructure;
- Eleanor Jones (UNDP consultant), environmental assessment; and
- Sybil Rickets (UNDP consultant), livelihoods.

SUMMARY

The mission was made at the request of the Jamaican Government, undertaken with the UNDP with a group of multi-sectoral, inter-institutional group of experts and consultants[1] that assessed the damage following ECLAC's methodology for the evaluation of the socio-economic and environmental impact of disasters[2] and prepared a report with the assistance of the Planning Institute of Jamaica. The report was presented on 19 October 2004 to the Minister of Finance for their consideration in organizing the reconstruction process, establish additional resources needed for the country and adopt mitigation measures. The issue of appropriate disaster reduction, risk management and the use of risk transfer instruments were discussed with national authorities.

Hurricane Ivan was one of a series of very strong, extreme climatic events that hit the Caribbean Basin in 2004, affecting more than a dozen countries during this year's hurricane season. Such events have exposed the different degrees of readiness, response and resilience of countries and states in the Caribbean region, exemplifying how vulnerability in the face of recurrent hazards varies greatly in accordance with the level of their development. Resilience to these events and sustainability are linked firstly to specific environmental conditions as well as to organizational institutional and economic policies.

Countries and states affected by Atlantic tropical systems ranging from tropical storms and depressions to category five Hurricanes (Saffir-Simpson scale) include the US state of Florida, the island of Cozumel in Mexico, the islands of the Bahamas, Cayman Islands, Barbados, Grenada, Tobago and Hispaniola with disparate economic and social effects in Dominican Republic and in Haiti. The cluster of events in 2004 talks strongly to the link between development and risk and disaster management where appropriate response and management of emergency are positively illustrated (the case of Cuba), minor global impact on the national economy with relevant local and fund allocation consequences (Florida and the depletion of FEMA's budget), total impact of a major event on a small island development state (Grenada) and spillovers of localized damage to the total economy both at the national level (Jamaica and Dominican Republic) and regional level (the Caribbean as a whole where event though not all island nations and states and governments had a direct hit, the whole of the region is exposed to indirect and tertiary effects (in terms for example of insurance costs, reassessment of the risk for investment, flows of tourism, etc.).

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[1] Ricardo Zapata (ECLAC), Focal Point on Disaster Assessment and overall coordinator; Roberto Jovel (UNDP consultant), technical supervision and sectoral analyst for infrastructure and productive sectors; Esteban Pérez, macroeconomist, Asha Kambon, social sectors analyst and Michael Hendrickson, sectoral analyst and government finances from ECLAC Subregional Headquarters for the Caribbean; Alicia Acosta, agricultural analyst from ECLAC Subregional Headquarters in Mexico; Eleanor Jones, Environment, David Smith, Tourism, Stephen Hodges, Infrastructure, and Sybil Ricketts, Livelihoods UNDP consultants.

[2] ECLAC (2003); see www.eclac.cl/mexico under heading of "Disasters".

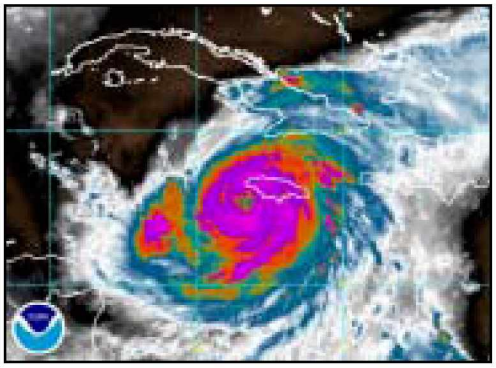
The Jamaica situation after hurricane Ivan points to an event that while being geographically limited in scope affected in different ways to whole of the country. The event's direct damage and indirect losses amount to 8% of the country's current GDP in 2003 (almost 36,000 million Jamaican dollars or 580 million of US dollars). More seriously the disasters will reverse the recuperation growth trend the country had been experiencing since 2002 as this was expected to be the third year of sustained growth at a rate of over 2.6% and could only grow at 1.9 given the event's consequences. Although tourism sector damage will probably not imply a major loss the expected dynamism will be slightly reduced and the mining exports will only marginally be affected (due to the diminished exports at the time of the hurricane that also entailed slight damage to port and docking facilities), the agricultural sector will experience a more severe setback since its already anticipated small decline will mean a further dip of 5%. In the external sector the current account sector will be slightly above the previous year level instead of decrease and the offsetting factors of financial flows and remittances, additioned now by insurance payments will not be able to neutralize it. In the fiscal account the current expenditure was incremented to cover for the emergency and humanitarian assistance and the increased capital expenditure for the reconstruction process in the remainder of the year has been estimated not to exceed a third of the emerging needs. This would allow maintaining the current year's deficit reduction goal. An additional positive element is that the estimated growth path was below the actual performance during the first half of the year and the deficit was also under the expected one on the basis of the first three quarters.

I. INTRODUCTION

1. Description of the event

Hurricane Ivan was formed as a tropical depression just off the coast of Africa on 2 September. It followed a westward direction, getting stronger, and became a tropical storm on the following day. By 5 September it had become a full-fledged hurricane, and continued its path towards the Caribbean where it eventually affected many island States. It reached the vicinity of Jamaica on 10 September, with category four winds (See map at right).

The hurricane followed an irregular path approaching the southern coast of Jamaica, and at 11:00 pm on 10 September was located at a point approximately 40 kilometers South from Hellshire Point, in the Parish of St Catherine, the closest position ever to the island. In the following hours, the eye of the hurricane seemed to be nearly stationary off the country's coast.



The initial effects of the hurricane were felt since 9 September in the form of showers and thundershowers in the East (Portland and St. Thomas) and in the Southwest (Westmoreland and St. Elizabeth) of the country. The following day rain showers were covering the entire country, with increased intensity in the northwest. On 11 September, as the hurricane passed closest to the island, strong sustained winds of up to 180 kilometers per hour occurred in the southern coastal areas. Rainfall totals during the period 10 to 12 September were highest in several locations of Clarendon, St. Catherine and in Kingston, as indicated in table 1-1, that shows preliminary data provided by the Meteorological Service.

As it can be observed, rainfall exceeded several times the normal or average depth for the locations mentioned above, which undoubtedly resulted in high storm runoff in the rivers draining the watersheds. When the carrying capacity of river channels was exceeded, extensive flooding of adjacent lands occurred. Then, too, the combination of saturated soils from previous events [1] and the intensive rains caused many land slippages that destroyed or cut roads, bridges and drainage culverts, as well as other physical infrastructure and housing.

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[1] Hurricane Charley passed south of the island on August 10, 2004, and also brought intensive rains and flooding.

Table 1-1

Preliminary rainfall data in selected locations

Parrish, Location	Rainfall (millimeters)				30-year Average
	10th	11th	12th	Total	
Clarendon					
Beckford Kraal	240.5	182.2	18.5	441.2	131
Trout Hall	416.1		17.3	433.4	211
St. Catherine					
Enfield	300.0	130.0	5.4	435.4	104
Worthy Park	258.0	408.0	15.4	681.4	109
Kingston/St. Andrew					
Palisadoes	286.5	131.8	…	418.3	107

Wind gusts as high as 340 km/h were recorded at selected points within the higher elevations of the island. Storm waves and surge were reported in excess of 20 meters along the cliff in the vicinity of Rick's Café, West End Negril. Wave heights along sections of the east (Manchioneal, St Thomas) and south coasts were reported between 2 and 8 metres.

The hurricane continued its northwest direction and went on to affect other countries in the following days. Of special importance were damage and losses imposed on the State of Florida. It is to be noted that initial projections indicated that Ivan might hit head on the Kingston area, in which case its winds and storm surge would have made considerable more damage.

2. Emergency actions and expenditures

Given that hurricane Ivan impacted relatively heavily on the poor and vulnerable, government agencies and private organizations had to undertake significant emergency relief operations. The Emergency Operations Center of the Office of Disaster Preparedness and Emergency Management began operations on 9 September, especially in the most heavily affected areas, including Clarendon, St. Elizabeth, and Westmoreland, by evacuating many persons from vulnerable areas. The following morning, the National Emergency Operations Center was activated to try and cope with the immediate effects of the disaster. The United Nations Disaster Assessment Team was in place even before the arrival of the hurricane, which fact made local operations more effective and timely.

Aerial survey were undertaken to ascertain those areas that required priority attention in the relief phase. Food and water, immediate health care, as well as the most essential goods were provided to those housed in temporary shelters. Then, several assessment teams – both local and internationally supported – were sent to the field in order to collate and collect data on damages and emergency needs around the entire island. The OFDA rapid damage assessment methodology was used for the latter.

Emergency assistance flowed promptly and generously to the most affected. Government and private sector sources made contributions to support these humanitarian requirements. It has been estimated that an amount of J$ 94.9 million, taken from the appropriate government institutions, was used for these relief activities. In kind and cash contributions from abroad, whose value has been estimated at J$ 182.7 million provided additional and much needed support from the international community. Thus, a total of J$ 277.6 million (or its equivalent of US$ 4.5 million) was used to meet the emergency requirements arising from the hurricane.

By 11 October, a month after the disaster occurred, only 310 persons remained in shelters, down from a peak value of 1,000 families in the days immediately after the hurricane.

Table 1-2

Summary of emergency expenditures following hurricane Ivan
as of October 11, 2004
(Jamaican Dollars)

Agency	Relief Operations	J$
National Solid Waste Management Authority		
Clean up operations		
Region	Trips	
NEPM	833	5131000
SPM	171	4065106
MPM/NERU	1516	12543200
MPM/NERU	4500	33070000
Subtotal	7,020.0	54,809,306.0
Estimated outstanding balance		12,202,250.0
Estimated outstanding balance		
Landfill cover material supplied by NWA		20,000,000.0
ODPEM	Household items	
	and materials	5,863,590.6
Post Ivan Clean up	Equipment	
	and Labourers	2,070,000.0
Subtotal		94,945,146.6
Foreign Emergency Assistance		
Goods and monetary assistance		182,678,144.4
Total Emergency Relief Expenditure		277,623,291.0

Source: ECLAC, based on official data.

3. Affected population

The most recent population and housing census of 2001, reported that the population of Jamaica was 2.6 million persons spread throughout the country's thirteen parishes. When Ivan struck the

island on 10 September 2004, the projected population was 2.65 million. [2] Fourteen per cent (14%) of the total population or some 369,685 persons was directly affected by the natural disaster. Many of these persons were found in the direct path of the hurricane in Clarendon, St. Elizabeth, Westmoreland, Kingston and St. Andrew and Manchester. The following map has been prepared by PIOJ to show the location of the affected communities.

Seventeen persons lost their lives as a direct result of the hurricane, eight from Kingston and St, Andrew, six from Clarendon (all from Portland Cottage), two from St. Catherine and one from Manchester. Deaths occurred due to collapsing roofs, mudslides, persons being swept away by floodwaters, or due to fallen trees. There were another fourteen deaths indirectly related to the hurricane. Nine of those deaths occurred in KSA, two each were reported from St. Elizabeth and St. Ann and one from Hanover.

At the beginning of October there were at least 38 shelters still opened island wide housing some 493 persons. The majority of these were in the parishes of Clarendon, Manchester, St. Elizabeth and St. Catherine, where a total of 23 shelters with 350 persons were still opened as of October 2, 2004

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[2] As reported by Government of Jamaica based on the *Demographic Statistics 2003*.

Table 1-3

JAMAICA: INCIDENCE OF POVERTY BY REGION (%)
FOR SELECTED YEARS, 1992 TO 2002

Region	1992	1995	1998	2001	2002
KMA	18.8	15	8.6	7.6	10.4
Other Towns	29.9	22,8	13.4	13.3	18.7
Rural Areas	42.2	37	19.5	24.1	25.1
Jamaica	33.9	27.5	15.9	16.9	19.7

Source: Jamaica Survey of Living Conditions

The Jamaica 2002 Survey of Living Conditions reported that the incidence of poverty in Jamaica stood at 19.7%, which represented a marked reduction from 1992, as represented in Table 1, when the incidence of poverty was reported to be 33.9%. Poverty combined with other negative social conditions increases the social vulnerability of different populations and therefore, in the wake of a natural disaster such as hurricane Ivan, it becomes imperative to make known the social conditions of the most affected population so that accurate support and assistance can be provided. This should allow for strengthening programmes that address the resilience of persons from among the affected population. It is readily agreed that the impact of disaster vulnerability is deeply embedded in the social circumstances of the affected population. The incidence of poverty in Jamaica is highest among those persons living in the rural areas, 25%, and decreases among those living in other towns 18.7%, and is yet lower for those living in the Kingston metropolitan Area (KMA), 10.4%. It was not surprising therefore, that the hurricane took its heaviest toll among persons who lived in the rural areas.

Information provided on the impact of hurricane Ivan on the sustainable livelihood patterns of some of the affected groups point to two groups for whom livelihoods and assets were significantly affected by the passage of hurricane Ivan. [3] These were farmers and fisher folk. The fisher folk could be found along the southern coastline in Clarendon, Manchester and St. Elizabeth, many of whom lost boats, engines, nets and fish pots, the basic tools of their trade in addition to their housing.

The farmers who are located on the mountain slopes of places such as Bog Hole in northern Clarendon and Cave Valley in St. Ann, lost crops and seeds.

Women from both communities lost stocks in small shops and produce from their backyard gardens. The response to the disaster has been varied with some communities possessing traditions of 'len han' [4] and supporting each other in the rebuilding efforts, while others are unable to make the most of the strengths of their communities in order to improve their conditions.

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[3] Information provided by Ms. Sybil Ricketts, UNDP Consultant examining impacts on sustainable livelihoods in Jamaica following hurricane Ivan.

[4] 'Len Han' is a form of community self help based on each person helping the other or lending a hand.

4. Vulnerability of Women and Children

In 2002 approximately 45.5% of the households surveyed reported females as the head of household. Female-headed households were highest in the KMA (50.8) followed by Other Towns (45.6%) and lowest in the Rural Areas (40.1). As so often is the case in times of crisis, such as natural disasters, the most vulnerable becomes the most affected. An examination of the data regarding those persons who have reported damages to the Ministry of Labour indicated that female-headed households were over represented in each category of type of damage reported. Of those household heads who reported their houses completely destroyed, 48% were female, while those who had reported severe damage and minor damage 57% and 54% were female heads of households, respectively. The SLC also reports that one of the characteristics of female headed households in Jamaica is that there is often a higher presence of children in female-headed households (73.8%) compared with those headed by males (64.9%) and a higher proportion of other female adults.

Hurricane Ivan may have impacted many people across the island but the group that seems to be most affected may be Jamaica's women and children. An outbreak of gastroenteritis in both the under and over 5 year old age groups was reported two weeks following hurricane Ivan and the National Surveillance system noted a marked increase in the number of accidents such as fractures, lacerations from machete or zinc and nail puncture wounds among the same age group. In addition, the Ministry of Health has estimated that some 12,500 children may be at risk for folic acid deficiency due to the expected shortage of fruits and vegetables caused by hurricane Ivan, which will be available to pregnant women.

The male labour force participation in 2003 was consistently higher (71.4%) for men than for women (53.2%), and the unemployment rate for women (17.6 %) was almost twice that of men (9.7%). [5] With the passage of hurricane Ivan and the destruction of many livelihoods, coupled with the expected period of delay before the productive sectors are able to operate at full capacity, women's ability to meet the needs of themselves and their families will become an even more challenging process. The vulnerability of children in Jamaica derives from their living in poor families either in remote rural areas or over-crowded inner city slums. It has been argued that children living in households dependent on female wage-earners are more vulnerable to poverty because women face higher rates of unemployment than men and are usually paid less than men, even for the same work. [6]

Following natural disasters evidence points to differing responses to the crisis by both men and women and of people in different age groups and socio-economic backgrounds. There has been little reporting on the possible psychosocial trauma, which the members of the society may have experienced, or of support provided.

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[5] Economic and Social Survey Jamaica 2003

[6] *Jamaican Children and Their Families: A Situation Assessment and Analysis 1999-2000.* UNICEF and PIOJ.

II. SOCIAL SECTORS

Hurricane Ivan very negatively affected the living conditions of the population of Jamaica, in varying degrees in the different social sectors. The impact on these sectors is described below.

1. Housing

a) Private housing

Damage to the housing sector was considerable. A total of 102,000 households reported damage to property to the Ministry of Labour and Social Security, [1] which is equivalent to 14% of the total housing stock of the country. Table 2-1 provides details of the households affected by hurricane Ivan by parish.

Table 2-1

Number of assessed affected households by Parish

Parish	Estimated HHs 2004	Affected HHs assessed	Proportion of HHs affected	Affected HHs processed	HHs totally destroyed	HHs Severely damaged	HHs Suffering Minor damage
Kingston & St. Andrew	177436	8710	0.09	5789	526	4532	731
St Thomas	25205	5836	0.06	3744	318	2580	846
Portland	22028	3100	0.03	1987	130	1324	533
St Mary	30481	6604	0.07	4716	353	3397	966
St Ann	46040	5470	0.05	3515	211	2774	530
Trelawny	19919	1155	0.01	364	56	284	24
St James	48221	6110	0.06	3321	288	2712	321
Hanover	18186	5502	0.06	4374	475	3433	466
Westmoreland	38194	11474	0.11	4334	443	3162	729
St Elizabeth	39891	12068	0.12	5922	414	4277	1231
Manchester	51497	7599	0.08	5436	458	4224	754
Clarendon	65442	19217	0.19	11739	1298	9537	904
St Catherine	131395	7070	0.07	6190	654	4735	801
Total	713935	99915	1.00	61431	5624	46971	8836

Source: ECLAC, based on figures provided by the Ministry of Labour and Social Security; Estimated HHs (households) for 2004 based on average household size of 3.7 and 2001 Population Census figures.

[1] The Ministry of Labour and Social Security possess a database as of October 15, which included 102,000 claims for damage. Of those claims 99,915 had been processed.

Of the households assessed, 61% had been processed providing details of extent of damage. Nine percent (9%) of those processed, or 5,624 households, were so severely damaged as to require complete reconstruction. More than a fifth of these homes could be found in areas such as Portland Cottage in the parish of Clarendon, and in the parish of St. Catherine. Some 46,971 homes or 75% were assessed as being severely damaged, with roof and structural damage, and another 14% or 8,836, as requiring minor repairs.

In terms of housing, as presented in Table 2-1, the five most affected parishes, in rank order are Clarendon which had 19% reported damage, St. Elizabeth 12%, Westmoreland 11%, Kingston and St. Andrew 9% and Manchester 8%. Housing that was situated in low lying areas near the sea shore, on riverbanks and on steep slopes proved to be the most vulnerable.

In terms of the housing stock, significant proportions (60%) of Jamaican households own their own homes. Ownership of dwellings is more prevalent, 70%, in the Rural Areas compared with Kingston Metropolitan Area (KMA), 47%, and in Other Towns, 57%. [2] The housing stock is relatively sturdy with 58% of dwelling structures being built of block and steel and 26% of wood. The regional distribution for 2002, suggests that block and steel is the preferred construction material for dwellings in the KMA accounting for 61% of the units, with its use accounting for 58% and 53% in Other Towns and Rural areas respectively. The majority of dwelling units in Jamaica, 82%, are categorized as separate/detached houses. In the rural areas, 93% fell into this category, in the Other Towns, 87% and the KMA 60%. Unfortunately most of the damaged properties were not covered by insurance, leaving the burden for repair and replacement that of the owner. See maps produced by the PIOJ for a spatial distribution of the characteristics of the housing stock in the most affected areas by parish, in the following pages.

[2] Jamaica Survey of Living Condition 2002.

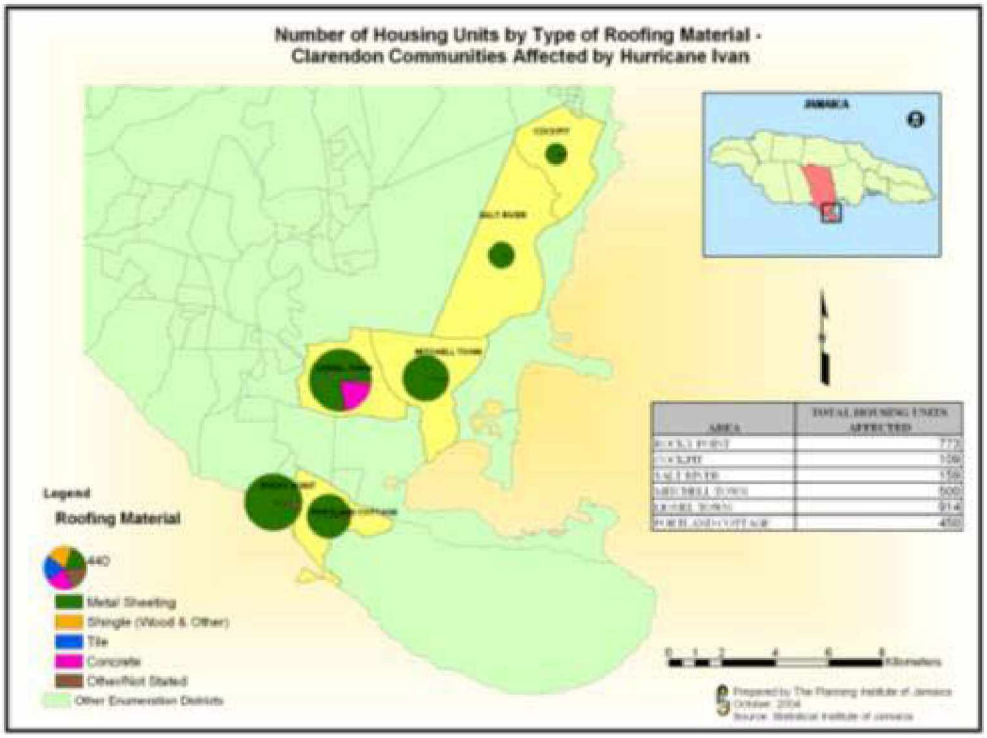
Table 2-2

Damage and losses caused by hurricane Ivan
on the housing sector of Jamaica
(Million Jamaican Dollars)

	Damage and losses			Reconstruction costs	Imported component
	Total	Direct	Indirect		
Total	**11,163.3**	**10,474.2**	**689.1**	**13,998.6**	**3,666.0**
Dwellings	9,151.1	9,151.1			3,202.9
House furnishings	1,323.1	1,323.1			463.1
Removal of debris	89.1		89.1		
Relocation costs	600.0		600.0		

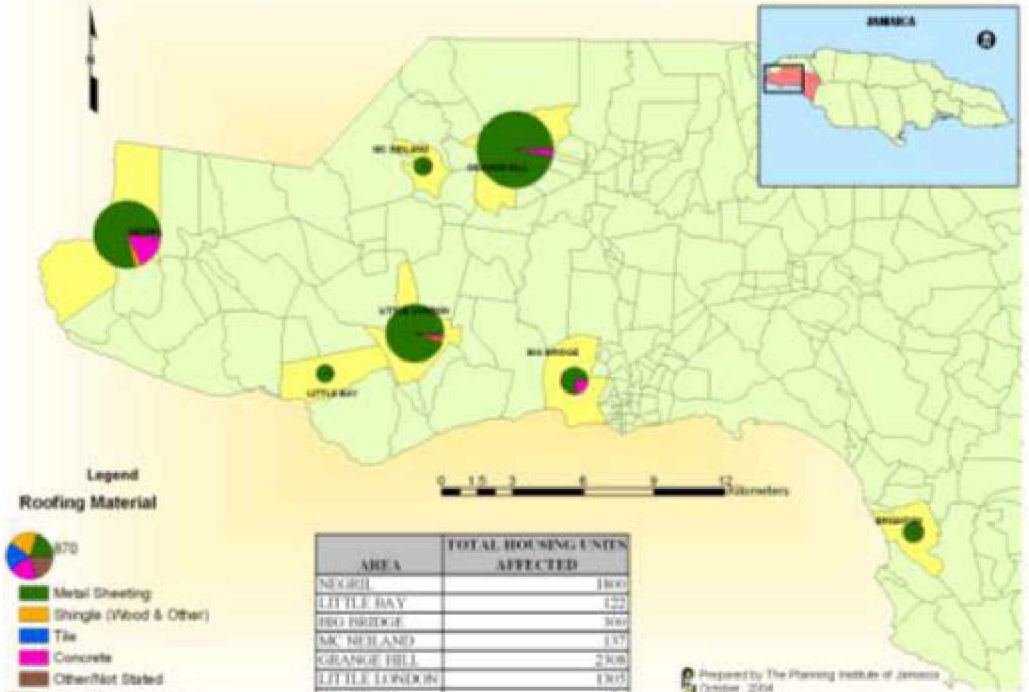
Source: Estimates by ECLAC on the basis of official information.

Total damage to the housing sector amounted to J$ 11,163 million. Of this figure, direct damage to dwellings and furnishings, accounted for some J$ 10,474 million or 93% of the cost. The indirect loss represents the cost of removal of debris and the relocation of certain communities [3] such as Rocky Point and Portland Cottage that were in extremely vulnerable environments. The indirect loss was thus estimated at J$ 689 million.

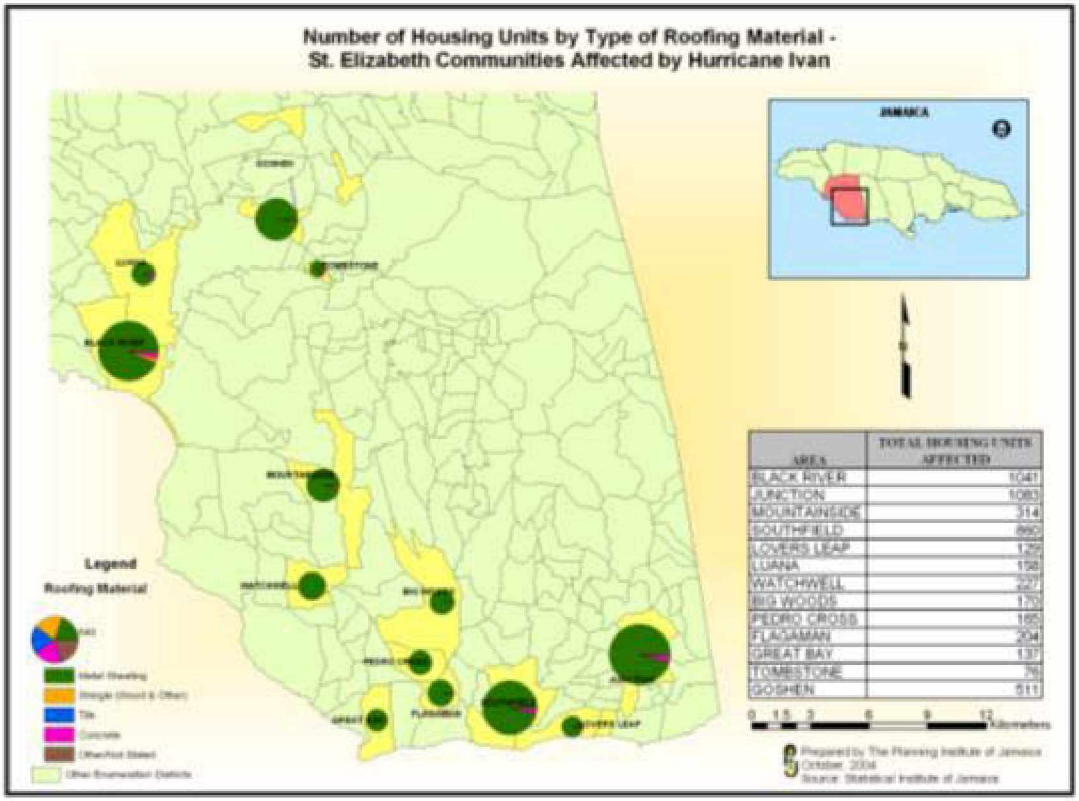


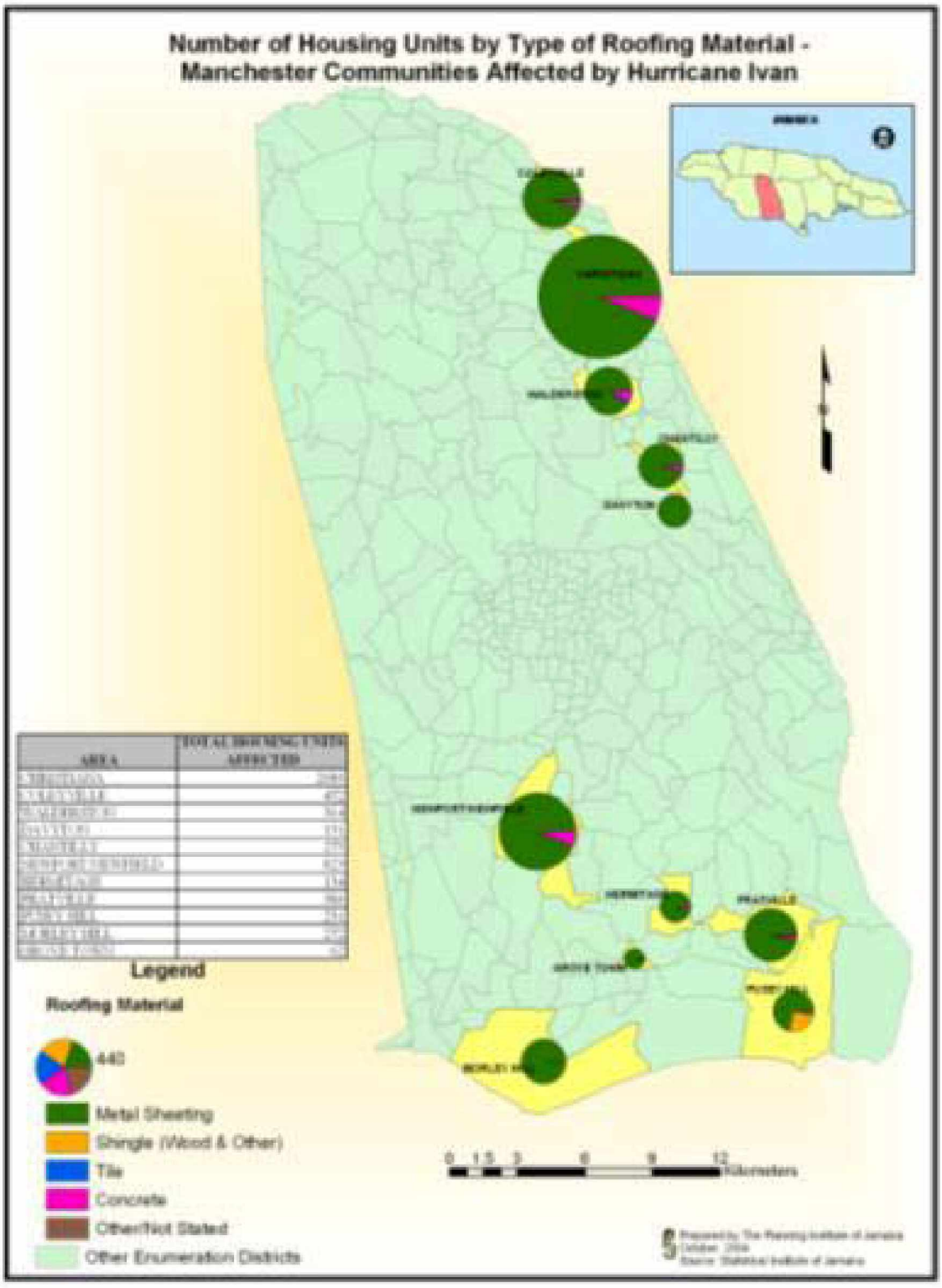
[3] This figure includes only the cost of land and services to be provided, as the cost of housing and furnishings is already accounted for as direct cost.

Number of Housing Units by Roofing Material - Westmoreland Communities Affected by Hurricane Ivan



AREA	TOTAL HOUSING UNITS AFFECTED
NEGRIL	1800
LITTLE BAY	122
BIG BRIDGE	300
MC NEILAND	137
GRANGE HILL	2308
LITTLE LONDON	1305
BRIGHTTON	171


Number of Housing Units by Type of Roofing Material -
St. Elizabeth Communities Affected by Hurricane Ivan
JAMAICA
Legend
Roofing Material
Metal Sheeting
Shingle (Wood & Other)
Tile
Concrete
Other/Not Stated
Other Enumeration Districts
AREA
TOTAL HOUSING UNITS AFFECTED
BLACK RIVER 1041
JUNCTION 1083
MOUNTAINSIDE 314
SOUTHFIELD 860
LOVERS LEAP 129
LUANA 158
WATCHWELL 227
BIG WOODS 170
PEDRO CROSS 165
FLAGAMAN 204
GREAT BAY 137
TOMBSTONE 76
GOSHEN 511
0 1.5 3 6 9 12 Kilometers
Prepared by The Planning Institute of Jamaica
October 2004
Source: Statistical Institute of Jamaica



Reconstruction with some required improvements to reduce vulnerability is a larger figure and amounts to J$ 13,998 million as can be seen in table 2-2.

b) Churches and other buildings

Many churches were severely affected by Hurricane Ivan. A preliminary estimate based on information provided by the Jamaica Council of Churches indicated that more than 162 churches of different denominations were damaged, some severely and a few completely destroyed. The main incidence of damage entailed the removal or compromising of roofs that led to considerable damage to furniture, equipment and other contents due to the action of rain. However, a number of churches also suffered structural damage, which might necessitate important outlays on improved reconstruction for them to withstand future disasters. Churches in areas prone to landslides were particularly at risk for structural damage, as earth movements undermined the integrity of walls and foundations.

Damage assessments are presently underway, and will surely indicate that direct costs will exceed several hundreds of million dollars. A partial estimation of J$ 130.5 million has been made so far, that does not include furnishings and religious images. Since many churches were uninsured or underinsured, they will have to raise the funds for restoration and reconstruction. With the loss of farm and other production in many rural areas, the need to fund repairs to damages homes, it is difficult to see how church members will be able to reconstruct their churches in the medium term without external assistance.

A number of historic churches that was or could have been designated as heritage sites have sustained significant damage. Although the Jamaica Council of Churches was in the process of conducting an audit of these churches to guide restoration work, it is anticipated that the outlay for such work will now have to be increased by a substantial amount.

Table 2-3

Partial information on Churches damaged by hurricane Ivan

Denomination	Number of churches affected	Type of damage	Estimated cost of reconstruction
AME	13	Roofs, furnishings	7.5
Anglican	...		1.0
Baptists	40		40.0
Brethen	…		…
Ethiopian Orthodox	…		…
Methodists	78	Structural, roof, furnishings	42.0
Moravians	22		40.0
Quakers	2		…
Roman Catholic	7		…
Salvation Army			…
United Church	72		…
Total	162		130.5

Source: ECLAC based on data supplied by the Council of Churches and individual churches.

In addition to the churches, many government buildings sustained damage in their infrastructure, furnishings and stock of materials. These include facilities in the Ministry of Security (Jamaica Defence Force, Department of Corrections, and Police Stations), the Ministry of Justice (Court Houses), and MLGCDS (including Infirmaries, markets, Parish Council Administrative Buildings, Women's Centers and Fire Stations). Their total damage costs amount to J$ 824.9 million.

2. Education and culture

a) Schools

Damage to the school sector caused by hurricane Ivan was widespread as can be seen from table 2-4. Of the 1,004 schools distributed throughout Jamaica's thirteen parishes, [4] 33% (333) suffered damage. Eight of the thirteen parishes had 30% or more of their schools damaged by Hurricane Ivan. The damage ranged from the removal of a few sheets of roofing to complete destruction of the school plant, which was reported in two instances. Of those schools which were damaged some 90% required repair.

Table 2-4

Jamaica: Damage to schools by parish

Parish	Total no. of schools	Total number damaged	Percent damaged	Number Requiring repair
KSA	165	28	0.17	28
St. Thomas	48	13	0.27	13
Portland	53	23	0.43	23
St. Mary	71	17	0.24	17
St. Ann	81	28	0.35	28
Trelawny	38	9	0.24	9
St. James	56	24	0.43	24
Hanover	40	30	0.75	30
Westmoreland	65	25	0.38	25
St. Elizabeth	87	42	0.48	11
Manchester	73	27	0.37	26
Clarendon	105	33	0.31	33
St. Catherine	122	34	0.28	34
Total	**1004**	**333**	**0.33**	**301**

Source: ECLAC, based on estimates provided by the Ministry of Education, Youth and Culture.

[4] Jamaica has a number of school types: Infant; Primary & all –Age; Primary and Junior High (grades 1-6); Primary and Junior High Schools (grades 7-9); Secondary High Schools (with grades 7-11); Secondary High Schools (with grades 12 & 13); Comprehensive High Schools; Technical High Schools; Agricultural High Schools; and Special Education Schools/Units

Geographically, the available data suggests that a majority of schools in Hanover, suffered damage as 70%, or 30 out of 40, schools were damaged by the passing of hurricane Ivan. The parish of St. Elizabeth was also hard hit as nearly 50%, or one out of two schools, in the parish reported damage. In no parish did 15% or less, of schools report damage. One school each in St. Elizabeth and Manchester, suffered complete destruction. Hurricane Ivan was able to cause harm to the school system so effectively, due to the age of the school stock, which in many instances, was over 50 years old and due to the low levels of maintenance. Despite these constraints, many schools reported minor damage. Facilities used as agricultural training sites attached to secondary schools also suffered damage, amounting to J$ 128 million due to hurricane Ivan. Direct damage to school buildings accounted for J$ 329.8 million, or 40% of the direct damage to the sector. Table 2-6 provides details of damage to the sector.

Approximately one third of the students enrolled in the public education system or 204,000 children were affected by hurricane Ivan. [5] Some 18% of the school population attended pre-primary school, 42% primary school, 31% secondary, 5.4% post-secondary and 4% tertiary. Roughly 97% of Jamaica's student population is enrolled in the public education sector. [6] Despite the damage to school plants (J$ 329.8 million) and furnishings which amounted to J$ 285.6 million, the Ministry of Education, Youth and Culture, took many creative actions to ensure that children's education would proceed with the least disruption. Shift systems were initiated to allow as many children as possible access to teacher instruction. The GSTAT (Grade Six Achievement Test) administered to approximately 48,000 grades six students, was expected to be conducted at the usual date during the current school year.

Schools also sustained indirect damage, amounting to J$ 10 million dollars from use as shelters. In the immediate aftermath of hurricane Ivan most schools were occupied as shelters but arrangements were made to ensure that families were quickly returned to their homes. This quick movement of families out of schools resulted in minor damage to the school plant. Some ten schools are still in use as shelters across the country.

b) Historical Sites

There was extensive damage to historic sites caused by the natural disaster. Many of these sites could be described as fragile and requiring extensive renovation work prior to hurricane Ivan. The natural event however, exacerbated the already delicate nature of these sites causing structural cracks to become more pronounced; boundary walls to suffer damage due to fallen trees; the loss of shingles to roof; and the undermining of foundations, particularly in the case of

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[5] The Economic and Social Survey Jamaica 2003 indicated that the total number of students enrolled in the pre primary, primary and secondary levels amounted to 673679.

[6] Jamaica Survey of Living Conditions 2002.

the historic Iron Bridge in Spanish Town, in the parish of St. Catherine. Table 2-5 provides details of the sites and the cost of damage. The total cost of damage to historic sites was J$ 51.5 million. Indirect losses were expected to be incurred from the delay in making these sites available as part of the offerings of the heritage tours product, amounting to J 2 million, as shown in detailed form in table 2-5.

Table 2-5

Damage and losses in historical sites
(Million Jamaican Dollars)

Location	Name of site	Direct damage
Spanish Town	Historic Square	12.0
	Barracks building	
	Manchester House	
	Historic Iron bridge	
Port Royal	Naval cemetery	32.0
	The Old Coaling Wharf	
	The Historic Naval hospital	
	The H Block and Ft. Charles	
Seville	Taino Hut	7.5
	African Hut	
	Caretaker's cottage	
	HQ House and Annex	
Total		51.5

Source: ECLAC, based on information from the Jamaica National Heritage Trust.

c) Summary

Total damage and losses to the education and culture sector amounted to J$ 806.9 million. Direct damage accounted for some 98% of total damage and indirect losses the remaining 2% (See table 2-6).

Table 2-6

Damage and losses sustained by the education and culture sector
(Million Jamaican Dollars)

Item	Damage and losses			Imported component
	Total	Direct	Indirect	
Total	**806.9**	**794.9**	**12.0**	**278.2**
School buildings	339.8	329.8	10.0	
Furnishings	285.6	285.6		
Agricultural training facilities	128.0	128.0		
Historical sites	53.5	51.5	2.0	

Source: ECLAC, based on information from the Ministry of Education and the Jamaica National Heritage Trust.

3. Health sector

Damage to the health sector was acute. Of the 343 health centres island wide, 124 (36%) suffered some degree of damage. Table 2-7 below details the cost of the damage to the health centres and their furnishings by parish. For many health centres it was roof and windowpane damage, for others, it was moderate to severe structural damage. The Ministry of Health has been able to place back into operation 93% (319) of the centres, while some 7% (24) remain inoperable due to the severity of their damage, lack of essential utilities or road access. Of the 23 public hospitals, 21 (91%) suffered damage mainly to roofs. Eight or 35% are unable to provide full service due to damage. Among the private hospitals, three out of seven reported some degree of damage. All are providing full service.

Table 2-7

Damage to health centers and their furnishings
as a result of hurricane Ivan
(Million of Jamaican Dollars)

Parish	Number of health centres	Cost of Damage	Cost of Damage to Equipment and Supplies
Kingston & St. Andrew	18	5.3	0.7
St Thomas	12	10.3	
Portland	2	0	1.0
St Mary	4	0.2	
St Ann	3	1.4	
Trelawny	8	12.0	0.1
St James	8	1.7	
Hanover	9	8.1	
Westmoreland	8	5.7	
St Elizabeth	15	12.3	4.0
Manchester	16	5.2	1.9
Clarendon	13	16.3	2.4
St Catherine	8	6.8	
Total	**124**	**85.3**	**10.1**

Source: ECLAC, based on figures from the Ministry of Health.

Total damage and losses to the health sector amounted to J$ 758.3 million dollars. Direct damage, including hospitals and health centers, accounted for J$ 718.2 million, of which 16% (J$ 39 million) are damage to equipment and supplies. Although the loss of vaccines, accounted for a negligible component of the cost of direct damages, J$ 283,185, such loss could present a serious set back to the governments' health protection programme.

Public provisioning in the area of primary and secondary care is of critical importance to maintaining an optimal health status of the Jamaican population. The Jamaica Survey of Living Conditions, 2002, reported that of those persons seeking health care in all of Jamaica, some 52% utilized the public sector. Use of the public sector health facilities was high (73%) among the poorest quintile, and significant (37%) among the wealthiest, as 63% of the wealthiest quintile was reported to have used private sector facilities. Of all the persons who sought health care and required hospitalization, almost all were hospitalized in public hospitals. Females tended to utilize the public sector health facilities more than their male counterparts. Shortage of expendable income among the female population who have a lower participation rate in the labour force than their male counterpart and responsibilities for single headed households, may be factors in minimizing their use of private facilities. A small proportion of the Jamaican population (14%) possess health insurance coverage, and in the rural areas this proportion is smaller still, with an average of approximately 8%, having coverage. Damage to the health sector therefore could deprive a significant proportion of the Jamaican population, and particularly those among the poorest, of the health care that they require.

Table 2-8

Damage to hospitals arising from hurricane Ivan,
by regional health authority
(Million Jamaican Dollars)

Regional Health Authority	Damage to Structures	Damage to Equipment and Supplies
Western	15.8	N/A
South East	37.8	14.1
Southern	50.0	12.8
North East	5.4	2.3
Total	**108.9**	**29.1**

Source: ECLAC, based on figures provided by the Ministry of Health N/A: Not available.

Indirect losses to the health sector amounted to J$ 40.2 million which could be attributable to the response of the health sector to the challenges brought on by the passing of hurricane Ivan. Special health education programmes had to be mounted in order to increase knowledge of water safety, to control diarrheal diseases, and to encourage proper solid waste management. The rains associated with hurricane Ivan led to flooding and associated ponding both of which facilitated the breeding of mosquitoes. The resulting deposits of debris and stagnant water in and around populated areas increased the potential for breeding *Aedes Aegypti* mosquito and the population of rodents and flies. The need for increased disease surveillance is imperative. Table 2-9 presents the summary of damage to the health sector.

Table 2-9

Damage and losses sustained by the health sector
(Million Jamaican Dollars)

Item	Damage and losses			Imported component
	Total	Direct	Indirect	
Total	**758.3**	**718.2**	**40.2**	**257.6**
Health centers	85.3	85.3		29.8
Hospitals	108.9	108.9		38.1
Medical equipment and supplies	39.2	39.2		35.3
Vaccines lost	0.3	0.3		0.3
Public education programme	12.4		12.4	
Latrines replacement	435.5	435.5		152.4
Vector control	21.8		21.8	
Supplement of folic acid	1.6		1.6	1.6
Epidemiological surveillance	0.4		0.4	
Vehicles	49.0	49.0		
Emergency operation centers	0.8		0.8	
Environmental health sanitation	3.2		3.2	

Source: ECLAC, based on information from the Ministry of Health.

III. PRODUCTIVE SECTORS

The productive sectors – including agriculture and livestock, food processing, mining, commerce and tourism – sustained significant damage and losses, of a similar magnitude as the social sectors and activities. The disaster impact on each of the productive sectors is described below.

1. Agriculture and livestock

While agriculture and livestock production had grown by a sizable 5.7% in 2003 over the previous year's, below normal rainfall had in fact produced a decline in the sector's gross domestic production in the first half of the present year. This reduction was due to the presence of dry conditions in the central and western parishes, which is where crops for domestic consumption are produced and experienced a drop of around 6.5%. Traditional agricultural exports, however, had shown a vigorous growth in the first half of 2004, when a 7.7% increase in gross output was registered, [1] recuperating from a steady decline in the past ten years.

Hurricane Ivan brought about strong winds, heavy rainfall and floods that affected the assets and production of the agriculture and livestock sector. Winds broke, bent and uprooted plants and trees; excessive humidity and water logging of soils also affected crops and plantations; winds and floods destroyed or damaged the sector's infrastructure.

The following is a brief account of the damage and losses sustained by both the domestic and export oriented activities in the sector.

a) Domestic production

Due to the action of strong winds and floods, physical infrastructure and equipment for the agriculture and livestock sector – including farm buildings and equipment, farm roads, irrigation equipment, etcetera – sustained significant damage and destruction, as were also large extensions of permanent plantations whose trees were broken or uprooted. Losses of lands due to the action of upstream erosion and to silting were not significant in extension and value, when compared to production losses. Most affected parishes were those of St. Catherine, Clarendon, Manchester, St. James, Hanover and St. Mary.

In regard to crops, losses occurred in the production of vegetables, fruits, banana and plantains, ground provisions and tree crops for domestic consumption. [2] In the case of livestock,

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[1] Planning Institute of Jamaica, *Economic Update and Outlook, April-June 2004*, Volume 9 No. 1, Kingston, 2004.

[2] Damage and losses in banana plantations whose production is exported are estimated in the following subsection of this chapter.

poultry, goats and pigs were most affected and milk production has decreased due to the death of dairy cattle.

Based on a preliminary survey of damage and losses conducted by the Ministry of Agriculture, it has been estimated that a total of 11,100 hectares of agricultural producing land were affected in one way or another, and that a total of 117,700 farmers sustained damages and losses.

The apiculture, fisheries and aquaculture activities also sustained significant damage and losses. Many trees that provided food for honeybee activities were destroyed and production of honey will be affected. The action of the sea, through the storm surge, caused severe damages to coastal line resources and to artisan and industrial fishery fleets and equipment. The catch of fish has temporarily declined as a combined result of the reduced fleet capacity and of the migration of fish to other places where food is available. Finally, ponds used for aquaculture sustained damage; fish stock and inputs were destroyed. Details of damage and loss estimates for this sector are included in table 3-1).

b) Traditional export production

Banana. The winds of Ivan inflicted heavy damage to virtually the entire area devoted to banana plantations in Jamaica, which is most evident in the parishes of St. Mary, Portland St. James and St. Thomas. Trees were broken or uprooted in an estimated surface area of 4,272 hectares, and the entire production of bananas both for export and for domestic consumption has been lost. [3] This is a very serious setback for these activities that had managed to increase output by 1.4% in the first half of the present year.

It is anticipated that the plantations can be resuscitated and that full production can be achieved in a period of 6 to 9 months, during which no significant production will be obtained. In addition to the loss of production over said period, there will be a negative impact on employment. Other than the limited labor that will be required for the rehabilitation of the plants and farms, nearly 8,000 persons will be out of work for the aforementioned period in the export oriented activities. As the new banana plants reach maturity and begin production, workers will be able to return in a staged fashion.

[3] This figure includes 2,226 hectares of banana for exports, 1,483 hectares of domestic consumption banana and 890 hectares of plantains.

Direct damage to export banana plantations exclusively, can be measured by the cost of resuscitating the plants in 2,226 hectares, using unit costs derived by the Banana Export Company Limited. [4] These damages were estimated as J$ 278.35 million.

Losses in production over the next six to nine months, while the plantations are being resuscitated, have been estimated as J$ 930 million. Of that figure, approximately J$ 400 will represent losses sustained in the present year, and the JS$ 530 will occur in 2005. This will have a negative impact on the balance of payments as they represent exports that will not be made to the tune of US$ 15 million.

In summary, the total impact on the banana export activities will reach J$ 1,208.35 million, of which 278.35 million (22%) are direct damages and J$ 930 million (78%) are indirect losses that will accrue in the present and following year (See table 3-1).

Coffee. The strong winds brought by Ivan affected the uplands where coffee is grown in the island. They caused the breaking up or uprooting of coffee trees as well as damage to the forest that provides shading to the plantation. In addition, the winds caused the loss of berries for the current crop in the Blue Mountain and lowland coffee areas. This caused a major setback to the increased coffee production that had been achieved in recent times as a result of major resuscitation of coffee trees activities by farmers. [5]

The destruction of 5% of the coffee tree population has been estimated at a value of J$992 million, which figure was arrived at by estimating the value of new plants for an estimated area of 2,225 acres as well as of rehabilitation of plants and lands in 2,630 acres more. It is to be noted that the new coffee trees will only begin producing after a 3 to 5 year period, when they reach maturity.

The winds caused the loss of berries in nearly 45% of the coffee-producing area. It has been estimated that this will impede the production and export of 213,000 boxes of Blue Mountain coffee and 41,000 of lower quality coffee. Combined with a respective value of J$ 2,050 and J$ 951 per box, this will translate into a loss of J$ 475.7 million that will have a negative impact of US$ 8 million in the country's balance of payments due to the non export of the product in the present year.

In addition to the above, a further indirect loss of J$ 97.6 million is anticipated for at least the following three calendar years due to the destruction of the coffee trees mentioned above, until the new trees reach maturity.

There exists an insurance scheme for the sector. Coffee production is insured provided the losses occur after berries are present in the trees, a the rate of US$ 20 per box for the case of Blue

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[4] Direct damages and indirect losses to banana and plantains for domestic consumption are dealt with and estimated separately under the appropriate heading of domestic production crops.

[5] *Economic Update and Outlook, April-June 2004*, page 20.

Mountain coffee and of US$ 12 per box for lowland quality coffee, to a combined maximum amount of US$ 8.8 million. The coffee trees were not insured since the premiums are considered too high. Reinsurance is available from a number of large international insurance groups – including Munich Re and others – whenever the losses exceed 20% of the expected crop. While in this occasion insurance proceeds will assist the coffee growers to recover part of their losses, it is feared that some producers that were already considering their withdrawal from this activity due to the low international prices, may now decide not to continue their production.

Table 3-1

Damage and losses in the agriculture and livestock sector
(Millions of Jamaican Dollars)

Sector and subsector	Total damage	Direct damage	Indirect losses	Impacts on the external sector: Increase in imports	Impacts on the external sector: Decrease in exports
Total	**8,550.1**	**3,407.0**	**5,143.0**	**440**	**2,784**
1. Agriculture	7,192.4	2,200.4	4,992.0	230	2,784
1.1 Domestic consumption	2,632.7	199.1	2,433.6		
Legumes	43.4		43.4		
Vegetables	396.4		396.4		
Condiments	142.7		142.7		
Fruits	111.3		111.3		
Cereals	76.8		76.8		
Bananas	522.0	120.4	401.6		
Plantains	341.0	78.7	262.3		
Grain provisions (Tubers)	570.6		570.6		
Tree crops	416.5		416.5		
Others	12.2		12.2		
1.2 Traditional Exports production	4,559.7	2,001.3	2,558.4		2,784
Bananas	1,208.4	278.4	930.0		930
Coffee	1,760.5	992.0	768.5		769
Sugar cane	887.2	521.9	365.3		591
Cocoa	27.6		27.6		28
Pimiento	351.0	209.0	142.0		142
Citrus	325.0		325.0		325
2. Livestock	758.6	607.6	151.0		
Broilers	366.5	366.5			
Layers	22.6	22.6			
Goats	149.5	149.5			
Cattle (beef)	28.0	28.0			
Cattle (dairy)	4.7	4.7			
Pigs	32.6	32.6			
Sheep	1.1	1.1			
Donkey	0.1	0.1			
Milk production	26.0		26.0		
Colonies and honey production	127.6	2.6	125.0		
3. Fisheries	342.0	342.0	...	210	
Fisheries	306.0	306.0	...		
Aquaculture	36.0	36.0	...		
4. Infrastructure	257.0	257.0		175	
Agriculture	62.2	62.2			
Livestock	21.0	21.0			
Fishery	85.0	85.0			
Irrigation Systems	88.9	88.9			

Source: ECLAC estimates, based on information from official sources and private sector enterprises.

Thus, it is estimated that the coffee production activity sustained direct damage amounting to J$ 992 million and total indirect losses of J$ 768.5 million, bringing the total amount of the impact to J$ 1,760.5 million. The indirect losses will have a corresponding negative impact on the balance of payment in view of the reduction in exports that is anticipated, and also a positive consequence due to the amount of expected reinsurance reimbursements. (See table 3-1). It is to be noted that the overall impact of this disaster is not restricted to this year, but will have medium term consequences due to the destruction of the coffee trees.

Sugar Cane. In this case again, the strong winds and the floods ensuing from the heavy rainfall affected these export activities, at a time when efforts were being made to increase the area of recently planted fields, to improve reaping conditions and to increase the sugar-to-cane production ratio.

Sugar canes were broken and uprooted in significant extensions, and flooding affected extensive areas. In addition, miscellaneous infrastructure and irrigation systems sustained damage and destruction. Furthermore, future production in both the public and private sectors will decrease, and – based on preliminary data supplied by the Sugar Company of Jamaica that covers approximately 70 to 75 per cent of the entire sugar industry in the country – will cause an estimated loss of 190,000 tons of cane, or 15.6% of last year's production. [6]

It is estimated that the direct damage to infrastructure and plantations amount to J$ 521.9 million, and that indirect production losses to the cane producers will reach J$ 365.3 million. The total impact of the disaster caused by Ivan in these activities will thus be J$ 887.2 million. (See table 3-1). It is to be noted that there will occur corresponding losses for the processing of cane and its conversion into sugar, which loss will be accounted for in the manufacturing sector.

Cocoa. Efforts were being made in 2003 to increase production to take advantage of increasing international prices and demand of the product. [7] However, the scarcity of rains in the first half of 2004 resulted in a declined production (by 47.7%), especially in Clarendon and St. Mary, the main producing parishes in the island. [8]

The hurricane damaged the trees and compromised the corresponding future production of cocoa, in an area of 1,100 hectares (2,700 acres), thus compounding the problems of the farmers. While the trees are expected to recover promptly, an estimated loss in production of J$ 27.6 million is expected for 2004 due exclusively to the action of the hurricane. This figure represents a loss of foreign exchange earnings and the likelihood of losing some international markets, if production is not restored promptly, remains a possibility.

Pimento. These production activities sustained significant damage and losses. On the one hand, physical infrastructure – including warehouses and equipment – and stocks of pimento

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[6] It is to be emphasized that the indicated figure reflects only losses sustained by farmers that produce cane. The corresponding losses in the production of sugar will be included in the manufacturing sector estimates.

[7] Planning Institute of Jamaica, *Economic and Social Survey Jamaica 2003*, Kingston, 2004.

[8] *Economic Update and Outlook, April-June 2004*, page 20.

already processed were damaged or destroyed. On the other hand, some trees were destroyed and berries were lost.

Estimates indicate that direct damage amount to J$ 209 million and that losses in future production will reach J$ 142 million, thus bringing the total effects on the pimento activity to J$ 351 million (See table 3-1). These losses will have a bearing on the manufacturing and export sector.

Citrus. The action of the strong winds caused the loss of many fruits that were in varying degrees of ripening, especially in the St. Catherine and Clarendon parishes. It has been estimated that these losses are equivalent to 35% of the expected production for the remainder of the year. These indirect losses amount to J$ 325 million. (Table 3-1 refers).

c) Summary

The overall impact of the hurricane on the agriculture and livestock sector, after including damage to its infrastructure and machinery, has been estimated at J$ 8,550 million or its equivalent of US$ 137.9 million, of which direct damage are J$3,407 million (40 per cent) and indirect losses are J$ 5,143 million (60%). See table 3-1.

2. Manufacturing

The manufacturing and processing sector had been performing well in the second quarter of the present year, as indicated by a 6.8% growth of its real GDP when compared to that of 2003. [9] Hurricane Ivan will have a negative effect on the Food Processing subsector, since there will be lower volumes of domestic agriculture and livestock products to process due to the damage and losses in the primary sector.

While no comprehensive damage and loss assessments have been completed as the time of the preparation of this evaluation, sufficient information was available to the ECLAC team to make order-of-magnitude estimations of the sector's expected performance in 2004 and 2005 as a result of the disaster.

The Jamaica Manufacturer's Association conducted a survey that indicated that 5% of the associates sustained significant damage to their infrastructure, machinery and stocks of products. A preliminary estimate puts these direct damages at J$ 210 million.

In addition to these direct damages, due to the temporary absence of electricity and water the entire food processing sector sustained production losses for a limited time period. Then too, after electricity services were restored, other problems prevented from achieving full operational capacity. It has been conservatively estimated that an average of 5 production days were lost as a result.

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[9] *Economic Update and Outlook, April-June 2004*, page 21.

Furthermore, the reduction in raw material inputs due to the losses sustained in the agriculture and livestock sector – described in the previous section of this report – will bring about significant production losses for the manufacturing sector. These losses were estimated on the basis of the following components: decline in the processing of agricultural and livestock products earmarked for the domestic markets; reduction in the processing of fresh products for export; and a decline in the production of sugar.

For the first component, a study was made to determine the fraction of item-by-item food production that is normally retained by the farmers for local consumption and that should not reach the processing plants and domestic markets. Volumes of the production of each product that were to reach the market and would not be available due to the disaster were subsequently estimated. Then, based on an analysis of wholesale market and farm gate prices, estimates were made to determine the added value of food processing that will not be forthcoming due to the loss in agriculture production. While it is recognized that this is an indirect manner to arrive at the processing sector loss, results thus obtained are indicative of the negative effect in this sector. In addition, an order-of-magnitude estimate was made of losses that will arise in processing poultry and other livestock products.

Table 3-2

Damage and losses in the food-manufacturing sector of Jamaica
(Million Jamaican Dollars)

Component	Damage and losses			Sector		Effect on exports
	Total	Direct	Indirect	Public	Private	
Total	**2,204.9**	**210.0**	**1,994.9**	**312.1**	**1,892.8**	**659.5**
Infrastructure, machinery and stocks	210.0	210.0	---	...	210.0	
Domestic sector processing loss	603.9	---	603.9		603.9	--
- Agriculture	421.9		421.9		421.9	
- Livestock	182.0		182.0		182.0	
Export oriented loss	885.0	---	885.0	161.1	723.9	659.5
- Sugar	225.5		225.5	161.1	64.4	-- [10]
- Food	659.5		659.5		659.5	659.5
Overall production activity reduction	506.0	---	506.0	151.0	355.0	...

Source: Estimated by ECLAC on the basis of official and private sector information.

In regard to the second loss component, based on a sample survey conducted by the Jamaica Exporters´ Association, a forecast was made on the loss of revenue they will sustain in the following six months due to the unavailability of fresh products for processing and export.

[10] The reduction in exports for the sugar industry has been accounted for in the agriculture sector. It is excluded here to avoid double accounting.

In the third component, estimates were made of the losses for the sugar processing plants based on the volume of sugarcane that was lost and in combination with the expected sugar/cane ratio and the prevailing price of sugar.

In summary, it can be stated that hurricane Ivan imposed total damage and losses of J$ 2,205 million (US$ 35.6 million) to the food processing sector, of which J$ 1995 are indirect (90 per cent of the total) and J$ 210 are direct damages. Furthermore, these losses will translate into a negative effect on the country's balance of payments due to the decrease in exports to the tune of J$ 660 million or US$ 10.6 million. (See table 3-2).

3. Mining

The growing world demand of aluminum has caused a sustained growth in the mining sector of Jamaica, so that it gross domestic product grew by 4.9 per cent in 2003. [11] In the first half of 2004, the utilized production capacity in the alumina plants was 100.2% and 95.7% in the bauxite plants. [12] The Jamaica Bauxite Institute had envisaged a 10% increase of production for the present year, before the hurricane struck.

Production at some of the sector plants was only interrupted for a short period of time before and after the hurricane struck, and the plants only sustained very light damage in non essential components. Full production operations were resumed shortly after. While damage to the plants´ infrastructure and quarrying sites was relatively minor, Ivan's winds and storm surge caused the destruction of sections of port, conveyance and loading facilities in at least two locations, so that export operations were affected. Use is presently being made of an alternative port, to expedite exports.

Preliminary estimates, pending more detailed assessments that are presently underway for insurance purposes, indicate that direct damage to infrastructure – mainly port related facilities – amount to J$ 50 million.

Estimations of indirect losses have been made taking into consideration the temporary stoppage of production of all plants over a period of 5 days. It was considered that it would be nearly impossible to recover these production losses in the remainder of the year since the plants are operating at nearly 100% of their capacity. The very high daily production achieved in the months of July and August, just prior to the disaster, was used as a basis to project the losses in the above-mentioned 5-day period. The increased operational costs due to the damage in port and related facilities were not deemed significant. The indirect losses were quantified as J$ 980 million, which would have a corresponding impact on the external sector on account of exports that will not be made in the present year.

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[11] *Economic and Social Survey Jamaica 2003*, page 9.1.

[12] *Economic Update and Outlook, April-June 2004*, page 22.

The total impact of the disaster on the sector amounts to J$ 1,030 million, or its equivalent of US$ 16.6 million. Indirect losses represent 95 per cent of the total impact. The overall impact of these damage and losses in the external sector accounts will include J$ 980 million (US$ 15.8 million) in lost exports and J$ 32 (US$ 0.5 million) in imports of materials and equipment to replace damaged infrastructure (See table 3-3).

Table 3-3

Estimated impact of the hurricane on the mining sector of Jamaica
(Million Jamaican Dollars)

Component	Damage and losses			Sector		Effect on external sector
	Total	Damage	Losses	Public	Private	
Total	1,030.0	50.0	980.0	---	1,030	
Infrastructure	50.0	50.0	---			32.0
Production	980.0	---	980.0			980.0

Source: Estimates made by ECLAC on the basis of official and private sector information.

4. Commerce

The Food, Beverages and Tobacco subsector – which represents 15 percent of total sales in the Distributive Trade sector – experienced a 12.2% downturn in sales in the first half of 2004, mainly due to decreased production of agricultural goods. [13]

The decreased amount of agricultural and livestock products that will reach the market after the losses caused by hurricane Ivan will most likely be compensated by imports from abroad, so that food availability is ensured in the country. Sales and profits in the commerce subsector will thus not be affected in a significant manner, except if import arrivals are delayed, and no negative impact is expected in its GDP as a result of the disaster. Nevertheless, supplying the demand of agriculture and livestock goods in the local markets will have an unforeseen impact on the balance of payments.

Estimates made of this possible effect based on the amounts and prices of those agriculture and livestock goods that should reach the local markets to satisfy domestic demands, and after discounting the amounts of said goods that are normally consumed directly by farmers without going into the commercial channels. The estimated negative impact on the balance of payments was thus estimated to be about J$ 556 million or its equivalent of US$ 9 million.

5. Tourism

The gross domestic product of the tourism sector in Jamaica has been rising steadily in the past two years, as a result of the industry's recovery from the effects of the September 11 attack in the United States and of the Severe Acute Respiratory Syndrome (SARS) outbreak last year. During

[13] *Economic Update and Outlook April-June 2004*, Op. Cit., pages 42 and 43.

the second quarter of the present year, total visitor arrival grew by 9.4%, while stopovers increased 12.0% and cruise passenger arrivals did so by 5.7%. [14]

The winds of the hurricane and the associated storm surge caused severe damage to hotel and restaurant infrastructure in the Negril and Treasure Beach tourist areas; [15] other tourist areas located in the vicinity of Kingston (Strawberry Hill) sustained damage as well. Beaches and coral reefs sustained damage due to the action of the storm surge that in some places exceed three meters in height. Some cruise ships were deviated from Jamaican ports before the arrival of the hurricane.

While the hurricane occurred during a relatively low-occupancy period of the year, revenue losses are to be high depending on the time required for rehabilitation of the damaged premises. In most cases, however, hotel owners expect to have achieved full infrastructure recovery before the high tourist season begins on 15 December. Entrepreneurs of the sector are making every effort not to layoff any of the skilled employees, resorting to their utilization in maintenance and rehabilitation activities, as well as offering advanced annual leave to the workers, so they can be available when the high season begins. Nevertheless, a limited temporary loss of employment seems inevitable in this sector.

Based on information furnished by private entrepreneurs, the total impact of the hurricane on the sector amounts to J$ 1,590.7 million, or its equivalent of US$ 25.7 million. Of this, J$ 466.3 million represent direct damage, and expected losses of revenue would amount to J$ 1,124.4 million. The impact on the external sector will be significant since most of the earnings of tourism are derived from foreign visitor expenditures. (See table 3-4).

Table 3-4
Estimated impact of the hurricane on the tourism sector of Jamaica
(Million Jamaican Dollars)

Component	Damage and losses			Sector		Effect on external sector
	Total	Damage	Losses	Public	Private	
Total	1,590.7	466.3	1,124.4		1,590.7	1,054
Infrastructure		466.3				
Revenue loss			1,124.4			

Source: Estimates made by ECLAC on the basis of preliminary private sector information.

[14] *Economic Update and Outlook April-June 2004*, *op. cit.*, pp. 34 and 35.

[15] About 47% of hotel infrastructure in the Negril area sustained heavy infrastructure and furnishing damage due to the action of the waves.

IV. INFRASTRUCTURE

Infrastructure was one of the main areas that sustained significant direct damage caused by wind, rainfall and runoff from the hurricane. Destruction and damage to infrastructure, however, was minor compared to the indirect effects arising from the temporary absence of the services that the population draws from the infrastructure. The damages and losses sustained by electricity, water supply and telecommunications systems, and by the transport sectors, are described below.

A word of caution is needed here. Contrary to the case of the social and productive sectors, information to evaluate damage and losses in the infrastructure sectors was not fully available at the time of the assessment. Some of the entities that provide some of these services were still facing the pressing needs of restoring their systems and facilities, and were thus unable to provide the information that was required. In addition, private enterprises in some sectors have engaged consultants to appraise their damage and losses with a view to submitting insurance claims, and were also unable to provide information that was in the process of being completed. Therefore, and contrary to what normally happens in other countries, the estimation of damage and losses in infrastructure presented herewith will be less comprehensive and will necessarily be of more limited accuracy than those of the sectors that have been described in the previous chapters.

1. Electricity and water

According to recent data, real GDP for the electricity and water subsector grew by 3.8% in the second quarter of 2004, in comparison to the same period for the previous year, thanks to increased production of both electricity and water. Total electricity generation rose in said quarter to 962.5 million KWh, and the production of water reached a total of 71,240 megaliters. [1] The hurricane is expected to affect the sector's performance for the third and fourth quarters.

a) Electrical sector

The electrical sector has sustained damages and losses that, while small in comparison to other sectors, have a very significant impact on the functioning of the entire Jamaican economy.

Power generation plants were not significantly affected. Just before the hurricane reached the island, power generation was suspended as a precautionary measure. The hurricane's strong winds affected lower voltage transmission lines through the breaking of poles especially those made out of wood, as well as urban distribution grids.

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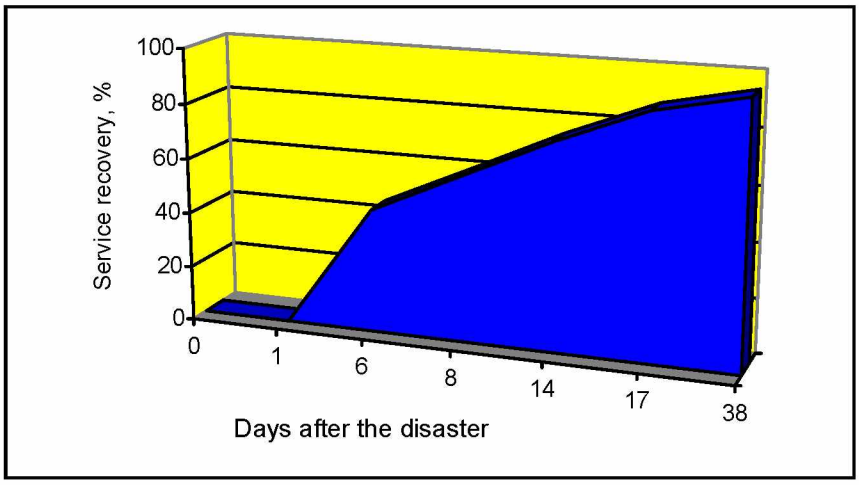
[1] *Economic Update and Outlook, April-June 2004*, Op. Cit., pages 36 to 39.

Electricity supply was interrupted throughout the island. The Jamaica Public Service Company Limited (JPS), the private entity entrusted with the provision of electricity in the island, began efforts to restore the transmission and distribution service on a staged basis. Priority was assigned to the reconnection of essential public buildings such as hospitals and water purification, production and pumping plants. Depending on the availability of road access, JPS began the slow process of replacing broken poles and restoring service. Thirty eight days after the disaster, there remained 5% of users still without service, especially those located in far away areas where roads were still interrupted or under repair. (See figure 4-1).

Figure 4-1

Recovery performance of electrical services after the hurricane



The JPS is bound to sustain a decline in revenues due to the interruption of the power supply. In the absence of detailed information, an attempt was made to estimate these losses; use was made of the average value of revenues in the past year [2] in combination with the information on service recovery performance described above. In addition, the utility company incurred unforeseen expenditures – including both overtime salary for employees as well as transport costs – for the repairs to the system, which will also have an effect on its financial results for the year. Again, in the absence of itemized information in this respect, order of magnitude estimations were made of these losses.

No estimates were available as yet in regard to the value of the damaged or destroyed assets. Nevertheless, since the JPS is undertaking the replacement of poles, cable lines and related equipment and materials drawing from its inventories, which it expects to replenish with imports

[2] Jamaica Public Service Company Limited, *2003 Annual Report*, Kingston, 2004.

later on, a rough estimate was made on the basis of the value of said stocks as described in the 2003 Annual Report.

Preliminary estimates indicate that the electrical subsector sustained total damage and losses of some J$ 1,398 million (or US$ 22.5 million), of which 589 million are direct damages (42%) and 809 million are indirect losses. Imports amounting to J$ 410 million (or its equivalent of US$ 6.6 million) will have to be made to replenish the inventory of materials and equipment of the utility. (See table 4-1).

Table 4-1

Estimated impact of the hurricane on the electrical sector of Jamaica
(Million Jamaican Dollars)

Component	Damage and losses			Sector		Effect on external sector
	Total	Damage	Losses	Public	Private	
Total	**1,397.9**	**589.0**	**808.9**	**1397.9**	**--**	**410**
Infrastructure	589.0	589.0				410
Decline in revenues	736.0		736.0			
Increased operational costs	72.9		72.9			

Source: Estimates made by ECLAC on the basis of official information.

The damage and losses sustained by the electrical sector utility will bring about many losses to the sectors and persons that make use of electricity as an input for their activities and production. Despite the availability of emergency generating plants, many activities could not begin their reactivation before electricity was restored or while the service was still suffering interruptions. These indirect losses have been estimated and accounted for in most of the sectors analyzed in previous chapters. However, the entire stoppage of electricity supply for at least one day, should have a negative impact on other productive sectors not analyzed herein, and will surely have an additional effect on the gross domestic product. Furthermore, the financial performance of the utility for the present year will be affected.

b) Water supply and sanitation

Water production and consumption in the first six months of 2004 was slightly above normal, [3] thanks to a 3.1% increase in the rural areas due to lower-than-normal rainfall as described in the agricultural section of this report.

The winds from the hurricane produced minor damage to buildings, while flooding and landslides affected water intake works, dislocated water mains and blocked access to some critical facilities. The high sediment content in river and spring water resulted in very high turbidity levels that could not be easily reduced at treatment plants, and some of them were temporarily taken out of operation. But the most significant factor was the lack of electricity that

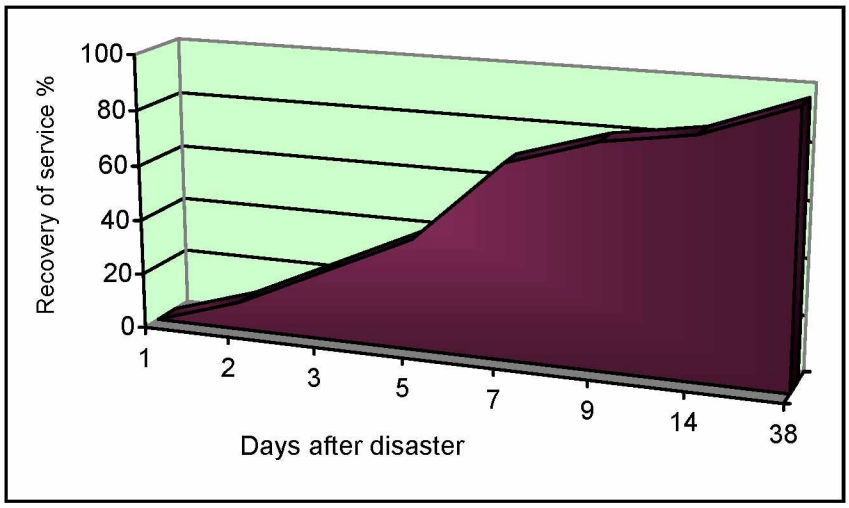
[3] *Economic Update and Outlook April-June 2004*, *op. cit.*, page 36.

impeded the functioning of key components of the system, including pumping stations and treatment facilities.

Over 600 electricity-dependent facilities, including sewerage plants, were affected in one way or another. While waiting for the restoration of electrical service, the National Water Commission (NWC), under the Ministry of Water and Housing, made efforts to bring back into service those facilities that could be operated on available standby generators as well as those systems that could be operated through gravity flow distribution. Priority was assigned to hospitals and other critical facilities. As electricity flows were restarted and road access to facilities was restored, water supply was slowly put back into service, as per the recovery chart given in figure 4-2.

Figure 4-2

Recovery performance of water supply services after the hurricane



After nearly 40 days after the hurricane struck, service has been restored in about 97% of the entire system. Nevertheless, some locations are still suffering from low water pressure, intermittent water supply and even no water, in response to variations in pressure within the system. During the initial days of the crisis, the NWC resorted to distributing water in many localities through the use of tanker trucks, both from its own fleet and renting others from private companies. NWC personnel had to work long hours in order to, first, prepare systems for re-energizing, to rehabilitate damaged plants, and for emergency distribution of water. Increased filtering and treatment of water was made in order to guarantee a minimum quality of drinking water. Therefore, the utility enterprise has suffered from loss of revenue and increased operational expenditures, over the time required for the resumption of normal activities.

There exists partial information concerning the direct damage sustained by the system. Estimations were made of the losses in revenue that the NWC will sustain, based on the recovery of the service data provided in Figure 4-2, in combination with the average daily revenue as

recorded for last year. [4] Operational cost increases were estimated taking into consideration overtime of field personnel, the cost of operation or rental of tanker trucks, increased fuel and water filtering and treatment costs, on the basis of information provided in the same annual report of the NWC and of the time required for recovery of the service.

It was estimated that the water supply and sanitation subsector sustained total damage and losses of J$ 578.8 million (US$ 9.3 million), of which direct damage amounted to J$ 90 million and indirect losses were J$ 488 million. Due to the need to import some equipment and materials from abroad, a J$ 134 million (US$ 2.2 million) negative impact will be sustained by the external sector. See table 4-2.

Table 4-2

Estimated impact of the hurricane on the water supply and sanitation sector of Jamaica
(Million Jamaican Dollars)

Component	Damage and losses			Sector		Effect on external sector
	Total	Damage	Losses	Public	Private	
Total	**578.7**	**190.4**	**488.3**	**578.7**	**---**	**134**
Infrastructure	190.4	190.4				
Decline in revenues	145.0		145.0			
Increased operational costs						
- Labor	178.8		178.8			
- Use of tanker trucks	6.5		6.5			
- Fuel costs	28.0		28.0			
- Treatment and filtering costs	30.0		30.0			

Source: Estimates made by ECLAC on the basis of official information.

These damage and losses sustained by the water supply and sanitation subsector will have an impact on other sectors. In the health sector, for instance, the lack of water created problems in the operation of hospitals and other facilities and the absence of a fully reliable quality in the water supply is partially responsible for increase morbidity rates, as described in chapter 3 of this report. In addition, the temporary absence of safe water at homes has forced people to resort to purchase bottled water fore consumption, thus affecting their household budget.

[4] National Water Commission, *Annual Report 2002-2003*, Kingston, 2004.

2. Transport

The hurricane caused a very negative impact on roads and generated revenue losses in the international airport in the capital city of Kingston.

a) Road transport

The heavy rains produced by hurricane Ivan and the ensuing floods and land and mud slides inflicted a heavy toll on the road network of the island, including both main roads maintained by the National Works Agency (NWA) and by Parrish councils. The storm surge caused heavy damage to the highway connecting Kingston and Norman Manley international airport (See photo at right).

Floods and landslides cut off entire sections of roads, blocked and destroyed drains and culverts, damaged and destroyed retaining walls and bridge approaches, and breached riverbanks and deposited silt on rive channels. As result of saturated soils, heavy rainfall and the eroding action of river and streams, slippage of entire sections of roads has occurred. High river stages and floods scoured river channels and adjacent roads and related works. Roadway carpeting was badly damaged. Some of the major arterial roads that sustained damage and interruptions included the following:

- Mandela Highway
- Mount Roser
- Constant Spring to Stony Hill
- Old Harbour road
- Montego Bay to Ocho Rios
- Ocho Rios to Faiths Pen, and
- Others in the corporate area.

Rehabilitation efforts of the NWA concentrated on clearing the roads to ensure at least single-lane traffic, which was achieved by September 30. Work still continues in regard to repairs and rehabilitation of Parrish and other local roads.

Direct damage to the road system includes the cost of removing landslide material, repairing and reconstruction of drainage and ancillary structures, repair and reconstruction of entire sections of different types of roads, and the resurfacing of many roads. In addition, many vehicles were carried away or destroyed by floods.

Indirect losses include the temporary interruption of passenger and cargo traffic in the road network for 3 to 5 days, the slower than normal traffic in single lane roads, the use of alternative and lower quality roads, and the increased transport cost due to deterioration of road surfaces. No information on the volumes of

traffic for the affected roads, or on the increased unit transport costs in the case of lower quality road surfaces was available at the time of the assessment. Therefore, it was not possible to undertake even an order-of-magnitude estimation of these indirect effects – that are anticipated to be very high in monetary terms – that will have a negative bearing on the population's well-being. The costs of river training to protect the roads from future damages were estimated as indirect losses.

Therefore, the total effect of the disaster on the road transport sector was estimated as J$ 3199 (US$ 51.6 million), of which J$ 2403 million refer to direct damage and the remaining J$ 796 million represent the underestimated value of indirect losses. Imported equipment and materials for the sector will have an estimated impact of J$ 1280 million or its equivalent of US$ 20.6 million (See table 4-3).

Table 4-3

Estimated impact of the hurricane on the road transport sector of Jamaica
(Million Jamaican Dollars)

Component	Damage and losses			Sector		Effect on external sector
	Total	Damage	Losses	Public	Private	
Total	**3,199.1**	**2,403.2**	**795.9**	**3,199.1**	**---**	**1,280**
Main roads	1271.5	1271.5		1271.5		
Parrish roads and infrastructure	666.4	666.4		666.4		
Other infrastructure	465.3	465.3		465.3		
Destruction and damage to vehicles						
River training works	795.9		795.9	795.9		

Source: Estimates made by ECLAC on the basis of official information.

b) Airports

The passage of the hurricane forced the closure of Norman Manley airport in Kingston and of Donald Sangster airport in Montego Bay, which handle international air passenger and cargo transport, for a period of three days.

Winds damaged roofing in the cargo areas as in the runway lighting system, and window breakage at Norman Manley airport. In addition, several light planes were swept and turned over by the winds. Operations were resumed after clean-up operations had been completed at both airports. Nevertheless, there occurred losses of revenue that will affect financial operations. These included the decline in passenger service, landing, security, car parking service, and airport improvement

fees, as well as in income from concessionaires established at the airports.

The total impact of the disaster on the subsector was estimated as J$ million, of which J$ 47 million are direct damages and J$ refer to indirect losses. The airport and airplane owners had insurance covering these damage and losses. See table 4-4.

Table 4-4
Estimated impact of the hurricane on the airport subsector of Jamaica
(Million Jamaican Dollars)

Component	Damage and losses			Sector		Effect on external sector
	Total	Damage	Losses	Public	Private	
Total			**13.1**	**60.1**		**16**
Damage to roofs and lighting system	47.0	47.0		47.0		
Damage to airplanes						
Decline in revenues	13.1		13.1	13.1		

Source: Estimates made by ECLAC on the basis of official information.

3. Telecommunications

The telecommunications subsector sustained significant physical plant damage and operational losses. Detailed assessments are under way, as required by the insurance companies before reimbursements can be made. Nevertheless, order of magnitude estimates are presented here.

The telephone exchange building and equipment located at Mandeville and another unspecified location were flooded and the service was turned off, which left the St. Elizabeth, Santa Cruz and other neighboring Parishes without phone communications. The submarine optic fiber cable that links the island with the United States, through which nearly 80% of the traffic – including Internet – is routed, was severed in its land section in the Cayman Islands. Traffic was the re-routed through satellites but service still remains at below standards.

Cell-phone services sustained damage as antennas were turned out of alignment by the strong winds of the hurricane. The lack of electricity made it necessary for the utilities to resort to use of standby diesel generators and many users refrained from using their phones as they lacked capacity to recharge their units. The utilities incurred into increased operational costs and will have lower revenues over the period of recovery, which is expected to last from one to two months.

Based on partial information available, it is estimated that the cost of direct damage to the telecommunications sector is J$ 198.6 million, as required for the repairs and reconstruction of

the assets. [5] Scant information available for two of the utilities would indicate that indirect losses would be around J$ 1,336.7 million. Therefore, the total amount of the impact of the hurricane on the sector would reach J$ 1,535 million, as shown in the following table. It is expected, though, that as more detailed information becomes available from the detailed surveys presently underway, the indicated damage and loss figure would raise.

Table 4-5

Estimated impact of the hurricane on the telecommunications sector of Jamaica
(Million Jamaican Dollars)

Component	Damage and losses			Sector		Effect on external sector
	Total	Damage	Losses	Public	Private	
Total	**1,535.3**	**198.6**	**1,336.7**	**---**	**1,336.7**	**120**
Damage to physical plant	198.6	198.6				
Increased operational costs	252.0		252.0			
Decreased revenues	1,084.7		1,084.7			

Source: Preliminary estimates made by ECLAC on the basis of limited information.

[5] It is to be noted that the cost of repairs to the optic fiber cable in the Cayman Islands is not included in these estimates.

V. IMPACT ON THE ENVIRONMENT

1. General comments

a) Conditions prior to the disaster

Natural hazards are an important component of the natural environmental systems operating in Jamaica, but the occurrence of extreme events is often accompanied by disastrous impacts on land and livelihood. Vulnerability and risk have been increased by anthropogenic activities in that inadequate settlement patterns and land use practices have greatly altered the natural rainfall-runoff relationships so that hydrographs tend to rise more quickly and flood flows are more frequent. Accelerated erosion accompanies the rapid runoff as natural protective resources become increasingly degraded. Settlement also occurs in hazard prone solution basins and floodways which are often compromised in their ability to discharge floodwaters because of blocked sinkholes or heavily silted channels. The record is therefore replete with damage from extreme hydrometeorological events, which are accompanied by slope failure, flooding and the attendant disruption of infrastructure and livelihoods. Social and economic dislocation result and considerable sums have to be diverted from budgetary allocations for capital and recurrent expenditure.

Hurricane Ivan was the second hurricane system to affect the island within one month. Charley, a category 1 hurricane, also passed south of the island on August 11, 2004, and brought intense rainfall and some wind damage primarily to the southern parishes of St Elizabeth and Manchester. Flooding from high intensity rainfall and high volume runoff occurred in several communities, and the worst hit was the Bigwoods area including Newell where there was extensive damage to agriculture, roads, houses and personal effects. This area had a similar experience from Ivan.

The south coast marine environment had also experienced storm wave activity from Charley and it has been suggested that given the similarity between Allen on the north coast (1980) and Ivan in the south coast (2004) in terms of the path of the eye with respect to the coastline, it is likely that damage to the nearshore and offshore marine environment could be similar. Reefs along sections of the north coast of Jamaica suffered a loss of about 67% during hurricane Allen.

Erosion within the coastal zone of the Roselle areas has been taking place for some time and the passage of several hurricanes over the past twenty years has contributed to the virtual disappearance of what was once a fairly extensive recreational beach anchored by coastal structures.

b) The receiving environment

The island's geology, topography and drainage patterns have influenced the response to the elements of hurricane Ivan. The areas most affected by the hurricane fall into four categories viz. coastal zone, hilly interior, solution depressions, and drainage network. They are discussed below.

The coastal zone. Jamaica's continental shelf is most extensive on the south coast and the floor (bathymetry) of coastal waters is characterized by shoals, "fishing banks", cays, patch reefs, and seagrass beds. Several large rivers drain sediment-laden runoff to the coastal waters along the eastern, central and western sections of the coast, and extensive floodplains coalesce from Kingston through St Catherine and Clarendon. The extensive wetlands of the Black river Morass and the floodplain of the Cabaritta River in St Elizabeth and Westmoreland, respectively, add to the features, which have interacted with the passage of hurricane Ivan. Distinctive coastal landforms and ecosystems also include the Palisadoes peninsula, the Portland Bight peninsula, embayments, and sandy and shingle beaches.

The hilly interior. The interior of the island is characterized by steep well-weathered slopes, highly fractured geological formations and well-developed networks of rivers and gullies draining north and south from a central east-west trending rugged mountainous axis. Limestone is the dominant lithology and weathering has created distinctive topographic forms and hydrogeology. Solution basins and high water tables reflect subterranean drainage mechanisms, which play a major role in the hydrological and hydrogeological response to extreme rainfall events. Intense slope failure during Ivan was associated with the distinctive geological zones of the Wagwater Belt (east), the Central Inlier, and the Hanover Block, each with well-weathered, highly fractured lithologies.

Solution depressions. These widely occurring depressions are characteristic of Jamaica's limestone topography; they accommodate extensive farming activities and interior settlements. They are drained through sinkholes and become inundated when floodwaters exceed the capacity for drainage. Aenon Town/ Cave Valley, Bog Hole, Bigwoods/Newell, Lluidas Vale-Worthy Park, are some of the areas identified with extensive losses to agriculture, housing and household effects.

Drainage network. Surface as well as groundwater flows characterize the drainage network of springs, sinkholes, rivers and gullies, and the aquifers add to the distinctive hydrology and hydrogeology of Jamaica.

2. The impact of the hurricane

a) Damage

Damage to each environmental asset is described in Table 5-1 and illustrated in Figures 5-2 and 5-3**.** Elements of the coastal ecosystem and morphology on the south coast have suffered damage and modification, mainly from storm surge and wave attack. Some of the more marked features

include the road failure at Roselle due to scouring and undercutting of the cliff face and shoreline; destruction of the seawall, housing and property in the Caribbean Terrace area immediately east of the mouth of the Hope River and south of the Harbour View housing estate; destruction of protective sand dunes and coastal vegetation along about 3 kilometers of the Palisadoes peninsula which accommodates the single road connecting the Norman Manley International Airport and the settlement of Port Royal with the rest of the island; erosion on the recreational beaches at Hellshire, Treasure Beach and Negril; destruction of resort facilities at Negril e.g. Rick's Café, and damage to several hotel properties; damage to fishing settlements /beaches including extensive losses at Old Harbour Bay, Rocky Point, Portland Cottage, Alligator Pond, Calabash and Great Bays.

Fig. 5-1 Caribbean Terrace shoreline

With respect to coral reefs the National Environment and Planning Agency (NEPA) has been monitoring the Port Royal Cays and specifically the site for the expanded ship's channel at Rackham's Cay. The new wall and the relocation area are significantly damaged. Corals that were placed on artificial structures (concrete blocks) were toppled and tossed about. [1]

Fig. 5-2. Palisadoes. Protective sand dunes and vegetation destroyed

At Portland Bight major damage was reported to free standing corals, which were tossed about, and to branching forms, which were broken. Massive coral heads were more secure and not badly affected. Some coral disease resulting from stress has already been observed. Reefs on the west of Pigeon Island were more badly affected than those on the east. Debris and coral rubble was washed up. Larger coral heads remained mostly intact, while younger corals on loose substrate were toppled. Some corals have been partially buried and bleaching has already been observed. [2] At Negril, a fair amount of damage to the reef structure has been reported. At Long Bay and the West End, coral heads were toppled, branching forms broken off and coral rubble scattered. Reefs at Little Bay suffered the most. There has also been damage to cliff faces in the West End, where waves reportedly were as high as 20 metres. [3]

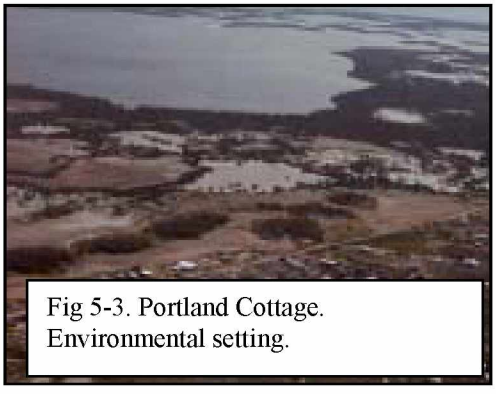


Fig 5-3. Portland Cottage. Environmental setting.

Evidence of uprooted seagrass beds and coral formations washed ashore at Rocky Point extending the matted shoreline for several metres seaward. At Alligator Pond extensive accumulations of seagrass and shingle were also evident, and all beaches along the coast need to be cleaned and rehabilitated.

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1 Personal communication from Ainsley Henry, National Environment and Planning Agency.
2 Personal communication from Brandon Hay, Coastal Conservation Area Management.
3 Personal communication, Karl Hanson, Negril Marine Park.

Mangroves in Portland Bight were badly damaged, with the taller trees showing the most damage. Trees were snapped in half or blown over completely. At the Peak Bay Forest Reserve (on the way to Rocky Point) the mangroves in the area *Rhizophoara mangle*, the red mangrove and *Laguncularia racemosa* the white mangrove, are mostly down.

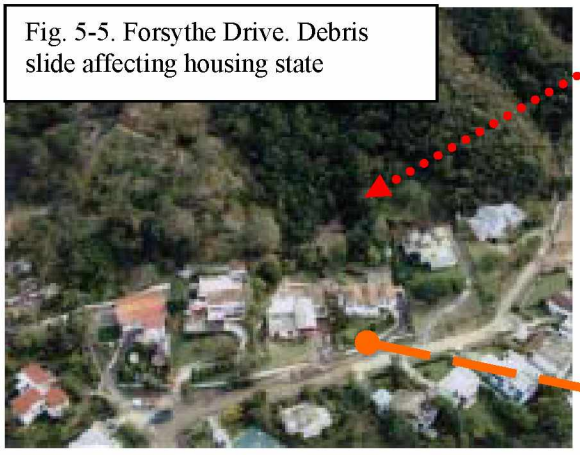
Storm surge/waves also damaged the bauxite-loading pier at Rocky Point and reduced the draft at Port Kaiser by deposition of rocks and seagrass in the area of the port.

Portland Cottage experienced the most extensive, dramatic and devastating effect of storm surge and wave inundation. This low- lying settlement in the salt marsh is a classic example of the consequences of the inappropriate sitting of settlements, and the need for well-informed zoning and rigid enforcement by government authorities.

Fig. 5-4. Portland Cottage destruction

Slope failure was marked especially in the lower southern areas of the Blue Mountains, and along the central mountain axis Extensive landslides, debris flows and mudslides caused major damage to farms, housing, roads, water distribution lines, and electricity and telecommunications networks. Blocked and broken roads disrupted access to several communities for in excess of two weeks in some instances. In addition the material moved downslope to river channels where the capacity to carry runoff was greatly reduced by the increased load and deposition in the channel. Housing on marginal hillsides faced collapse and inappropriate clearing of unstable slopes damaged and/or threatened houses downslope. (See figure 5-5).

Fig. 5-5. Forsythe Drive. Debris slide affecting housing state



Debris slide

Soil erosion in the hilly areas caused loss to agriculture, forest stands, and buildings, and contributed to extremely high levels of turbidity in surface runoff. This turbidity compromised water supply necessitating closure of treatment works and high application of flocculants for settling.

River bank erosion and collapse occurred in some areas, but was particularly marked in the Hope River Valley in Kingston where extensive settlements (legal and squatter) occupy the banks and terraces of the river below Papine and August Town in northeastern St Andrew. In the gorge of the Rio Cobre, a major north south transportation artery, scouring of the banks undercut the road, which was also affected by landslide and rockfall. Devastating inland flooding occurred mainly in solution depressions although there was some ponding and floodplain inundation.

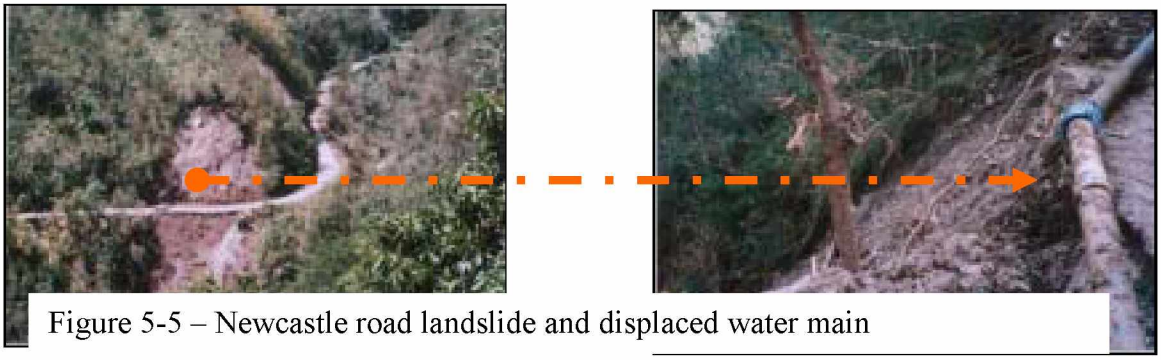


Figure 5-5 – Newcastle road landslide and displaced water main

b) Losses

Losses to forestry, beaches, road network, water supply and sewage systems, utility infrastructure, agriculture, tourism, fisheries, and mining exports can be attributed to environmental damage. These are indicated in table 5-1**.** The washout of sanitation systems can be considered losses as well as indirect consequences. The implications for environmental health and the cost for remedial and preventative action are perhaps best captured as indirect loss.
Damage (landslides and siltation) to water intakes, flooding of works, turbidity levels, washout of mains, and blocked access to works all contributed to losses in the water sector.

Indirect losses can also be associated with the need for increased applications of fertilizers on eroded soils, retention structures on failed slopes, sea defences on eroding shorelines, drain cleaning and desilting of river channels from eroded soils, and solid waste collection of detritus generated by hurricane damage. Landfill capacity has been reduced and the projections for accommodating waste will need to be reexamined.

Potential long-term effects have been described for the island's ecology with particular reference to Shoreline Protection, Fisheries and Parks and Protected Areas.

With respect to shoreline protection, seagrasses, mangroves and coral reefs are three major ecological units that interact to form shoreline protection and stabilization. The loss of major seagrass beds will result in loss of nearshore stabilization and could result in beach erosion. Loss of mangroves will result in the loss of the buffer provided to coastal areas. The toppling of coral heads, and breaking of branching forms will result in the die off of corals due to stress, physical damage, or smothering by sand. The damage to the reef structures will have an impact on coastal protection.

In terms of fisheries loss of mangrove areas will result in the reduction of fish nurseries, a major ecological function provided by mangroves. The damage to the reef structures will have an impact on coastal protection as well as the fisheries for both finfish and shellfish, as the corals are a major habitat for fish and provide grazing and breeding areas.

Loss of income is a major impact for all the Parks and Protected Areas. The loss of mooring buoys in Negril may also result in the secondary impact of anchor damage to coral heads from recreational boaters. Efforts are being made to re-establish buoys for swim demarcation, fish nurseries and mooring.

The interrelationship of the elements of the hurricane, environmental damage and impact on economic assets/sectors is clearly evident in this event.

c) Summary of damage and losses

The total amount of damage to the environment has been estimated as J$ 3,754.5 million, as the cost that would be required to bring back the assets to their original condition; however, part of this damage has already been accounted for in the sectors that utilize them. Total environmental service losses were not estimated as there was not sufficient quantitative data available.

Table 5-1 provides details on the damage and losses that were observed. Table 5-2 summarizes the estimation of damage and losses sustained by the environment, whether natural or built, as a result of the hurricane.

It is to be noted that the required river training works, damage to the water supply systems and to river gauging stations, as indicated in table 5-2 are already accounted for under the respective sector damage and loss estimates. Therefore, when estimating the overall impact of the hurricane on the entire country, adjustments will be made to ensure that no double accounting occurs.

Caribbean Terrace

Hellshire Beach

TABLE 5-1: Recovery Time and Cost						
Environmental Asset	**Damage Quality/Extent**	**Service Loss/Indirect**	**Cost**	**Recovery Period**	**Restoration Cost**	**Notes**
COASTAL ECOSYSTEM						
Recreational Beach	Moderate/Local	Tourism sector – Negril major attraction		Medium-long term	J$ 600m to reseed Negril Beach	Hellshire, Negril, Great Bay-Treasure Beach, Alligator Pond Negril contributes US$350m/annum to Jamaican economy
Fishing Beach	Severe/Extensive	Seafood, restaurants, hotel sector, local food supply, livelihoods		Medium term	J$306m	Manchioneal, Old Harbour Bay, Rocky Point, Alligator Pond, /Calabash Bay Portland Cottage 16 fishing beaches affected
Sand Dunes/Sand spit	Destructive/Local	Coastal protection				Palisadoes – urgent restoration required
Salt Ponds	Moderate/Local	Coastal protection, habitat				Portland Cottage
Mangroves/Vegetation	Moderate/Local	Coastal protection, habitat				Portland Bight
Wetlands	Minimal/Local	Coastal protection, habitat				South coast. Negril Great Morass
Seagrass Beds	Severe/Extensive	Coastal stabilization, habitat, coral reef protection				Portland Bight-Rocky Point, Alligator Pond

TABLE 5-1: Recovery Time and Cost						
Environmental Asset	**Damage Quality/Extent**	**Service Loss/Indirect**	**Cost**	**Recovery Period**	**Restoration Cost**	**Notes**
Coral Reefs	Severe/Extensive	Coastal protection, habitat, natural attraction, recreation, beach enhancement, biodiversity, carbon sequestration, pharmaceutical				South Coast patch reefs Port Royal Cays, Portland Bight, Negril
Fishing Banks	Minimal/Local					Pedro and Morant
Cays/Shoals	Moderate/Local					Palisadoes
BUILT COASTAL ASSETS						
Sea Defence Groynes	Severe/Local	Coastal protection – road, housing, structures, beach		Medium	J$ 1600m	Palisadoes, Roselle*, Caribbean Terrace/Harbour Head, Treasure Beach,
INLAND TOPOGRAPHY						
Slopes	Severe/Destructive/extensive	Vegetation, Agriculture, Road infrastructure, Structures, Utilities		Medium-long	Slope stabilis	Kgn & St Andrew most extensive – Wagwater geological zone Central Inlier, Hanover Block
Inland Basins	Severe/Local Minimal	Agricultural production – sugar, mixed farming		Short - repetitive		Worthy Park, Frome, Aenon Town-Cave Valley, Newell, New River, Bog Hole
Coastal Plains	Severe/Extensive	Housing, resort, tourism, Road				St Thomas*, St Andrew, Negril, Treasure Beach, Montego Bay

TABLE 5-1: Recovery Time and Cost						
Environmental Asset	**Damage Quality/Extent**	**Service Loss/Indirect**	**Cost**	**Recovery Period**	**Restoration Cost**	**Notes**
Soils	Severe, Extensive	Agriculture, water quality		Medium-long		High turbidity levels in water - quality poor
DRAINAGE NETWORK						
River Channels	Severe/Local	Efficient Stormwater runoff Flooding		Medium to long	J$657m	River Training Desilting
River Banks	Severe/Local	Poorly sited structures				
Gully erosion	Severe/ Local					
WATER RESOURCES						
Surface Water Quality	Severe	Water supply, irrigation, storm runoff				Pollution from washed out sanitation systems
Groundwater Resources		Aquifer storage				
Supply Infrastructure		Network treatment & distribution	J$100m			Direct damage to system
Monitoring & Management		Data collection & analysis for Resource management	J$1.4m			Damage to gauges and recorders
FORESTRY						
Public Plantations incl. Roads & Structures	Severe/ Extensive	Protection vs. erosion Air purification Carbon sequestration Sustainable quality water yield ,Timber, Fuelwood Biodiversity/habitats		Short-medium	>J$52m	Private holdings not assessed Natural forests more resilient Difficult to assess flora, fauna and habitat loss
Protected Areas – BJCNat'l Park	Moderate/Local	Recreation, Biodiversity			J$2.6m - BJC …. others	Blue & John Crow Mtn, Portland Bight, Negril Marine Park

TABLE 5-1: Recovery Time and Cost						
Environmental Asset	**Damage Quality/Extent**	**Service Loss/Indirect**	**Cost**	**Recovery Period**	**Restoration Cost**	**Notes**
Private Holdings	Not assessed					
Biodiversity/Habitat	Not assessed					
ENVIRONMENTAL HEALTH						
Sanitary Facilities	Destructive/extensive	Water Pollution Vectors/W/Q monitoring, etc.	J$39m	Medium	J$435.5m	Complete washout of pit latrines in several areas
Solid Waste Mgt	Severe/extensive/islandwide	Disruption of normal cleaning Vectors	J$81m.	short		Collection and disposal of trash associated with Hurricane damage islandwide

Table 5-2

Summary of damages to the environment, arising from hurricane Ivan
(Million Jamaican Dollars)

Environmental assets	Estimated damage
Total	**3,754.5**
Natural coastal assets	
- Negril Beach	600.0
- Old Harbour Bay, Rocky Point, etcetera	306.0
Built coastal assets (Palisadoes, etc)	1,600.0
Drainage network (River training works)	657.0*
Water resources	
- Water supply system	100.0*
- River gauging stations	1.4*
Forestry	
- Public Plantations	52.0
- BJD National Park protected areas	2.6
Environmental health (latrines)	435.5*

Source: Estimations made by ECLAC on the basis of official and private sector information.
* These amounts are accounted for under other sectors.

VI. SUMMARY OF DAMAGE AND LOSSES

The total impact of hurricane Ivan on Jamaica, as described in previous chapters of this report, amounts to 36,886 million Jamaican dollars, or its equivalent of US$ 595 million. [1] In spite of some limitations imposed by the lack of sufficient data in some infrastructure sectors or activities, the above figure reflects the amount of damage and losses sustained by the country.

Of the total figure quoted above, 63% (J$ 23,182 million) refers to damage to physical assets and the remaining 37% (J$ 13,704 million) to indirect losses or changes in economic flows that will occur during the remainder of 2004 and in the next three years. [2] Partial information from the insurance industry indicates that an estimated amount of J$ 3,000 would be reimbursed to owners of affected homes and other infrastructure, no information was available in regard to the possible insurance refunds to productive activities.

The total amount of damage and losses are equivalent to 8% of the country's GDP for the previous year, which figure provides a measure of the magnitude of the disaster for the island. While the same hurricane imposed damage and losses to other neighboring island states that represent much higher figures, [3] the impact in Jamaica should not be underestimated, especially in regard to its geographical distribution.

Of special relevance and interest is the breakdown of the above amount by type of impact, as follows:

	J$ million	Per cent
Destruction and damage to assets	23,182	63
Production losses	9,987	27
Increased operational expenses and revenue losses	3,666	10

The first type of impact refers to the amount of assets that have been lost or damaged and which will have to be reconstructed or repaired in the following years, and is a measure of the reconstruction effort to be undertaken by the government and private sector. In addition, the second type of impact indicates the amount by which – after converting to value added – gross domestic product will be affected. Finally, the third type of impact – while admittedly underestimated due to lack of sufficient data especially in the transport sector – is an indication of how private and public sector utilities will be affected in their financial results for the year.

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[1] A uniform exchange rate of J$ 62 per United States Dollars has been utilized throughout the assessment.

[2] It has been demonstrated that in disasters caused by hydrometeorological phenomena, the value of indirect losses normally exceeds that of direct damage. In this case, however, and despite the underestimation of transport losses, the winds of the hurricane imposed significant damage to assets that result in the out-of-pattern damage and loss structure.

[3] Preliminary estimates indicate that the impact in Grenada was of more than 2.4 times the value of that country's GDP.

The private sector sustained damage and losses of J$ 27,180 million (74% of the total estimated impact), while the public sector suffered the remaining 26 per cent of the impact. Nevertheless, the government has already indicated his disposition to absorb part of the damage sustained by poor population groups that do not have any means to face the requirements of reconstruction. The government's share of the impact will therefore be substantially higher.

The analysis undertaken allows to identify the sectors that were most affected in one-way or another. The productive sectors were the most affected since they sustained damage and losses of J$ 13,375 million, followed by the social sectors (J$ 12,729 million), while infrastructure suffered a comparatively lower impact (J$ J$ 6,988). (See table 6-1 below). However, the single most affected sector is that of housing which sustained total damage and losses of J$ 11,164 million, or 31% of the total impact, followed by agriculture and livestock (J$ 8,550 million and 24%), and transport (J$ 3,256 million and 9%). When only indirect losses are considered, the most affected sector is that of agriculture (J$ 5,143 and 37% of total losses), followed by food processing (J$ 1,995 million and 14%), tourism (J$ 1,591 million and 12%), and telecommunications (J$ 1,535 million or 11%).

Table 6-1

Summary of damage and losses caused by hurricane Ivan in Jamaica
(Million Jamaican Dollars)

Sector and subsector	Damage and losses			Sector	
	Total	Direct	Indirect	Public	Private
Total	**36,886.3**	**23,182.2**	**13,704.1**	**9,605.8**	**27,180.5**
Social sectors	13,684.6	12,943.3	741.3	2,520.7	11,163.9
- Housing	11,163.9	10,474.8	689.1		11,163.9
- Education and culture	806.9	794.9	12.0	806.9	
- Health	758.4	718.2	40.2	758.4	
- Public buildings	955.4	955.4		955.4	
Productive sectors	13,375.6	4,133.3	9,242.3	312.1	13,063.5
- Agriculture and livestock	8,550.0	3,407.0	5,143.0		8,550.0
- Food processing	2,204.9	210.0	1,994.9	312.1	1,892.8
- Mining	1,030.0	50.0	980.0		1,030.0
- Tourism	1,590.7	466.3	1,124.4		1,590.7
Infrastructure	6,987.9	3,545.0	3,442.9	4,117.5	2,770.4
- Electricity	1,397.9	589.0	808.9	279.6	1,118.3
- Water supply and sanitation	678.7	190.4	488.3	578.7	
- Transport	3,255.9	2,460.0	795.9	3,199.1	56.8
- Telecommunications	1,535.3	198.6	1,336.7		1,535.3
- Airports	120.1	107.0	13.1	60.1	60.0
Environment [4]	2,560.6	2,560.6	...	2,560.6	
Emergency expenditures	277.6	---	277.6	94.9	182.7

Source: ECLAC.

[4] To avoid double accounting, damage to assets already accounted for in other sectors are not included in this figure.

Based on the above information it is possible to assert that the disaster caused by hurricane Ivan in Jamaica can be described, in broad terms, as one that destroyed or damaged assets of housing, transport infrastructure, the environment and some permanent agricultural plantations, while at the same time imposing a decline in future agriculture and livestock and food processing production and in the tourism industry, as well as bringing about decreased revenues and increased operational costs of utilities in the electricity, water supply, telecommunications and transport sectors. In the following chapter, an analysis of the repercussions that these damages and losses will have on the macroeconomic position of the country will be presented.

When the results of the analysis of the impact of the hurricane on the national economy and the living conditions of the population are considered in their entirety, the perception that the country only sustained minor effects cannot be sustained. In fact, the figures provided above speak for themselves. Furthermore, the impact can more easily be understood when the analysis is carried down to the parish level. [5] A relatively high proportion of damage and losses were concentrated in the parishes of the southern parishes of Manchester, St. Elizabeth, Clarendon and St. Catherine, where the action of winds, storm surge, rains and floods was stronger.

It is also of interest to note that in 1988 hurricane Gilbert (See box) produced much higher impacts in Jamaica, and also to compare the impact of Ivan with that of other disasters that have occurred in the Caribbean area in the recent past. [6]

Table 6-2

Selected natural disasters in the Caribbean and their impact

Natural disaster	Year	Country	Impact
Gilbert	1988	Jamaica	65% of GDP
Hugo	1989	Montserrat	200% of GDP
Debbie	1994	St. Lucia	18% of GDP
Luis and Marilyn	1995	Antigua	65% of GDP
Luis and Marilyn	1995	St. Kitts and Nevis	85% of GDP
Georges	1998	St. Kitts and Nevis	50% of sugar harvest
Lennny	1999	Barbuda	95% of primary sector GDP
Michelle	2001	Jamaica	1% of GDP
Ivan	2004	Grenada	200% of GDP
Ivan	2004	Jamaica	8% of GDP

Source: On the basis of official information.

[5] Not sufficient time was available to undertake a more detailed analysis of the disaster impact at parish level.

[6] Prior to Hurricane Gilbert, Jamaica was affected by a Hurricane in 1980 and by floods in 1986 and 1991. The respective losses are estimated at 2%, 3% and 6% of GDP respectively. See, Charveriat, C. *Natural Disasters in Latin America and the Caribbean: An Overview of Risk.* IDB, Working Paper #434, October 2000.

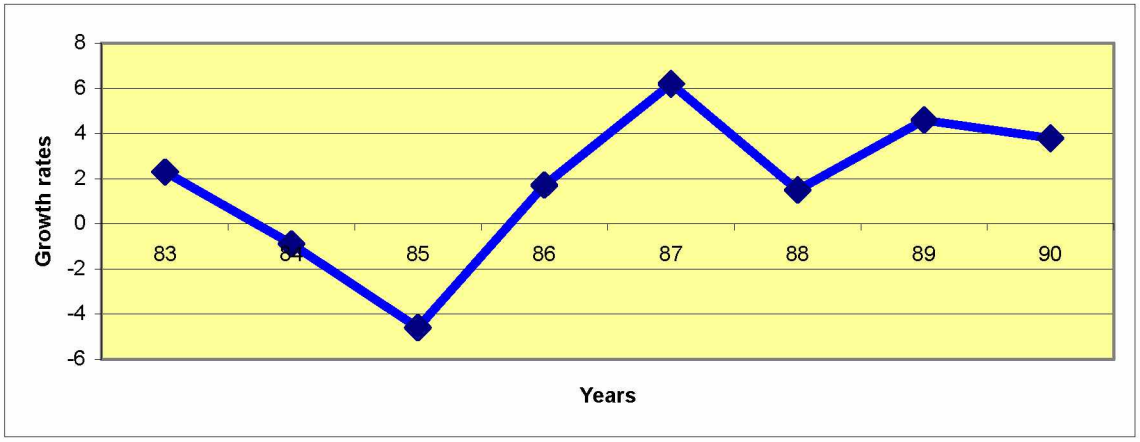
Box 6-1

The impact of hurricane Gilbert

Hurricane Gilbert hit Jamaica in 1988. The population affected is estimated at 810,000. The event caused 49 deaths. It amounted to 65% of GDP. It affected mostly the agricultural and mining sectors of the economy. It also had a negative impact on the manufacturing sector (1%, 0.3% and 1% in 1987, 1988 and 1989 respectively).

In terms of aggregate GDP growth, it caused a drop from 6.2% in 1987 to 1.5% in 1988 (taking into account the effects of Hurricane Gilbert. See Figure 6-1). In 1989 GDP growth recovered to 4.6% and stabilized at 4% in 1990. In terms of merchandise exports, these declined from 24% in 1987 to 14% in 1988 and 16% in 1989. Manufacturing exports rose by 22% between 1987 and 1988 but then declined by –25% in 1989. For their part imports grew by 17% in 1988 and 36% in 1989.

Jamaica: GDP growth 1983-1990



Sources: On the basis of information provided by the Planning Institute of Jamaica (PIOJ), the Bank of Jamaica (BOJ) and Charveriat (2000).

VII. MACROECONOMIC EFFECTS

1. Introduction

This chapter comprises four sections. The first two sections present an analysis of the macroeconomic trends in the previous year (i.e., the year prior to the disaster) and in the two quarters of the year 2004 preceding the natural disaster. The third section analyses the short run expected performance of the economy without the disaster. The final section provides a macroeconomic assessment of the disaster. All the sections survey the overall economic trends of the economy, fiscal policy, the external sector and the financial system to the extent that is permitted by data availability.

All estimations were carried out on the basis of official data and also on information provided by private sector organizations. They are presented in Jamaica Dollars unless indicated otherwise.

In the year in which the disaster occurred (2004) overall GDP is projected grow by 1.9% (2.6% in the pre-disaster scenario). The most affected sectors include agriculture (-0.8% and -5% in the pre and post Ivan scenarios), electricity and water (3.7% and 2.2% in the pre and post Ivan scenarios), transport storage and communications (3.4% and 2.6% for both scenarios respectively) and to a lesser extent manufacturing (4.7% and 4.2% for both scenarios respectively) and mining (9.9% and 9% for both scenarios respectively).

The effects of Hurricane Ivan are not estimated to be significant enough to hamper the attainment of the macroeconomic targets set by the authorities. The fiscal deficit will remain as projected within the vicinity of 4% and the current account deficit, due to the good performance of the economy in the first half of the year, is projected to be roughly between 9% and 10% of GDP. Under controlled fiscal and balance of payments conditions and given the stability of exchange rate movements, monetary policy will maintain its current stance.

2. The pre-disaster situation: the evolution of the economy in the year prior to the disaster

a) Main trends

During 2003 the Jamaican economy registered the strongest growth performance in more than a decade (1.1% and 2.3% in 2002 and 2003). The behavior of economic activity responded to the ongoing dynamism of mining (4.8%) and the recovery of the agriculture and tourism sectors (5.7% and 6.0% respectively). (See Table VII-1 for the main macroeconomic indicators).

The robust growth in the real sector was unhampered by the climate of uncertainty and loss of confidence in the national currency prevailing in the first semester of 2003 and which

translated into a sharp depreciation in the exchange rate .The chain of events was triggered by the official announcement in December 2002 that the actual fiscal deficit for FY 2002/2003 would exceed its expected target by a wide margin (-7.3% versus -4% of GDP). [1]

The loss in the currency's external value led the Bank of Jamaica to adopt a contractive monetary policy resulting in significant increases in the spectrum of interest rates on its open market instruments. The authorities complemented the interest rate hikes with interventions in the foreign exchange rate market causing a decline in the stock of net international reserves. At the same time the government announced a package of tax measures to increase revenue and expenditure cuts to curtail the fiscal imbalance.

These measures were able to narrow the fiscal gap for FY 2003/2004 and tame the nominal exchange rate depreciation in the second half of 2003 allowing the Central Bank to relax its policy stance. The effects of the depreciation in the exchange rate were nonetheless felt in the rate of inflation that reached the two-digit level for the first time in six years (14%).

On the external front the overall position in the balance of payments deteriorated in spite of the reduction in the current account deficit (-13.3% and -12.4% of GDP in 2002 and 2003) as a result of the decline in the surplus in the capital and financial accounts due to the decision of the government to avoid external refinancing options to repay its international debt.

[1] FY stands for fiscal year. The fiscal year in Jamaica runs from March to April.

Table 7-1
JAMAICA: MAIN ECONOMIC INDICATORS

	1995	1996	1997	1998	1999	2000	2001	2002	2003a/	2004a/	2004/b	2005b/
					Annual rates of growth c/							
Gross domestic product	1,0	1,0	-1,7	-0,3	0,0	0,9	0,8	1,5	2,3	2,6	1,9	2,2
Gross domestic product per capita	0,1	0,1	-2,5	-1,2	0,0	0,0	-0,1	0,6	0,2	1,4	1,0	
					In US dollars							
Gross domestic product per capita	1 928	2 578	2 683	2 775	2 645	2 724	2 847	2 894	2 962	3095	2996	
					Annual rates of growth c/							
Gross domestic product by economic activity												
Agriculture, Forestry & Fishing	2,9	4,0	-13,4	-1,7	1,0	-12,0	5,8	-7,0	4,7	-0,8	-4,6	
Mining & Quarrying	-5,1	6,1	4,3	1,8	0,1	-1,0	2,6	3,3	4,9	9,9	9,1	
Manufacturing	-1,4	-5,1	-2,7	-4,7	-1,9	0,6	0,8	-0,8	-0,8	4,7	4,2	
Construction & Installation	6,9	-5,4	-3,5	-6,7	-1,7	0,7	2,2	2,4	1,2	2,2	3,4	
Electricity & Water	3,4	4,7	6,6	6,3	4,6	2,2	0,7	4,6	4,7	3,7	2,2	
Transport Storage & Communication	9,8	9,4	6,3	6,4	6,8	6,5	5,1	6,2	3,6	3,4	2,6	
Distributive Trade	4,2	1,4	0,8	-1,3	-0,5	1,2	0,0	0,1	1,0	0,9	0,9	
Finance & Insurance Services	3,6	3,4	-10,6	-4,2	7,0	3,1	-8,3	6,2	4,6	0,0	0,0	
Real Estate & Business Services	2,8	2,0	-4,5	-2,6	-1,5	0,0	1,1	0,7	1,8	1,5	0,6	
Producers of Government Services	0,8	-0,4	0,1	0,6	0,0	-0,3	0,6	0,4	0,2	0,4	0,4	
Miscellaneous Services (incl. Household & Non-Profit Institutions)	8,9	-3,6	-8,3	-4,1	-0,2	2,5	-0,8	1,0	5,5	7,0	6,0	
Less: Imputed service charge	10,6	9,0	-9,6	-0,1	3,1	1,8	-9,1	5,4	1,6	5,0	5,0	
					Millions of US dollars							
Balance of payments												
Current account balance	-99	-143	-332	-334	-216	-367	-757	-1 074	-765	-722	-757	
Merchandise balance	-829	-994	-1 132	-1 131	-1 187	-1 442	-1 618	-1 871	-1 942	-1 992	-2 103	
Exports fob	1 796	1 721	1 700	1 613	1 499	1 563	1 454	1 309	1 386	1 588	1 541	
Imports fob	2 625	2 715	2 833	2 744	2 686	3 004	3 073	3 180	3 328	3 581	3 644	
Services balance	494	453	467	477	655	603	383	315	560	606	576	
Income account	-371	-225	-292	-308	-333	-350	-438	-606	-571	-651	-632	
Unilateral transfers	607	624	625	628	647	821	916	1 087	1 189	1 315	1 402	
Financial and capital balance d/	126	414	162	378	216	367	757	1 074	765	722	757	
Net foreign direct investment	81	90	147	287	429	394	525	407	374	146	....	
Financial capital	45	324	15	91	203	365	781	1 091	765	721	752	
Global balance	27	271	-170	44	.....	....	...	...	...	...		
Variation in reserve assets e/	56	-202	205	-27	132	-519	-871	244	432	-90	...	
Other indicators of the external sector												
External debt (millions of US dollars)	2 032	2 415	3 278	3 306	3 024	3 375	4 146	4 348	4 192	4 800	4 800	
External debt (% of GDP)	66,1	55,2	48,8	48,1	44,4	47,8	55,9	57,4	57,4	60,0	60,0	
Employment												
Participation rate f/	69,0	67,7	66,6	65,6	64,5	63,3	63,0	63,6	62,0	....	...	
Unemployment rate	16,2	16,0	16,5	15,5	15,7	15,5	15,0	15,1	13,1	13,0	13,0	

Table 7-1 (Conclusion)

	1995	1996	1997	1998	1999	2000	2001	2002	2003a/	2004	2004	2005
Prices												
Rate of change of the consumer price index (december to december)	25,5	15,8	9,2	7,9	6,8	6,1	8,7	7,3	14,1	10,0	11,0	
Rate of change of the nominal exchange rate (december to december)	19,4	-11,8	3,6	2,6	10,7	10,2	4,3	6,0	19,4	4,2	4,2	
Weighted deposit real interest rate	26,2	20,8	14,1	15,5	13,3	12,2	10,1	8,9	-6,5	-1,7	-2,6	
Weighted lending real interest rate	48,6	37,8	31,9	30,1	24,6	22,1	19,5	18,3	4,6	7,1	6,2	
Central government g/					*Millions of dollars of Jamaica*							
Revenue	56 643	61 299	65 196	72 842	83 839	97 611	97 770	109 504	142 251	168 291	174 053	
Expenditure	44 442	64 225	72 113	84 743	93 166	95 782	113 678	141 080	173 248	186 911	197 689	
Overall fiscal balance h/	3 807	-14 966	-20 787	-19 171	-12 583	-3 172	-21 413	-31 861	-28 838	-21 366	-23 636	
Primary balance i/	21 778	12 314	3 776	15 418	29 201	39 749	29 597	30 259	59 332	74 554	72 284	
Interest	17 971	27 280	24 564	34 589	41 784	42 920	51 010	62 121	88 170	95 920	95 920	
External	...	...	...	...	6 804	8 614	10 657	15 186	16 709	21 649	21 649	
Internal	...	...	...	...	34 980	34 306	40 353	46 935	71 461	74 270	74 270	
					Percentages of GDP							
Fiscal balance with grants	...	...	...	...	...	...	-5,6	-7,6	-5,9	-3,8	-4,2	
Fiscal balance without grants	...	...	...	...	...	...	-6,1	-7,9	-6,0	-4,6	-5,0	
Primary balance							7,8	7,2	12,2	13,4	12,8	
Money and credit												
Internal credit	30,1	32,0	34,3	...	38,3	37,7	39,3	36,8	45,5	44,4	44,4	
To the public sector	6,7	7,5	8,8	...	7,6	6,9	17,2	23,3	35,8	...	...	
To the private sector	23,4	24,5	25,5	...	30,7	30,8	22,1	13,6	9,7	...	...	
Money supply (M2)	36,8	35,8	37,1	37,5	40,9	40,4	40,8	31,2	28,2	29,0	29,0	

Source: ECLAC on the basis of official information.

a/ Preliminary data. Refers to the pre-Ivan scenario.

b/ Refers to the post-Ivan scenario.

c/ At constant 1986 prices.

d/ Includes errors and omissions.

e/ The sign (-) denotes an increase in reserves.

f/ Economic active population as a percentage of the working age population.

g/ On a fiscal year basis. The estimates for FY 2004/2005 with the disaster are based on the assumption that the governnment assumes 30% on the reconstruction costs and that total revenue does not change in the scenarios prior and post Ivan.

h/ Includes grants.

i/ Excludes interest payments.

a) Economic policy

Fiscal policy. During FY 2003/2004 the authorities adopted a contractive policy managing to reduce the previous fiscal year's deficit from 7.3% to 5.8% of GDP. This result was mainly achieved through expenditure restraint and the implementation of a set of revenue enhancing measures between the months of May and June 2003.

Total expenditures remained at the level of the previous fiscal year (36% of GDP) due to a contraction in social programme expenditures, which managed to offset the rise in the wage bill and interest rate payments.

The said revenue measures proved effective, in spite of the fact that their effects fell below the expected target, and resulted in an increase in the tax to GDP ratio by 1.7% points (24.56% and 26.36% of GDP in FYs 2002/2003 and 2003/2004). The most important ones included the expansion of the General Consumption Tax Base and an upward movement in the rate in telephone services and customs user fees on specified imports.

Notwithstanding these fiscal efforts on the expenditure front, the rising stock of public debt remains a source of concern to the monetary and fiscal authorities (150% and 187% of GDP at the end of 2002 and 2003) as it significantly constrains the margin of manoeuvre as well as the composition of government expenditures. When classified by functional category debt management expenditures are found to be the single most important category within total expenditure absorbing 65% of the total and followed, in the distance, by human capital enhancement expenditures such as education (4% of total expenditures). The debt situation also explains the decision of international agencies to downgrade Jamaica's long-term sovereign local currency rating in January 2003 and in February 2004.

Monetary and exchange rate policies. In 2003, policy responded to the dual role played by the Central Bank as the guarantor of monetary and price stability on the one hand; and as the lender of ultimate resort to the government providing liquidity needs and sustainable financial conditions for the servicing of the government's debt on the other. Both roles were assumed sequentially in the first and second semesters of the year respectively.

As a result monetary policy underwent through two stages. In the first stage (January to June) the Bank imposed a series of measures destined to reign the fall in the nominal exchange rate visibly intense in the first five months of the year. The monthly exchange rate depreciated by 18% between January and May 2003 (J$51.59 in January and J$ 61.08 in May per 1 USD). The depreciation was triggered by the significant deterioration of the fiscal accounts in FY 2002/2003.

The most important measure consisted in restricting liquidity through open market operations while at the same time engage in interventions in the foreign exchange market. The bank also established a special deposit requirement for financial institutions as a way to absorb liquidity, which required the said institutions to hold 5% of their average prescribed domestic liabilities on deposits at the Bank of Jamaica.

The overall result was a contraction in high powered money (-5%), a higher plateau of the open market instrument term structure of interest rates with the concomitant negative consequences on the government's fiscal accounts and a decline in the stock of international reserves (470 million US$) which was amplified by the redemption of a Eurobond in the first quarter of the year.

The second semester witnessed a relatively more stable macroeconomic environment. At the end of the first semester the exchange rate halted its rate of depreciation (4.7% for the June quarter) and stabilized at J$ 60.62. The monetary authorities took advantage of these circumstances and allowed interest rates to decrease while maintaining a higher interest rate level in relation to the previous year. This lessened to some extent the debt burden of the government and also provided the required liquidity to finance its fiscal deficit. During this period net credit to the public sector rose by 28% and base money and money supply expanded 15% and 13% respectively.

The central bank's stance did not significantly affect the liquidity position of the commercial banking system. Between December 2002 and December 2003, the loan to deposit ratio advanced from 0.41 to 0.50. Commercial banking system nominal rates increased marginally and real interest rates declined as a consequence of the two-digit inflation level (10% and 4.6% for overall average weighted real loan rate in December 2002 and December 2003 respectively).

The downward trend in real interest rates in conjunction with the level of growth and stabilization efforts by the Bank of Jamaica pinned up the demand for loans (22% in real terms). Personal loans, tourism and transport and communication accounted for 47% of the total.

c) Evolution of main variables

Economic activity. The expansion of economic activity (2.3%) responded mainly to the vibrant performance of the primary and services sector although all sectors with the exception of manufacturing and producers of government services registered positive rates of growth.

The performance of agriculture (-7% and 5% in 2002 and 2003) is accounted for by domestic agriculture as export agriculture declined (14% and -6% respectively). This responded to an improvement in climatic conditions and government relief assistance to farmers affected by the flood rains.

The growth of the mining sector (3.3% and 4.8% in 2002 and 2003) reflected an increase in capacity utilization of alumna plants in JAMALCO and ALPART and higher prices due to favorable external demand conditions.

Manufacturing output contracted as in the previous year (-0.8% and -1.0% in 2002 and 2003). This was due to declines in the two major manufacturing components beverage, food and tobacco and other manufacturing (-0.6% and -1.5% respectively). The behavior of the former responded to the reduction in sugarcane milled, to the effects of the increase in the tax base, which affected dairy products, and delays in the timely provision of raw material inputs. The

evolution of other manufacturing reflected the closure of the refinery plant for repairs and maintenance in the third quarter of the year. For its part textile and apparel continued to exhibit a marked lack of competitiveness.

The rate of growth in the construction sector fell below that registered in the previous year (2.3% and 1.1% in 2002 and 2003) and benefited from the expansion and improvement of on-going infrastructure projects including the Highway 2000, the Northern Coastal Highway and the increase in capital expenditures by the utilities companies.

The tourism sector provided the most important impetus to overall economic growth (-0.4% and 6% in 2002 and 2003). The performance of this sector capitalized on higher investment levels, efforts to diversify tourism products and a greater number of cruise ship calls. The number of visitor arrivals, mainly cruise ship tourists, and visitor expenditure expanded 17% and 8% respectively.

Prices, wages and employment. The rate of inflation reached double digits (7.3% and 14.1% on a point-to-point basis in 2002 and 2003 respectively) for the first time in six years. The determining factors included the depreciation of the nominal exchange rate, the tax measures implemented between May and June, higher international oil prices, increases in transport costs and the increase in the minimum wage.

The decomposition of the price level into its different components shows that the largest contributor to inflation was the food and drink and transportation categories (48% and 13% of the total) followed by fuels and other components and housing expenses (9% for both).

Turning to salaries and emoluments, during 2003 the government proceeded to settle wage claims to weekly and daily paid public employees and to education officers.

For its part, the rate of unemployment declined with respect to the previous year (15% and 13% for 2002 and 2003) due mainly to a decline in the registered labor force rather than due to an increase in the number of employed. The labor force fell from 1124.4 to 1098.8 thousands while the employed labor force remained at 954. The decomposition of labor force statistics by gender category shows that the decrease in the labor force was particularly pronounced for females (506 and 488 thousands for 2002 and 2003). The female category also recorded the largest decrease in the unemployment rate (11% and 10%; 21% and 18% for males and females for 2002 and 2003 respectively).

Evolution of the external sector. The global result of the balance of payments was negative, as the current account deficit (-13.3% and -12.4% of GDP in 2002 and 2003) was not offset by the surplus in the capital and financial account. As a result, the stock of net international reserves declined (1600 and 1169 million USD$ for 2002 and 2003).

The trade balance worsened (20% and 26% of GDP in 2002 and 2003) as a result of the increase in the petroleum import bill (29%). This in turn responded to the rise in the international price of oil, the exchange rate depreciation and to the expansion of import demand for non-mineral products. The other categories of imports, consumer good imports and capital goods registered a decline (-4% and -14% respectively) as a result of a fall in the demand for consumer

durables due to the introduction of the tax measure package in May -June and to a lower level of investment in the telecommunications sector.

For their part exports rose for the first time in three years consequent upon the good performance of alumina (12%) which represents 80% and 58% of total traditional and domestic exports. The performance of other traditional exports was mixes as bananas and sugar recorded positive growth (14%) while coffee, rum and bauxite witnessed a deteriorating performance (-10%, -12% and -19%).

The services balance widened its surplus (271 and 444 million US$ in 2002 and 2003) due to the expansion of tourist arrivals (13%) reflecting favorable external conditions and the efforts of the authorities to improve the competitiveness of the sector. The most significant increase was recorded in the European market (0.2% and 29% in 2002 and 2003).

Remittances, which constitute one of the main sources of external finance and of foreign exchange inflows, expanded (13% and 17% of GDP in 2002 and 2003) responding to the expansion in the market share of financial institutions and to the improved performance of the United States economy.

The capital account of the balance of payments registered a deficit (-17 million US$ for both 2002 and 2003) while the financial account narrowed its surplus in relation to the previous year (1135 and 1020 million USD in 2002 and 2003). The reduction in the financial account's surplus is explained mainly by the repayment of euro bond loan, which caused a reduction in the inflows corresponding to other official investment category (77 and -368 million USD).

The impending macroeconomic disequilibria and the downgrading of the country's international credit rating status in June 2003 prevented the authorities from tapping on the external capital market to seek any further funding. Finally, private investment flows rose (814 and 956 million US$ in 2002 and 2003) albeit at a lower rate than expected as a result of the lower levels of activity in the telecommunications and financial sector services.

3. The evolution of the economy in the year of the disaster: The first two quarters of the year

a) Main trends

In the first two quarters prior to the disaster GDP recorded a 2.7% growth in relation to the same period over the previous year. Growth was fuelled by the mining, manufacturing and tourism sectors (10%, 6% and 9% respectively).

The expansion of economic activity translated into higher than projected tax revenues, which jointly with a reduction in programme expenditures yielded a fiscal deficit below that programmed for the first quarter of fiscal year 2004/2005 (16.8 and 14.3 billion J$ for the budget and the actual fiscal balance).

The improved performance of export agriculture, mining and tourism resulted in a higher level of exports of goods and services. The net export imbalance declined from -709 to -687 million USD. As well the services balances yielded a higher surplus as a consequence of a greater level of travel inflows. The goods and services deficit was more than offset by a higher level of current transfers and net investment incomes, which translated into a higher level of net international reserves.

For its part the rate of inflation witnessed a decline in its trend relative to the previous year.

b) Economic policy

Fiscal policy. Fiscal operations yielded a surplus in the first quarter of the year, equivalent to 1.2% of GDP, and a deficit of 2.7% of GDP in the second quarter (the first quarter of FY 2004/2005). The fiscal results responded to stronger than projected growth in tax revenues.

Tax revenues responded to continued growth of the economy in general. More specifically these responded to the payment of arrears in the first quarter and the full effects of the tax measures that were passed in 2003 in the second quarter.

For their part expenditures rose above the planned target for he first quarter of the year due to increases in the two most important categories, wages and salaries and interest payments. Contrarily, in the second quarter, expenditures were below budget due to the reduction in recurrent and capital expenditures.

Government operations were financed by a mix of foreign and domestic sources. The governments' financial resources were augmented by the issue of the Euro and Regional bond mentioned above. At the end of May the public debt increased to 710 million US$ which represented a 4.8% with respect to March.

Monetary and exchange rate policy. During the first two quarters of the year monetary conditions remained stable. The effect of the increase in net international reserves consequent upon the improved performance of the external sector on the monetary aggregates was partly offset by sterilization operations.

These managed to contract the growth of net domestic assets with respect to the previous year without altering the declining and convergent trend of the term structure of interest rates. As a result the monetary base and the narrow and expanded money supplies rose by 1.2%, 0.1% and 1.5% respectively. In the same vein the main tenors of the Bank of Jamaica decreased from 14.85% to 14.20%; 16.0% to 15.05% and from 15.57% to 14.98% for the 30-day, 180-day repo and 180-day treasury bill. For their part the commercial banks followed suit and the weighted average loan rate decreased from 19.10% to 17.75% between March and June.

In line with these developments the exchange rate remained stable and saw an insignificant depreciation with respect to the previous year (59.42 $J and 60.76$J in May 2003 and May 2004).

c) Evolution of the main economic variables

Economic activity. The level of economic activity picked up significantly in the second quarter of 2004. For that quarter the economy registered one of the highest rates of growth in the past eight years (2.7%). Growth was fuelled by the dynamism of mining, manufacturing and tourism.

The agricultural sector registered a contraction mainly as a result of stagnation of domestic agricultural activities (-1.25% on average for the first two quarters) as export agriculture expanded especially in the first quarter of the year (19.7% and 3.8% for both quarters respectively). The performance of agriculture was due to the effects of a draught on the output of domestic crops.

The mining sector (9% on average for the first two quarters) responded to favorable external conditions for alumina and both higher capacity and close to full capacity utilization levels at bauxite and alumina plants.

The performance of manufacturing registered the highest rate of growth in the first two quarters of the year (6% on average) at least in the past eight years. This reflected the increased output in cement production, in the food processing sectors, and in the output of beverages and tobacco. It also responded to the stability in the workings of the local petroleum refinery.

Construction activities grew moderately (2%) maintaining the trend of the past year and in spite of the increase in cement production. The behavior of the sector was also affected by the scant growth in imports as the sector is highly dependent on foreign construction materials, machinery and equipment.

The tourism sector remained buoyant (7% and 11% for the first and second quarters of the year) as stopover arrivals increased their numbers by 10%. In consonance tourism expenditure grew 7%. Cruise passengers who have less of an effect on the economy expanded by 1.5%.

Prices, wages and employment. In the first six months of the year the rate of inflation declined from 5.6% to 3.8% in relation to the previous year. The year 2003 witnessed a higher than expected inflation rate due to the effect of the tax measures, mentioned above, on the general price level.

The behavior of the rate of inflation in 2004 responded to the stability of the nominal exchange rate and of the general macroeconomic conditions.

In terms of its components, the movement in the rate of inflation responded in the first quarter to the increase in the food and drink (28% of the total) and housing and other expenses categories (26% of the total). In the second quarter, the food and drink category was the main driver of inflation (80% of the total). Prices within this category were affected by supply shortages due to draught conditions, which reduced the availability of agricultural products and due to a ban on beef imports from the United States.

The external sector. The global balance of payments yielded a positive result as the surplus in the capital and financial account more than offset the deficit in the current account. As a result the economy increased its stock of net international reserves in relation to the previous year. Reserves increased by 439 million US$ and the stock of net international reserves grew from 1220 to 1604 million US$ for the period January-June.

The current account deficit improved both through the increase in traditional exports and the decline in imports. The behavior of exports reflected the dynamism of mining and quarrying, manufacture and export agriculture; and more precisely a favorable external environment, improved technical conditions and expansion in productive capacity and higher rates of capacity utilization.

The services balance surplus widened fuelled by the rise in travel receipts, which in turn responded to the good prospects of the tourism sector for the year. Tourist arrivals, mainly stopovers, and tourist expenditure registered significant increases.

For their part the income account imbalance rose mainly due to profit repatriation while current transfers and more specifically private transfers expanded.

The capital and financial account's surplus is mainly explained by the increase in inflows associated with the issue of a government 200 million Eurobond in February and a US$ 50 million bond in March.

4. The expected performance of the economy without the disaster

a) Main trends

The Jamaican economy was expected to expand by 2.6% in the absence of the disaster propelled by the mining, tourism and manufacturing sectors. Agriculture was expected to exhibit a decline while construction was projected to remain on its moderate growth path.

The authorities had targeted a fiscal deficit of 3.8% of GDP based on an increased rate of growth of the economy in conjunction with efforts at fiscal consolidation and a downward trend in the spectrum of interest rates.

The rate of inflation was forecasted to decline relative to the previous year nearing the one digit level as a result of price and exchange rate stability and in spite of the rise in international oil prices.

On the external front the good performance of exports and the decline in imports visible in the first part of the year led the authorities to revise their estimate of the current account deficit from 13% to 10% of GDP. The deficit was expected to be amply financed by official financial flows due to the issue of Euro and regional bond resulting in an increase in the stock of net international reserves.

b) Economic policy

Fiscal policy. For the fiscal year 2004/2005 the fiscal deficit was expected to decline from -5.6% to 3.8% of GDP and projected to reach equilibrium by FY 2005/2006.

The expected result for FY 2004/2005, which is predicated on a growth rate of 3-4% and an inflation rate of 9% and focused mainly on constraining the growth of the two most important categories of expenditures, wages and interest payments on the domestic debt (which represent 34% and 40% of total expenditure) and to a lesser extent by an increase in tax collections.

Part of the wage-controlled growth depended on the said agreement between the government and the Jamaica Confederation of Trade Unions to reduce the wage bill by implementing a two-year policy of public employment and wage restraint effective April 1 2004 until March 31 2006. Interest payments on the domestic debt are expected to decline as the Central Bank maintains its current policy of gradually reducing the cost of borrowing.

Tax revenue was expected to increase from 26.9% to 27.5% of GDP between FY 2003/2004 and 2004/2005. For its part expenditure was forecasted to decline from 36.7% to 34.45 of GDP. Within these category recurrent expenditures, and in particular wages and salaries and interest payments, were expected to drop from 12.4% to 11.1% and from 18.15 to 16.9% between FY 2003/2004 and 2004/2005.

The authorities projected a primary surplus of 13% of GDP and as a consequence a decline in the public debt to GDP ratio from 145% in FY 2003/2004 to 136% in FY 2004/2005.

Monetary and exchange rate policy. During 2004 the expected continued improvement in the overall macroeconomic conditions allowed the Bank of Jamaica to ease its monetary policy stance and reduce the spectrum of interest rates on its tenors, lowering the cost of the internal debt service of the government and also that of the Bank of Jamaica's open market operations.

From May 2003 to May 2004, the rates of interest on the 90 and 180-day reverse repurchase instruments declined from 20% and 24% to 14.40% and 14.55% respectively. Accordingly the nominal exchange rate depreciated in line with the fall in interest rates (60.61 J$ and 61.18 J$ per US$1.00 for the weighted selling nominal exchange rate in December 2003 and June 2004). The exchange rate was also expected to remain stable throughout the year.

The progressive reduction in interest rates would have been facilitated by the moderate buildup in the stock of international reserves as a result of the placement of a euro and a regional bonds in the international capital markets totaling 250 million USD and the projected increase in the current account due to the increase in the oil import bill and higher outflows of profit repatriation.

The reduction in nominal interest rates and the expected reduction in the rate of inflation would not have had a significant effect in the level of real interest rates. Notwithstanding the demand for loans was expected to increase in line with the positive developments in the real sector.

c) Evolution of main variables

Economic activity. For 2004 the economy was forecasted to expand by 2.7% fuelled by the continuing dynamism of mining, tourism and to a lesser extent manufacturing.

The agricultural sector was expected to witness a downward trend already visible during the first two quarters of the year (-1% and -2% growth for the first and second quarters and -5% for 2004). The performance of agriculture was expected to respond to adverse climatic conditions, the effects of Hurricane Charley, which hit two of the parishes accounting for close to half of the crop production, and to the reduction in planting activities.

The mining sector was forecasted to continue the expansion of the previous year (10%) on the basis of favorable external conditions (in particular higher aluminum prices), expansion in productive capacity and its higher rate of utilization.

The manufacturing sector was projected to increase by 4% .due to the increase in the demand for its products and improved productivity as well as higher levels of output in some of the main subsectors within the manufacturing industry.

The construction sector was projected to maintain a moderate rate of growth (2%). The activity of the sector was expected to respond mainly to on-going government infrastructure projects.

The sectors electricity and water, and transportation, storage and communications were expected to grow in line with the expansion of the economy (2% and 2.6% respectively) notwithstanding the rise in the international price of oil. The growth dynamics of the former was expected to respond in particular to the performance of the mining sector, which is highly energy intensive. The performance of the latter would be positively affected by the spill over effects of the tourism sector.

Tourism activities were projected to rise in accordance with the expected upward trend in visitor stop-over arrivals and expenditures (10% with respect to 2003). Cruiseship arrivals, which account for a small part of visitor expenditure, were expected to grow at a very moderate rate. Prior to Hurricane Ivan, the industry registered a temporary decline in its activity due Hurricane Charley. Tourism performance reflected the full recovery of the industry following the effects of September 11th and responded in greater part to the favorable economic conditions in developed economies.

Prices, wages and employment. The rate of inflation was projected to decline relative to the previous year as a result of the dynamism in economic activity and also due to monetary and exchange rate stability despite the increase in international oil prices. This upward impulse was expected to be reflected in higher energy and transportation costs. Overall the rate of inflation was forecasted to decrease from 14% to 9% on a calendar year basis and from 17% to 10% on a fiscal year basis.

The growth in wages was expected to be moderate due to the Memorandum of Understanding signed by the government and the Jamaica Confederation of Trade Unions, which

will rein the rate of growth of the wage bill for a two-year period. Under the agreement wages are expected to increase less than 3%.

The evolution of the external sector. The current account deficit was projected to decline (-12% and -10% of GDP in 2003 and 2004) due to the improved performance of mining and agriculture and higher tourism inflows. The current account imbalance was projected to be more than offset by financial inflows leading to an increase in the stock of international reserves. Between the first and the last quarter of the year the stock of international reserves was expected to increase by 93 million US$ (1604 and 1666 millions US$ for the first and fourth quarter of the year).

The performance of merchandise exports (15%) responded favorable price conditions as well as greater levels of demand for Jamaica's main export products as in the case of mining export products. In the case of agriculture, export products had registered a vigorous expansion especially in the first quarter of the year (19.7% and 3.8% for the first and second quarter), which was projected to moderate in the second semester. The projected behavior of merchandise imports (11%) was determined by the productive needs of an expanding economy, the moderate growth in the construction sector, and the increase in the international price of oil.

The widening of the surplus in the services balance (560 and 606 million US$) was projected to respond to the increase in tourist arrivals and the good prospects of the tourism industry in general. For their part current transfers (12%) evolved in line with the evolution of the United States economy. The result on the investment income account was foreseen as in the past to be driven by profit repatriation.

Finally, the financial and capital account surplus responded to the issue of a Euro and regional bonds by the government referred to in the previous section and to private foreign direct investment flows in the tourism and mining sectors.

5. The evolution of the economy with the disaster

a) Main trends

As a result of the impact of the natural disaster the economy will witness a reduction in the rate of economic growth (2.6% and 1.9% pre and post Ivan) (See Table VII-1 and Figure VII-1). The main economic sectors that will be affected by the natural disaster are agriculture mining, transport, storage and communication, and to a lesser extent tourism and manufacturing.

Given the sectors that were most affected the disaster will have a negative impact on the balance of payments as exports are expected to decline and imports will increase. The even will also affect to a lesser extent the behavior of prices. However there will not be significant changes on the financial accounts of the balance of payments. It is expected that the increase in the current account deficit will be more than offset by financial flows.

Fiscal policy will maintain the targets it has set for the current fiscal year. Expenditures will rise as a result of relief and reconstruction efforts. The greater level of expenditures will be financed in principle by grants or concessional lending. It is not expected that the disaster will have an effect on tax revenues, which for the months prior to the disaster was above the budgeted amounts.

As no significant changes are expected in the fiscal outturn and the estimated global balance of payments result monetary policy will maintain its current stance. It is expected that the authorities will maintain their current policy, which has led to declining interest rates while at the same time ensuring price and exchange rate stability.

b) The fiscal outlook

The authorities remained poised to maintain a primary balance of roughly 13% in their fiscal accounts notwithstanding the effects of the natural disaster. The fiscal deficit with and without grants is projected to be -4.2% and -5% (See Tables VII-1. and VII-2) and respectively not taking into account off-budget expenditures which amount to close to 3% of GDP. The fiscal outcome taking into account the effects of the natural disaster remains thus within the original planned fiscal target range of the government. [2]

The most significant impact of the natural disaster will be on the expenditure side of the fiscal accounts. Increases will be recorded in programme related expenditures due to relief operations (95 million J$) and capital expenditures due to the reconstruction and recovery efforts (see footnote 43).

[2] It is assumed that the government assumes roughly 30% of the reconstructions costs for the fiscal year 2004/2005 (estimated at 2.3 billion J$) and that capital expenditures rise accordingly.

However the two most important items of recurrent expenditure wages and salaries and domestic interest rate payments (11% and 16% of GDP for FY 2004/2005) will not be affected by the natural disaster. The evolution of wages and salaries will be determined by the agreement mentioned in the previous section between the government and the unions, which calls for wage growth moderation. The only circumstance in which the disaster would affect the wage and salary item in the fiscal accounts is if the government is forced to hire additional workers for the clean-up operations, which would not represent a significant expenditure. Interest rate payments are likely to respond to the commitment of the government to sound debt management and the monetary policy of the Bank of Jamaica. As long as the Bank of Jamaica maintains its policy of declining interest rates, interest rate payments are unlikely to be affected.

Hurricane Ivan will not have an impact on the revenue side of the fiscal accounts. Most of the affected activities and areas do not contribute substantially to the tax revenue collection. Some movement may be expected in the bauxite levy and capital revenue but it will not be significant. In addition the growth of the economy in the first three quarters of the year and the full visible effect of tax measure that were undertaken in the previous year will also dampen any effect of the Hurricane on tax collection activities.

Nonetheless it should be taken into account that the increase in expenditure brought about by the effects of the natural disaster will have to be balanced either by a change in the distribution of expenditure, a change in the revenue account or a combination of both. Most likely as it stands the increase in expenditure due to the Hurricane, above what was projected for FY 2004/2005 will be covered by grants and concessional lending.

An additional factor that should be taken into account when analyzing the effect of Hurricane Ivan on revenues and expenditures is that the net fiscal outturn from April to August of 2004 was above that projected for the period. It exceeded the projection by 510 millions J$ which provides a buffer stock to finance part of the expenditures occurring as a result of the disaster without receiving grants or having access to concessional lending.

Table VII-2

Central Government Operations 2004-20005 - Prior to Hurricane Ivan
(Millions of J$)

					Prior to Ivan		Post Ivan	
	Actual (April-August)	Budget	Projected Sept-Dec	Projected Jan-March	Projected			
	2004		2004	2004	2004/2005	% of GDP	2004/2005	% of GDP
Revenue & Grants	64,430.9	64,514.9	58,852.8	50,769.5	174,053.2	30.8	174,053.2	30.8
Tax Revenue	58,820.4	58,446.0	53,320.1	43,868.5	156,009.0	27.6	156,009.0	27.6
Non-Tax Revenue	3,718.6	3,702.6	3,440.5	2,645.4	9,804.6	1.7	9,804.6	1.7
Bauxite Levy	1,074.0	951.0	811.9	591.7	2,477.6	0.4	2,477.6	0.4
Capital Revenue	425.4	202.8	475.4	1,355.0	2,255.8	0.4	2,255.8	0.4
Grants	392.6	1,212.4	804.8	2,308.8	3,506.2	0.6	3,506.2	0.6
Expenditure	86,837.5	87,431.0	64,921.0	43,660.6	195,419.0	34.6	197,689.0	35.0
Recurrent Expenditure	83,021.2	83,661.9	62,200.0	41,689.3	186,910.5	33.1	187,005.5	33.1
Programmes	13,637.3	13,802.3	8,231.6	6,195.8	28,064.7	5.0	28,159.7	5.0
Wages & Salaries	26,359.9	26,454.3	21,042.3	15,524.0	62,926.2	11.1	62,926.2	11.1
Interest	43,024.1	43,405.3	32,926.1	19,969.4	95,919.7	17.0	95,919.7	17.0
Domestic	34,116.7	33,538.2	25,781.8	14,371.7	74,270.2	13.1	74,270.2	13.1
External	8,907.4	9,867.1	7,144.3	5,597.8	21,649.4	3.8	21,649.4	3.8
								0.0
Capital Expenditure	3,816.3	3,769.0	2,720.9	1,971.3	8,508.5	1.5	10,683.5	1.9
Capital Programmes	3,698.9	3,663.9	2,567.6	1,925.3	8,191.9	1.5	10,367.5	1.8
Fiscal Balance (Surplus + / Deficit -)	-22,406.6	-22,916.0	-6,068.2	7,108.9	-21,365.8	-3.8	-23,635.8	-4.2
Loan Receipts	82,881.8	94,739.4						
Domestic	57,805.3	85,918.9						
External	25,076.5	8,820.5						
Divestment Proceeds	652.6	1,586.5						
Amortization	74,643.1	81,760.9						
Domestic	54,603.1	61,344.9						
External	20,040.0	20,416.0						
Overall Balance (Surplus + / Deficit -)	-13,515.2	-8,351.0						
Primary Balance (Surplus +/ Deficit -)	20,617.5	20,489.3	26,857.9	27,078.4	74,553.8	13.2	72,283.8	12.8

Source: On the basis of information provided by the Ministry of Finance of Jamaica.

c) Monetary policy

The effects of Hurricane Ivan on monetary magnitudes and hence on monetary policy will be determined by the fiscal and balance of payments results in the post-Ivan scenario. At the time of the writing of this report the impact of the event on the fiscal and balance of payments results was estimated to be minor. The fiscal deficit is expected to remain roughly within the vicinity of 4% of GDP and the stock of reserves will not vary in any significant way as a result of the effect of the Hurricane on the balance of payments to warrant the adoption of a contractive monetary policy.

As a result it is unlikely that monetary policy will vary in any significant way its stance for the rest of the year. The authorities will remain set on lowering, within a reasonable range, the term structure of interest rates. Also although the projected rate of inflation is higher in the post relative to the pre-Ivan scenario, it is still lower than that recorded in 2003.

c) Evolution of the main variables

Economic activity. Taking into account the effects of the disaster on the productive sectors the level of economic activity will register a 1.9% growth for 2004 (2.6% pre-Ivan). This will result from the losses in output flows in the agriculture; mining; manufacturing; electricity and water; transport storage and communication; real estate and business and the tourism sector. Among these the most affected sectors are agriculture, electricity and water and transport storage and communications.

The agricultural sector (-1% and -5% for the pre and post Ivan scenarios) was affected by heavy rainfalls and floods, which had a significant impact on the sector's assets and production flows. Damage was caused to physical infrastructure and equipment to domestic crops (mainly vegetables, fruits, bananas, plantains, ground provisions and tree crops) and to traditional export products (banana, coffee, sugar cane, cocoa, pimento and citrus). The agricultural sector had already been affected by adverse climatic conditions in the first part of the year. With the exception of coffee half of the losses in production flows and income in this sector will take place during the current year and the rest in 2005. In the case of coffee, the agricultural sector will continue to sustain losses until 2007 estimated at 292 million J$. As agricultural activities are highly intensive in labor the Hurricane will also have an impact on employment. Available data for the banana subsector indicates that it will sustain a temporary loss of 8 000 jobs.

The manufacturing sector will be mildly affected by the impact of Hurricane Ivan (4.7% and 4.2% for the pre and post Ivan Scenarios). The losses are concentrated in the food processing sub-sector. The losses will also affect manufacturing export products.

The mining sectors' rate of growth taking into account the effects of the disaster is estimated at 9.1% (10% in the pre-Ivan scenario). Most of the losses were due to temporary stoppage of production, which will be impossible o recover during the current year given the close to full capacity utilization rates during the year.

The performance of the electricity and water (3.7% and 2.2% in the pre and post Ivan scenarios) sector is expected to be affected by the declines in output and income caused by the interruption of the power supply.

For transport, storage and communications (3.4% and 2.6% in the pre and post Ivan Scenario) losses in production resulted from the temporary interruption of passenger and cargo traffic in the toad network, reduction in the volume of traffic and higher costs due to the use of alternative means of transportation and communications.

Table VII-3

Ratio of value added to gross output by economic sector, 2003
(Percentages)

Sector	Value added to gross output
Agriculture forestry & fishing	46.4
Mining & quarrying	43.7
Manufacture	32.2
Electricity & water	44.0
Construction & installation	26.4
Distributive trade (Wholesale & retail)	66.8
Transport, storage & communication	49.3
Financing & insurance services	63.4
Real estate & business services	66.7
Producers of government services	72.6
Miscellaneous services	37.0
Household & private	87.8

Source: ECLAC computations based on information provided by the Statistical Institute of Jamaica.

The construction sector will increase its rate of growth (2.2% and 3.4% in the pre and post Ivan scenarios) propelled by on-going reconstruction activities.

The expected growth of real estate and business services will decline from 1.5% to 0.6% as a result of the damage sustained by the housing sector.

Finally the tourism sector will record a one percentage decline from the rate of growth expected without taking into account the disaster (7% and 6% in the pre ad post Ivan scenarios) due to the temporary closure of some of the hotels affected by the hurricane. It is expected nonetheless that the tourism will fully recover before the end of the year to take advantage of the high season and that the visitor arrival flows will return to their previous trend. Thus far

employers have not opted for cutting employment and in some cases are using their workers for relief and reconstruction activities (i.e., picking-up of debris).

Prices, wages and employment. The rate of inflation will rise due to a decline in the supply of foodstuff consequent upon the effect of the event on agricultural output. On a point-to-point basis the rate of inflation will increase from 10% to a range comprised between 11% and 12%. The rate of inflation will not be significantly affected in so far as the overall monetary and exchange rate conditions of the economy remain stable.

Temporary increases in unemployment will occur in some of the affected activities that are labor intensive. In the previous section it was mentioned that the banana sub-sector will sustain 8 000 temporary job losses.

The evolution of the external sector. The current account deficit will expand from 10% to 11% of GDP in the pre and post Ivan scenarios) (See Table VII-4). The current account imbalance will be more than compensated by the surplus in the capital and financial account. The projected level of reserves in the pre-Ivan scenario will not be affected in any significant way by the impact of the Hurricane.

It is expected that due to the effects of the event on mining and agriculture, merchandise exports will decline. At the same time merchandise imports responding mainly to the reconstruction needs and to the necessity of replacing lost output will rise. As a result the merchandise balance will widen its gap from 28% to 30% of GDP with and without taking into account the effects of the Hurricane.

The services balance will reduce its expected surplus reflecting the effect of the Hurricane on stop-over arrivals. The estimated decline in the expected surplus for 2004 will be of the order of -6%. In spite of the effects of the Hurricane, the services surplus will increase by 3% in relation to 2003. The majority of hotel accommodations will recover and be operational close to the end of the year and as result the effect of the event on the services balance will be felt in 2004.

The negative result on the income account will decline as affected firms may decide to slowdown their profit repatriation flows to finance recovery and reconstruction operations and to recoup losses due to the temporary higher levels of inactivity following the impact of the natural disaster. Given the regional impact of the disaster this effect will be in this case minor.
Current transfers will experience an increase as family members living abroad provide financial support to their relatives affected by the Hurricane. Transfers will rise by roughly 6% to 7% when comparing the behavior of that item with and without the effects of the natural disaster (and 17% with respect to 2003). Also it is to be expected that official transfers may rise as a result of greater grant receipts.

The capital and financial account will most likely register an increase in its surplus in post relative to the pre-Ivan scenario. Capital transfers will reflect inflows related to recovery and reconstruction activities. In the financial account, the sub-account other official investment flows may expand reflecting official inflows from donor countries, multilateral institutions and other assistance. Also the capital and financial account will record increased insurance flows. Finally

the sub-accounts other private investment and foreign direct investment are likely to respond positively as recovery and reconstruction activities, say in the tourism sector, are carried out.

Table VII-4

Balance of payments 2003-2004 prior and post Hurricane Ivan
(Millions of USD)

	2003	**Pre-Ivan 2004**	**Post-Ivan 2004**
1. Current Account	-765.1	-722.4	-757.2
A. Goods Balance	-1942.6	-1992.4	-2103.3
Exports (f.o.b)	1385.6	1588.7	1540.5
Imports (f.o.b)	3328.2	3581.1	3643.8
B. Services Balance	559.8	605.7	576.1
Transportation	-143.6	-140.8	-156.0
Travel	1102.7	1176.0	1159.0
Other Services	-399.2	-429.3	-427.0
C. Income	-571.4	-651.0	-631.9
Compensation of Employees	70.7	86.3	86.3
Investment Income	-642.1	-737.3	-718.2
D. Current Transfers	1189.1	1315.2	1401.8
General Government	105.2	102.8	108.0
Other Sectors	1083.9	1212.4	1293.9
2. Capital & Financial Account	765.1	722.4	757.2
A. Capital Account	0.1	1.6	1.6
Capital Transfers	-0.3	1.6	1.6
General Government	0.1	0.1	0.1
Other Sectors	-0.4	1.5	1.5
B. Financial Account	765	720.8	752.3
Direct Investment	…	…	…
Portfolio Investment	…	…	…
Other official investment	-363.8	501.9	600.0
Other private investment	696.7	724.2	724.2
Reserves	432.1		

Source: On the basis of information provided by the Bank of Jamaica.

VIII. GUIDELINES FOR A REHABILITATION AND A RECONSTRUCTION PROGRAMME

1. Rehabilitation stage

This initial phase is focused on normalizing the living conditions of victims, while also continuing to reactivate economic activity in the areas affected. Vital needs had to be met and basic services delivered. The victims' food, health care and employment needs should take priority and were met expeditiously through the following actions done both by the public sector and with private sector, international donors and NGO's:

- Provision of food
- Provision of potable water
- Medical attention to those at risk
- Control and prevention of diseases, especially contagious diseases
- Housing repair
- Establishment of improved sanitation services
- Generation of productive jobs
- Provisional repair of access roads to affected areas
- Supply of seeds and basic inputs into farming for small and medium-scale farmers, along with soft loans and other financial support
- Repair of affected infrastructure

The suggested rehabilitation programme met vital and basic needs, control and check the spread of diseases and epidemics in order to prevent hardships from becoming more acute. These actions will certainly overlap with the reconstruction stage.

2. Reconstruction stage

This is the most crucial stage in economic and social terms, since it will lead to the full re-establishment of normal living conditions and the country's economic and social development momentum and increase the resilience reducing the vulnerability that Hurricane Ivan made evident.

This phase ought to bring about the implementation of specific projects that are matched to available resources and that can be assimilated by the different economic sectors and the country's government and financial sector. The main aim of the reconstruction stage and the projects thereof is to effectively overcome the direct and indirect losses stemming from the disasters, while increasing the mitigation against a recurrence of the event that took place. For example, the approaches to bridges have been exposed as being vulnerable to the type of water that descended on them.

Reduced vulnerability of housing, infrastructure reconstruction that improves on current exposure as evidenced by the damage suffered agricultural recovery and income-generating programmes are all part of this phase.

Most importantly, on designing the reconstruction programme it will be important to take into account macroeconomic principles so as to prevent the undesirable consequences of overly ambitious reconstruction programmes that impinge on the overall economic performance or absorptive capacity.

3. Recommendations

The reduction of the vulnerability of the population through the strengthening of their resilience to future natural hazards has to be the aim of any reconstruction effort.

- Small grants, soft loan facilities or community micro-financing facilities will need to be urgently established where they don't exist and/or strengthened where they already exist to assist persons in the rural and coastal communities at rebuilding their livelihoods. Particular grants/lending facilities should be targeted to the fisher folk, farmers and the women of those communities who lost assets through damage to small shop holdings and home based enterprises, such as food preparation and backyard gardening;

- Projects that support the improved resilience of schools as they are used as shelters should be paired to access to education by the school age population will be essential such as school book, meals and uniform grants (including shoe grants) as many children walk to school in the rural areas;

- Model starter homes, built to standards which will resist the devastation of hurricane force winds, should be built as demonstration units for communities, many of whom will be involved in self help projects to rebuild their communities should be coupled to appropriate location and hazard mapping to avoid locating these in heavily exposed areas.

- Projects which support public health and sanitation education should be supported to reduce the burden on the health system and given the damage to health facilities improve existing ones and repair the damaged ones with higher standards.

- In the aftermath of a natural disaster, attention needs to be paid to the psychosocial trauma of the affected population. Such support is required for all persons affected but particularly the most vulnerable: the women and children in the rural communities. It is also an opportune moment to introduce disaster prevention and mitigation education.

The impact of the natural disaster on the economy should not alter the present course of economic policy. Reconstruction investment must be appropriately programmed overtime and paired with external resources in the form of donations or concessionary loans. Under the targets set by the authorities will not be comprised by the effects of Hurricane Ivan. The authorities

should continue to reduce interest rates, which will facilitate over time through direct and indirect channels the reduction of the public debt burden.

Authorities should are also aware that in smaller economies fiscal policy is tied to the external and foreign exchange constraint. It is important to articulate and coordinate fiscal aims with an external balance where export performance is coupled with appropriate financial flows and remittances. In this sense the prompt recovery of agriculture and the expected continuing dynamism of mining and tourism are of paramount importance for creating a growth enabling macroeconomic context.