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. Information was also supplied by various ministries and agencies of the Government of Jamaica as well as several non-government institutions and private sector entities. These include, among others:

- The Office of Disaster Preparedness and Emergency Management (ODPEM);
- The Meteorological Office ;
- The Ministry of Labour and Social Security;
- The Ministry of Health;
- The Ministry of Education, Youth and Culture;
- The Ministry of Water and Housing/National Works Agency;
- The Ministry of Finance and Planning;
- The Ministry of Agriculture/RADA;
- The Bank of Jamaica;
- The Jamaica Manufacturers Association;
- The Jamaica Exporters Association;
- Telecommunications companies;

This report is provided to the Government of Jamaica 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 Perez (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.

November 1, 2004

I. INTRODUCTION

The Meteorological Phenomenon

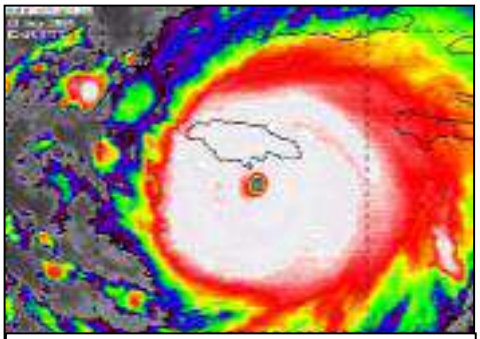
On September 2, 2004 Tropical Depression Number Nine formed over the eastern tropical Atlantic, just about 890 km southwest of the Cape Verde Islands. This was later to threaten the island of Jamaica as a powerful Category 5 hurricane named Ivan.

The Depression moved on a near westward track over the next few days while rapidly gaining strength and became a Tropical Storm within 12 hours during the morning of September 3. At this point the system was setting up to become a classical "Cape Verde Hurricane", which is one that forms near the Cape Verde Islands and then proceeds on a west-bound track, crossing into the Caribbean Sea before recurring to the Northeast. By 4:00 a.m. on September 5, Hurricane Ivan had developed near 1950 km east-southeast of the Lesser Antilles with sustained winds of about 120 km/h and the five-day projection placed Ivan within the Caribbean. Ivan's position and movement were of major concern for all interests in the central Caribbean.

5-DAY FORECAST TRACK for

Recognizing the possible threat to Jamaica, the Meteorological Service Division of the country's Ministry of Land and Environment issued an Evacuation Order for all cays and banks at 8:00 a.m. on September 8 (Bulletin #5), a Hurricane Watch for the island at 5:00 p.m. on September 8 (Bulletin #8) and a Hurricane Warning (Bulletin #12) at 8:00 a.m. on September 9, 2004. This was downgraded to a Tropical Storm Warning (Bulletin #32) at 11:00 p.m. on September 11, and eventually lifted in Bulletin #35 at 11:00 a.m. the following day.

Hurricane Ivan's approach continued through September 10 with the tropical cyclone nearing south-central Jamaica. At 11:00 p.m. the eye of the hurricane was located approximately 40 kilometres south of Hellshire Point in the parish of St. Catherine. It later made its closest pass to the island; nearly 30 kilometres to the south of Portland Point, Clarendon. Thereafter, an unexpected wobble to the west during the morning of September 11 kept the centre of the system just off the southern coastline for the next 6-8 ho



THE EYE OF HURRICANE IVAN

During this time, the effects of the hurricane were most pronounced over the island's southwestern parishes. The data also suggest that parishes in the northeast were relatively unscathed by the heavy rainfall and violent winds associated with Ivan.

The Severe Weather Event

The Meteorological Service Division operates a Doppler radar that provides rainfall information out to a radius of 480 kilometres from the radar station near Kingston. This equipment is also capable of estimating wind speeds within its range. The Division also monitors a network of over 250 rainfall stations across the island; each of which is required to record the accumulated rainfall over each 24-hour period, from 7 a.m. that day to 7 a.m. the following day. This facilitates a quantification of flooding events, estimation of return periods for such events, and comparative analyses with prior events and established climatic averages.

Showers and thunderstorms, associated with the instability created by Ivan, began to impact Jamaica on September 9, 2004 with morning showers over Portland and St. Thomas in the extreme east of the country, and showers over Westmoreland and St. Elizabeth in the southwest during the afternoon. The Doppler radar also detected moderate to heavy showers over northeastern parishes during the afternoon of the 9th.

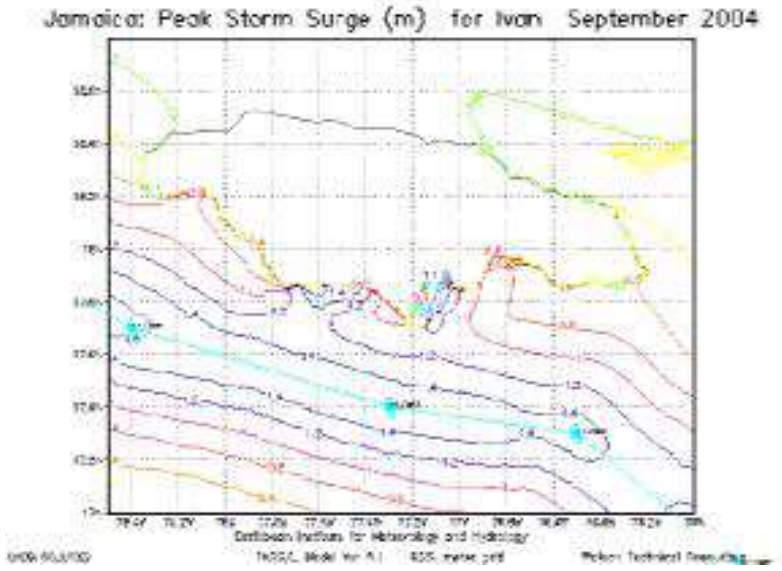
Friday, September 10 began with scattered light to moderate showers being detected by the radar over territorial waters to the north and south of the island. These came ashore in the northeast and gradually spread along the north coast and then over eastern and central parishes during the early hours of the morning. By mid-morning, rainfall was affecting sections of all parishes with varying intensities; however, the heaviest activity appeared to have been occurring in the northwest. During the afternoon, showers became more sustained as a spiral band covered mainly the eastern half of the island and drifted westward.

Heavy rainfall and violent winds continued across the island and over adjacent waters throughout September 11. Strongest wind speeds were estimated, by the radar, to be sustained at about 180 kilometres per hour. This was as the eye of Hurricane Ivan passed close to the island's southern coast, and satellite imagery also suggests that sections of southern parishes were directly affected by the activity within the eyewall of the hurricane. Rainfall activity was also observed on the 12th over most parishes but with decreasing intensity throughout the day.

The strongest winds actually recorded by meteorological equipment during Ivan's passage were 214 km/h at the Pedro Bank, which is about 90 km off the south coast. Since the centre of the system was somewhat closer to Portland Point, it could be assumed that winds of at least that magnitude existed on the mainland. Each of the Service's automatic weather stations located on the mainland ceased recording at some point between September 10 and 12, hence, the highest reported winds were not representative of what was experienced. The Doppler radar, however, estimated that winds across the island were sustained at 180 km/h during the early hours of September 11.

Significant storm surges also impacted sections of Jamaica, particularly along the southern coastal areas. With the centre of the tropical cyclone passing so close to the coastline, high tides caused by upwelling, as well as dangerous battering waves driven by the system's southeasterly winds in its most intense quadrant, affected communities close to the shore. Figure 1 represents the predicted levels of storm surge as projected by the TAOS Model being run by the Caribbean Institute of Meteorology and Hydrology in Barbados.

Figure 1:



Analysis of the rainfall data for all southern parishes[1], as well as Hanover and St. James in the northwest, over the 3-day period September 10-12 revealed that a number of locations recorded over 100% of the 30-year mean rainfall expected for the entire month of September. Highest 3-day totals were recorded in the parishes of Kingston/St. Andrew, St. Catherine, Clarendon and Manchester with extreme values of 681.5 millimetres (mm) occurring in Craighead, Manchester, 709.4 mm in Mavis Bank, St. Andrew, and 720.8 mm in Ritchies, Clarendon.

A comparison with the established 30-year normals, i.e. 1951-1980, indicates that Kingston/St. Andrew and St. Catherine, both in the southeast, experienced what could be described as having the most unusually high levels of precipitation of the parishes. Over 300% of normal was recorded for stations in these parishes. Stations in south-central and southwestern parishes of Clarendon, Manchester and Westmoreland followed with reports of over 200% of the climatological mean.

A more detailed analysis of data retrieved from a representative few stations is presented in the attached Table 1.

[1] It must be noted that rainfall data representative of a number of stations in southern parishes were lost due to damage done to rain gauges by Hurricane Ivan.

Brief Historical Background

In all southern parishes, exclusive of St. Thomas, highest one-day rainfall figures were found to exceed the 10-year return period values during the passage of Hurricane Ivan. Extreme cases were recorded in Kingston/St. Andrew, St. Catherine, Clarendon and Manchester with 24-hour rainfall exceeding the 100-year return period at particular stations. A more detailed analysis is presented in the attached Table 2.

Table 1: Comparison of Ivan's Cumulative Point Rainfall (September 10-12) with Climatological Mean

Station/Parish	Ivan Rainfall (mm)				30-yr Mean	% of Mean
	10th	11th	12th	Total		
St. James						
Montego Bay	95.4	90.4	-	185.8	155	120
Hanover						
Askenish			346.1	346.1	341	101
Green Island			274.2	274.2	248	111
Mount Peto	166.1	199.5	4.3	369.9	356	104
Shettlewood			305.6	305.6	300	102
Westmoreland						
Darliston	186.7	182.6	7.3	376.6	210	179
Frome		260.8	26.4	287.2	222	129
Negril Point		290.0	28.0	318.0	155	205
Savanna-La-Mar	196.7	194.3	17.3	408.3	173	236
St. Elizabeth						
Accompong			291.0	291.0	454	64
Appleton	19.6	194.4	18.6	232.6	288	81
Barton Isle		272.0	3.1	275.1	232	119
Goshen		255.5	10.2	265.7	186	143
Manchester						
Craighead	358.0	245.5	78.0	681.5	251	272
Grove Place			339.0	339.0	193	176
Hartham	400.0	100.0	15.0	515.0	202	255
Mandeville			435.0	435.0	240	181
Clarendon						
Beckford Kraal	240.5	182.2	18.5	441.2	234	189
Mason River	249.6	179.0	15.4	444.0	216	206
Ritchies	50.4	560.0	110.4	720.8	-	-
Rock River		449.1	5.1	454.2	208	218
Thompson Town	53.0	420.4	64.8	538.2	275	196
Trout Hall	354.8	75.6	0.8	431.2	211	204
St. Catherine						
Bog Walk			468.6	468.6	142	330
Bois Content	275.9	187.5	-	463.4	-	-
Enfield	300.0	130.0	5.4	435.4	176	247
Worthy Park	258.0	408.0	15.4	681.4	179	381
Kingston/St. Andrew						
Mavis Bank	518.0	188.4	3.0	709.4	197	360
Palisadoes	286.5	131.8	-	418.3	107	391
Rose Hill	487.0	168.4	-	655.4	334	196
St. Thomas						
Norris	350.4	166.5	-	516.9	-	-
Plantain Garden	243.6	187.2	0.8	431.6	315	137

***Table 2**: Comparison of Highest One-Day Rainfall Totals (mm) with Climatological Return Periods for Southern Parishes*

Parish/Station	Highest 24-hour Total	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Westmoreland							
Darliston	*318.9*	104	174	220	279	322	365
Savanna-La-Mar	*196.7*	107	160	195	239	272	304
St. Elizabeth							
Appleton	*194.4*	90	124	145	172	192	212
Manchester							
Craighead	*309.5*	128	177	209	250	280	310
Hartham	*400.0*	119	180	221	273	311	349
Clarendon							
Trout Hall	*354.8*	112	175	217	269	308	347
St. Catherine							
Enfield	*300.0*	110	177	221	277	318	360
Worthy Park	*408.0*	118	187	233	291	334	376
Kingston/St. Andrew							
Mavis Bank	*518.0*	139	242	313	400	465	529
Rose Hill	*487.0*	110	175	218	273	313	353
St. Thomas							
Plantain Garden	*243.6*	165	248	302	371	423	474

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 Centre of the Office of Disaster Preparedness and Emergency Management began operations on September 9, 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 Centre 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 made local operations more effective and timely.

Aerial surveys 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. Several assessment teams – both local and internationally supported – were then sent islandwide to collate and collect data on damages and emergency needs. 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. Contributions from the international community

estimated at J$182.7 million provided additional and much needed support. 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 October 11, a month after the disaster occurred, only 310 persons remained in shelters, down from a peak 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
($)

Agency	Relief Operations	J$
National Solid Waste Management Authority		
Clean up operations		
Region	Trips	
NEPM	833	5 131 000
SPM	171	4 065 106
MPM/NERU	1516	12 543 200
MPM/NERU	4500	33 070 000
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 fourteen parishes. When Ivan struck the island on September 10, 2004, the projected population was 2.65 million.[2] Fourteen per cent of

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

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 the 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 fallen trees, collapsed roofs, mudslides or persons being swept away by floodwaters. 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

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 Survey of Living Conditions 2002 reported that the incidence of poverty in Jamaica stood at 19.7 per cent, when the incidence of poverty was reported to be 33.9 per cent, which represented a marked reduction from 1992, (See Table 1 – 3). 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 per cent, and decreases among those living in other towns 18.7 per cent and is yet lower for those living in the Kingston Metropolitan Area (KMA), 10.4 percent. 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, points to two groups for whom livelihoods and assets were significantly affected [3]. These were farmers and fisher folks. The fisher folks 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 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

[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.

unable to make the most of the strengths of their communities in order to improve their conditions.

4. Vulnerability of Women and Children

In 2002, approximately 45.5 per cent of the households surveyed reported females as the head of household. Female-headed households were highest in the KMA (50.8 per cent) followed by Other Towns (45.6 per cent) and lowest in the Rural Areas (40.1 per cent). 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 per cent were female, while those who had reported severe damage and minor damage 57 per cent and 54 per cent were female heads of households, respectively. The **JSLC** 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 per cent) compared with those headed by males (64.9 per cent) 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, which will not be available to pregnant women.

The male labour force participation in 2003 was consistently higher (71.4 per cent) for men than for women (53.2 per cent), and the unemployment rate for women (17.6 per cent) was almost twice that of men (9.7 per cent).[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 which are 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]

---

[5] Economic and Social Survey Jamaica 2003

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

II. SOCIAL SECTORS

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

1. Housing

a) Private Housing.

A total of 102 00 households reported damage to property to the Ministry of Labour and Social Security[6]. This is equivalent to 14 per cent of the 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	177 436	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	181186	5502	0.06	4374	475	3433	466
Westmoreland	381194	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 households (HHs) for 2004 based on average HH size of 3.7 and 2001 Population Census figures.

Of the household assessed, 61 per cent had been processed, providing details of the extent of damage. Nine percent of those processed, or 5 624 households, were so severely damaged that they require complete reconstruction. More than one 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 percent were assessed as being severely damaged, with roof and structural damage, and another 14 per cent or 8 836 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 percent reported damage, St. Elizabeth 12 percent, Westmoreland 11 percent, Kingston and St. Andrew 9 percent and Manchester 8 percent. 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 percent) of Jamaican households own their homes. Ownership of dwellings is more prevalent (70 percent) in the Rural Areas compared with Kingston Metropolitan Area (KMA), 47 percent, and other Towns, 57 per cent[6].

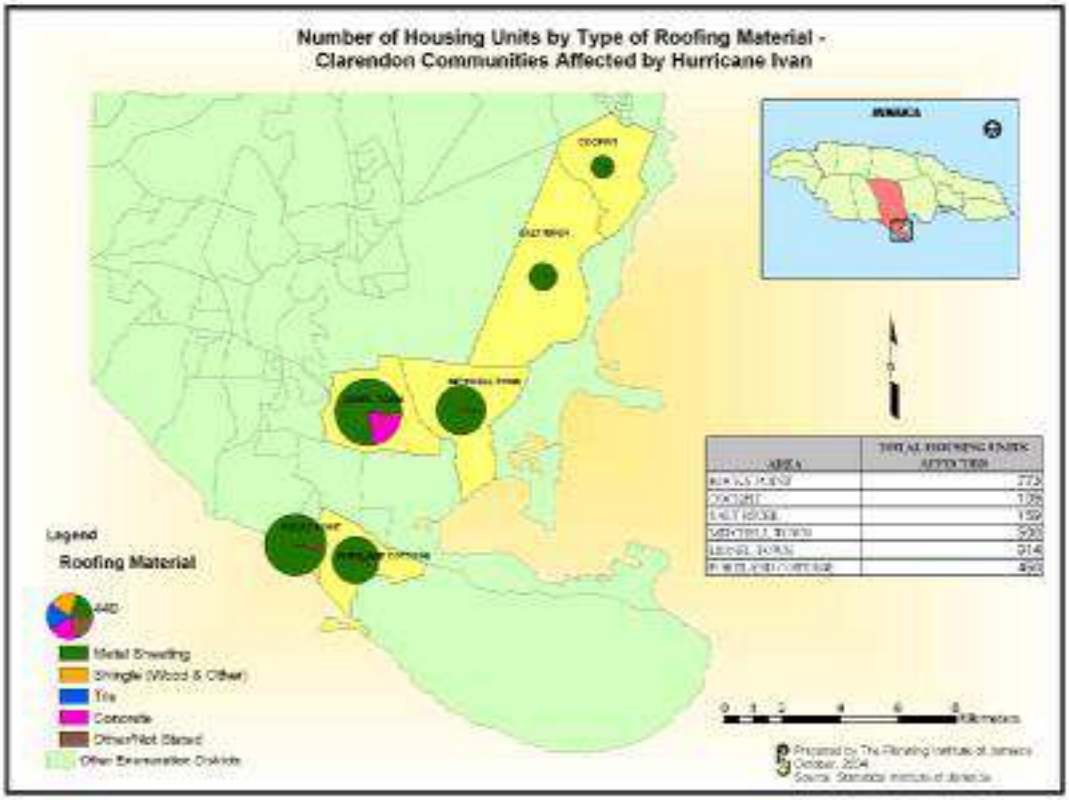
The housing stock is relatively sturdy with 58 percent of dwelling structures being built of block and steel and 26 percent of wood. The regional distribution for 2002, suggests that block and steel is the preferred construction material for dwellings in the KMA accounting for 61 percent of the units, and 58 percent and 53 percent in Other Towns and Rural Areas respectively. The majority of dwellings units in Jamaica, 82 percent are categorized as separate/detached houses. In the Rural Areas, 93 percent fell in this category, in the Other Towns, 87 per cent and the KMA 60 percent. Unfortunately, most of the damaged properties were not covered by insurance, leaving the burden for repair and replacement to 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 parish, in the following pages)

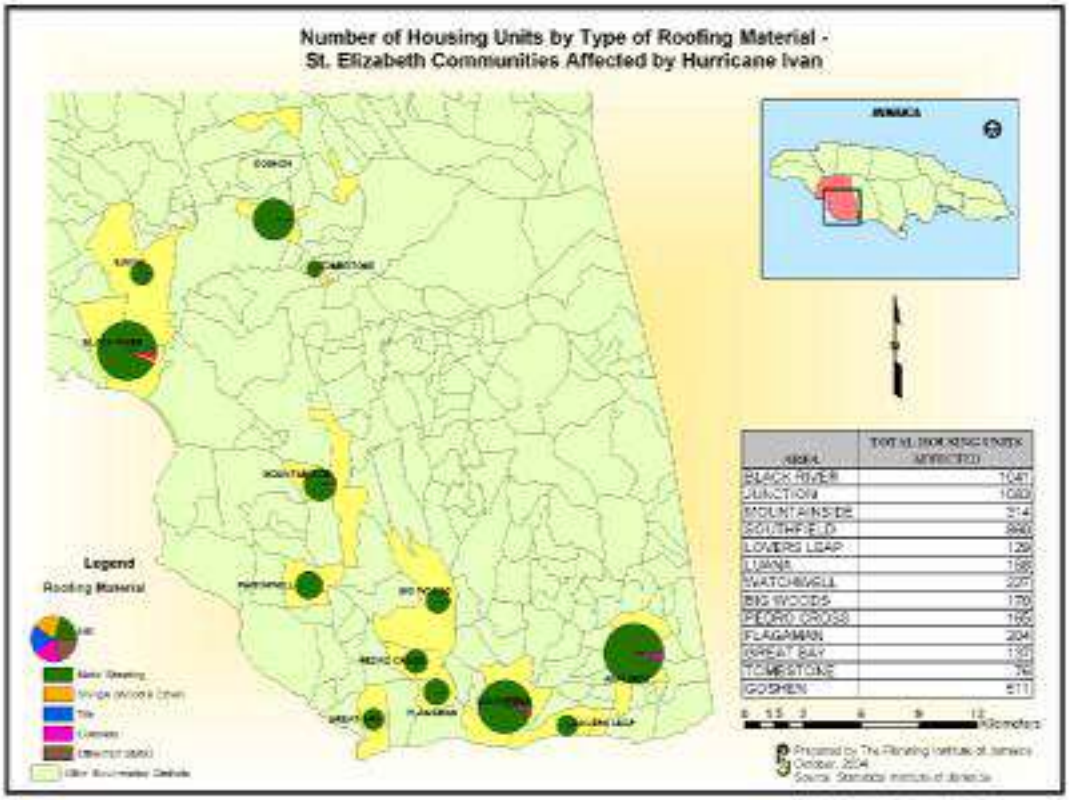
Table 2-2
Damage and losses caused by hurricane Ivan on the Housing Sectors of Jamaica ($million)

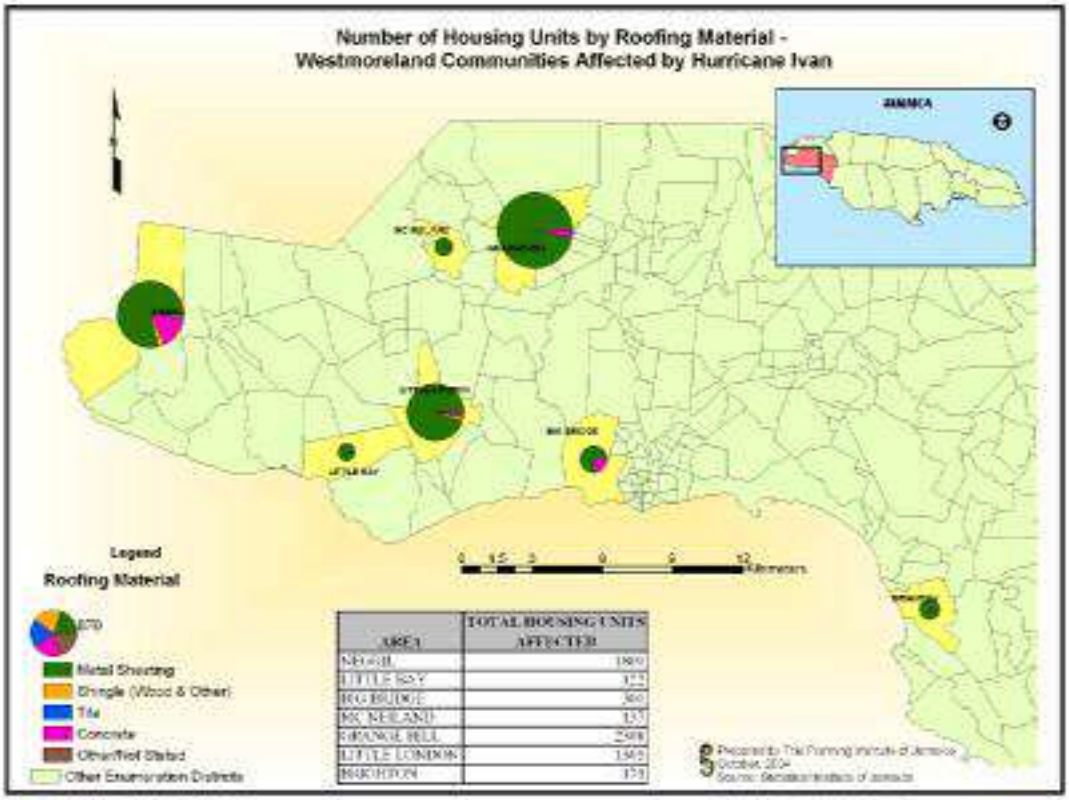
Location	Damage and Losses			Reconstruction Costs	Imported Component
Item	**Total**	**Direct**	**Indirect**		
Dwellings	9 151.1	9151.1		13998.6	3202.9
House Furnishings	1323.1	1323.1			463.1
Removal of Debris	89.1		89.1		
Relocation Costs	600.0		600.1		
Total	**11 163.3**	**10474.2**	**689.1**	**13998.6**	**3666.0**

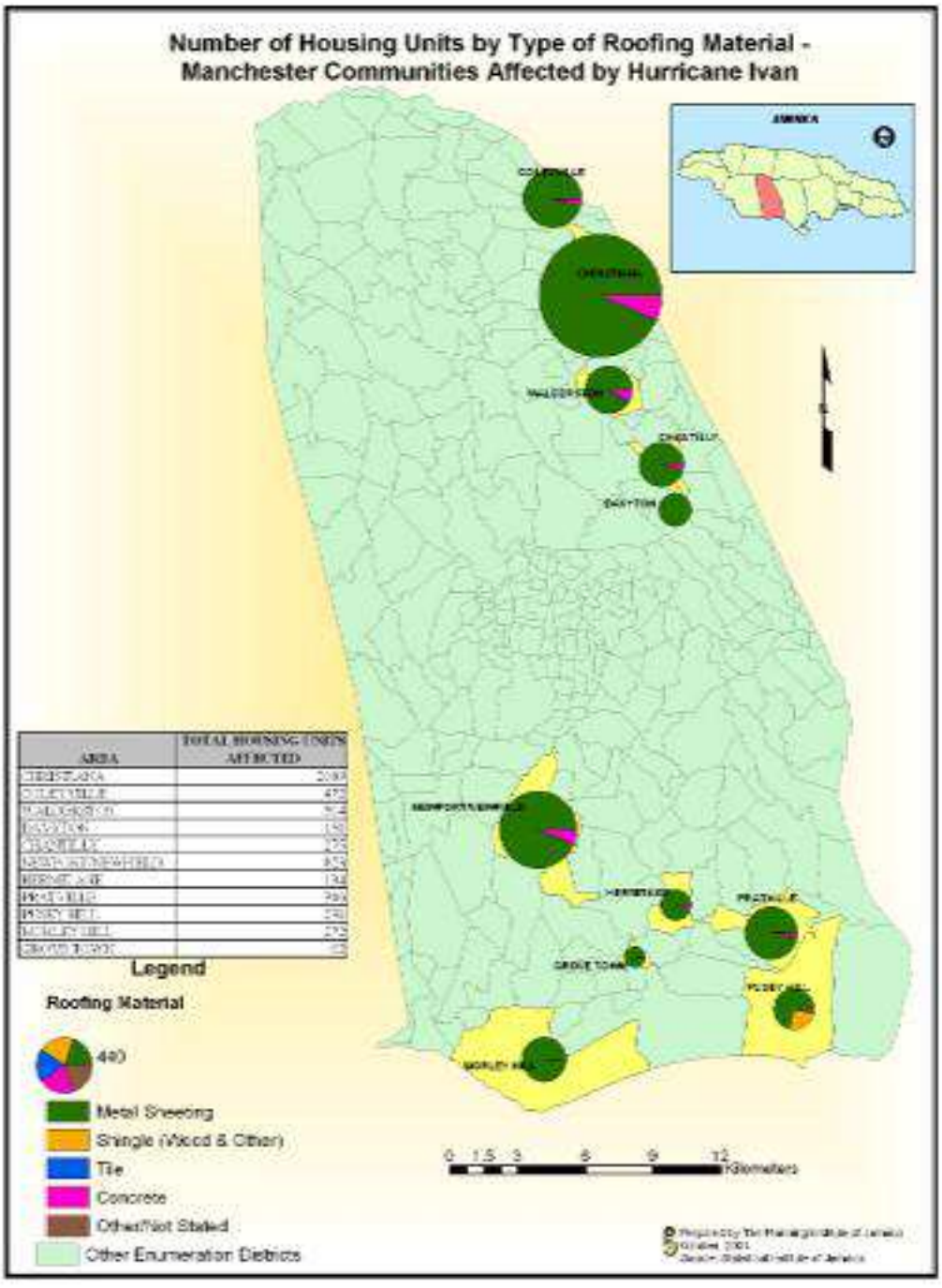
Source: Estimates by ECLAC on basis of official information

Total damage to the housing sectors amounted to $ 11 163 million. Of this figure, direct damage to dwellings and furnishings accounted for some $10 474 million or 93 percent of the cost. The indirect loss represents the cost of removal of debris and the relocation of certain communities[6] such as Rocky Point and Portland Cottage that were in extremely vulnerable environments. The indirect loss was thus estimated at $ 689 million. Reconstruction with some improvements to reduce vulnerability amounts to $ 13 998. (See Table 2.2)


Number of Housing Units by Type of Roofing Material -
Clarendon Communities Affected by Hurricane Ivan
Legend
Roofing Material
Metal Sheeting
Shingle (Wood & Other)
Tile
Concrete
Other/Not Stated
Other Enumeration Districts


Number of Housing Units by Type of Roofing Material -
St. Elizabeth Communities Affected by Hurricane Ivan
Legend
Roofing Material
Kilometers


Number of Housing Units by Roofing Material -
Westmoreland Communities Affected by Hurricane Ivan
JAMAICA
Legend
Roofing Material
Metal Sheeting
Shingle (Wood & Other)
Tile
Concrete
Other/Not Stated
Other Enumeration Districts
Kilometers
AREA
TOTAL HOUSING UNITS AFFECTED


Number of Housing Units by Type of Roofing Material -
Manchester Communities Affected by Hurricane Ivan
JAMAICA
AREA
TOTAL HOUSING UNITS AFFECTED
Legend
Roofing Material
440
Metal Sheeting
Shingle (Wood & Other)
Tile
Concrete
Other/Not Stated
Other Enumeration Districts
0 1.5 3 6 9 12
Kilometers

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 that 162 churches of different denominations were damaged, some severely and few completely destroyed. The main incidence of damage entailed the removal of 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 hundred million dollars. A partial estimation of $ 130.5 million has so far been made. This 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, and the need to fund repairs to damaged 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 be designated 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
African Methodist Episcopal Church	13	Roofs, furnishings	7.5
Anglican	----		1.0
Baptists	40		40.0
Brethren	----		----
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

2. Education and Culture

a) Schools

Damage to schools caused by Hurricane Ivan was widespread as can be seen from Table 2-4. Of the 1 004 schools distributed throughout Jamaica's[6] 14 parishes, 33 percent (333) suffered

damage. Eight of the parishes had 30 percent or more of their schools damaged. 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 percent required repair.

Table 2-4
JAMAICA: DAMAGE TO SCHOOLS BY PARISH

Parish	Total Number 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

Geographically, the available data suggest that a majority of schools in Hanover, suffered damaged as 70 percent or 30 out of 40 schools were affected. The parish of St. Elizabeth was also hard hit or one out of every two schools, in the parish reported damage. In no parish did 15 percent or less, of the schools report damage. One school each in St. Elizabeth and Manchester suffered complete destruction. Facilities used as agricultural training sites attached to secondary schools also suffered damage, amounting to $128 million. Direct damage to school buildings accounted for $329.8, or 40 percent of the direct damage to the sector. (See Table 2-6)

Approximately one third of the students enrolled in the public education system or 204 00 children were affected by Hurricane Ivan[6]. Some 18 percent of the school population attended pre-primary school, 42 percent primary school, 31 percent secondary, 5.4 percent post-secondary and 4 percent tertiary. Roughly 97 percent of Jamaica's student population is enrolled in the public education sector[6]. Despite the damage to schools plants $329.9 million and furnishings amounting to $285.6 million, the Ministry of Education, Youth and Culture, took many creative actions to ensure that children's education would proceed with least disruption. Shift systems were initiated to allow as many children as possible access to teacher instruction. The Grade Six Achievement Test (GSAT) administered to approximately 48 000 grade six students, was expected to be conducted at the usual date during the current school year.

Schools sustained indirect damage, amounting to $10 million from the use of shelters. In the immediate aftermath of the hurricane most schools were occupied 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 10 schools were still in use as shelters across the country at the time of the writing of this report.

b) Historical Sites

There was extensive damage to historical sites caused by the natural disaster. Many of these sites could be described as fragile and required 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 from roofs; and the undermining of foundations, particularly in the case of 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 $ 51.5 million. Indirect losses were expected to be incurred from the delay in making these sites available as part of the heritage tours product, amounting to $ 2 million, as shown in detailed form in Table 2-5

Table 2-5
Damage and Losses in Historical Sites
($ million)

Location	Name of Site	Direct Damage
Spanish Town	Historic Square Barracks Building Manchester House Historic Iron Bridge	12.0
Port Royal	Naval Cemetery The Old Coaling Wharf The Historic Naval Hospital The H Block and Ft. Charles	32.0
Seville	Taino Hut African Hut Caretaker's Cottage HQ House and Annex	7.5
Total		51.5

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

c) Summary

Total damage to education and culture sector amounted to $806.9. Direct damage accounted for some 98 percent of total damage. (See Table 2-6).

Table 2-6
Damage and losses sustained by the education and culture sector
($ million)

Location	Name of Site			Direct Damage
Item	Damage and Losses			Imported component
	Total	Direct	Indirect	
School Buildings	339.9	329.8	10.0	
Furnishings	285.6	285.6		
Agricultural Training Facilities	128.0	128.0		
Historical Sites	53.5	51.5	2.0	
Total	806.9	794.9	12.0	278.2

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 percent_ suffered some degree of damage. Table 2-7 below details the cost of the damage to the health centres and their furnishing 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 restore operation to 93 percent of the centres, while some 7 percent (24) remain inoperable due to the severity of their damage, lack of essential utilities or road access. Of the 23 public hospitals, 21 (91 percent) suffered damage mainly to roofs. Eight or 35 percent wee 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 Centres and their furnishings as a result of Hurricane Ivan
($ million)

Parish	Number of Health Centres	Cost of Damage	Cost of Damage to Equipment and Supplies
KSA	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	28	6.8	
Total	128	85.3	10.1

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

Total damage and losses to the health sector amounted to $ 718.2 million, of which 16 per cent ($ 39 million) involved damage to equipment and supplies. Although the loss of vaccines accounted for a negligible component of the cost of direct damages, $ 283 185, such loss could present a serious set back to the government's 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 percent utilized the public sector. Use of the public sector health facilities was high (73 percent) among the poorest quintile, and significant (37 percent) among the wealthiest, as 63 percent 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 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 percent) possesses health insurance coverage, and in rural areas this proportion is smaller, with an average of approximately 8 percent having coverage. Damage to the health sector therefore could deprive a significant proportion of the Jamaican population, 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)

Regional Health Authority	Damage to Structures	Damage to Equipment and Supplies
Western	5.8	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 $ 40.2 million which could be attributable to the response of the health sector 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 waste disposal management. The rains associated with Hurricane Ivan led to flooding and the formation of ponds both of which facilitated the breeding of mosquitoes. The resulting deposits of debris along with stagnant water in and around populated areas increased the potential for breeding Aedes Aegypti mosquitoes and the population of rodents and flies. The need for increased disease surveillance is imperative. Table 2-9 presents a summary of damage to the health sector.

Table 2-9
Damage and Losses Sustained by the Health Sector
($ million)

Item	Damage and Losses			Imported Component
	Total	Direct	Indirect	29.8
Health Centres	85.3	85.3		38.1
Hospitals	108.9	108.9		35.3
Medical Equipment and Supplies	39.2	39.2		0.3
Vaccines Lost	0.3	0.3		
Public Education Programme	12.4		12.4	
Latrine 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 Centres	0,8		0.8	
Environmental Health Sanitation			3.2	
Total	758.3	718.2	40.2	257.6

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 percent 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 6.5percent. Traditional agricultural exports, however, had shown a vigorous growth in the first half of 2004, when a 7.7percent increase in gross output was registered[6], 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[6]. In the case of livestock, 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[6]. This is a very serious setback for these activities that had managed to increase output by 1.4percent 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.

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[6]. 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 $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 $1,208.35 million, of which $278.35 million (22 percent) are direct damages and $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[6]

The destruction of 5 percent the coffee tree population has been estimated at a value of $992 million. This figure was arrived at by estimating the value of new plants for an estimated area of 2225 acres as well as the rehabilitation of plants and lands in 2630 more acres. It is to be noted that the new coffee trees will only begin producing after a three to five year period, when they reach maturity.

The winds caused the loss of berries in nearly 45 percent of the coffee-producing area. It has been estimated that this will impede the production and export of 213000 boxes of Blue Mountain coffee and 41000 of lower quality coffee. Combined with a respective value of $2050 and $ 951 per box, this will translate into a loss of $475.7 million in export earnings that will have a negative impact of US$8 million in the country's balance of payments for 2004.

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

There exists an insurance scheme for the sector. Coffee production is insured, provided the losses occur after berries are present on the trees at a rate of US$20 per box for the case of Blue Mountain coffee and 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 to be too high. Reinsurance is available from a number of large international insurance groups –

including Munich Re and others – whenever the losses exceed 20 percent of the expected crop. Although on 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
($Million)

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.

It is estimated that the coffee production activity sustained direct damage amounting to $992 million and total indirect losses of $768.5 million, bringing the total amount of the impact to $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. The strong winds and the floods ensuing from the heavy rainfall affected 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, – based on preliminary data supplied by the Sugar Company of Jamaica that covers approximately 70.0 percent – 75.0 percent of the entire sugar industry in the country – will cause an estimated loss of 190000 tons of cane, or 15.6 percent of last year's production[6].

It is estimated that the direct damage to infrastructure and plantations amount to $521.9 million, and that indirect production losses to the cane producers will reach $365.3 million. The total impact of the disaster caused by Ivan in these activities will thus be $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[6]. However, the scarcity of rains in the first half of 2004 resulted in a declined production (by 47.7 percent), especially in Clarendon and St. Mary, the main cocoa producing parishes in the island[6].

The hurricane damaged the trees and compromised the corresponding future production of cocoa in an area of 1100 hectares (2700 acres), thus compounding the problems of the farmers. While the trees are expected to recover promptly, an estimated loss in production of $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.

Pimento. The physical infrastructure – including warehouses and equipment – and stocks of pimento 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 $209 million and that losses in future production will reach $142 million, thus bringing the total effects on the pimento activity to $351 million (see Table 3-1). These losses will have a bearing on the Manufacturing and Export sectors.

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

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 $8,550 million or its equivalent of US$137.9 million, of which direct damage are $3,407 million (40 percent) and indirect losses are $5143 million (60 percent). (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 percent growth of its real GDP compared with 2003[6]. 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 percent of the associates sustained significant damage to their infrastructure, machinery and stocks of products. A preliminary estimate puts these direct damages at $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. After electricity was restored, other problems prevented them from achieving full operational capacity. It has been conservatively estimated that an average of five production days were lost as a result.

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)

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	--[6]
- 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.

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 $ 2205 million (US$35.6 million) to the Food Processing sector, of which $1995 million is indirect (90 percent of the total) and $210 million is 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 $660 million or US$10.6 million. (See Table 3-2).

3. Mining sector

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 percent in 2003[6]. In the first half of 2004, the utilized production capacity in the alumina plants was 100.2 percent and 95.7 percent in the bauxite plants[6]. The Jamaica Bauxite Institute had envisaged a 10percent 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 slight 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 $50 million.

Estimates of indirect losses have been made taking into consideration the temporary stoppage of production of all plants over a period of five 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 percent 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 five-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 $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.

The total impact of the disaster on the sector amounts to $1030 million, or its equivalent of US$16.6 million. Indirect losses represent 95.0 percent of the total impact. The overall impact of these damage and losses in the external sector accounts will include $980 million (US$15.8 million) in lost exports and $32 million (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)

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 sector

The Food, Beverages and Tobacco subsector – which represents 15 percent of total sales in the Distributive Trade sector – experienced a 12.2 percent downturn in sales in the first half of 2004, mainly due to decreased production of agricultural goods[6].

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. This sales and profits in the commerce subsector will 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 over 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 the second quarter of the present year, total visitor arrival grew by 9.4 percent, while stopovers increased 12.0 percent and cruise passenger arrivals by 5.7 percent.[6]

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[6]; 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 metres in height. Some cruise ships were diverted from Jamaican ports before the arrival of the hurricane.

While the hurricane occurred during a relatively low-occupancy period of the year, revenue losses can be high depending on the time required for rehabilitation of the damaged premises. In most cases, however, hotel owners expect to have achieve full infrastructure recovery before the high tourist season begins on December 15. Entrepreneurs of the sector are making every effort not to layoff any of the skilled employees by 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 $1590.7 million, or its equivalent of US$25.7 million. Of this, $466.3 million represent direct damage, and expected losses of revenue would amount to $1124.4 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)

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.

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 percent in the second quarter of 2004, in comparison with the corresponding period for the previous year. This was due to increased production of both electricity and water. Total

electricity generation rose in the quarter to 962.5 million KWh, and the production of water reached a total of 71240 megaliters.[6] The hurricane is expected to affect the sector's performance for the third and fourth quarters.

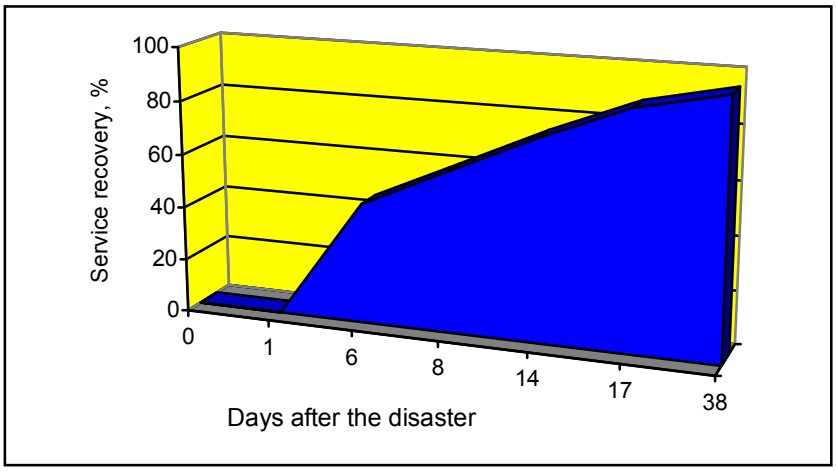
a) Electricity sector

The Electricity 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.

Electricity supply was interrupted throughout the island. The Jamaica Public Service Company Limited (JPSCo.), 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, JPSCo. began the process of replacing broken poles and restoring service. Thirty eight days after the disaster, there remained 5 percent of users still without service, especially those located in far away areas where roads were still inaccessible or under repair. (See figure 4-1).

Figure 4-1
Recovery performance of electrical services after the hurricane



The JPSCo. is expected or will 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 and use was made of the average value of revenues in the past year[6] 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 later on, a rough estimate was made on the basis of the value of those stocks described in the company's 2003 Annual Report.

Preliminary estimates indicate that the electrical subsector sustained total damage and losses of some $1398 million (or US$22.5 million), of which $589 million are direct damages (42 percent) and $809 million are indirect losses. Imports amounting to $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)

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 electricity sector will result in 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 gross domestic product.

b) Water supply and sanitation

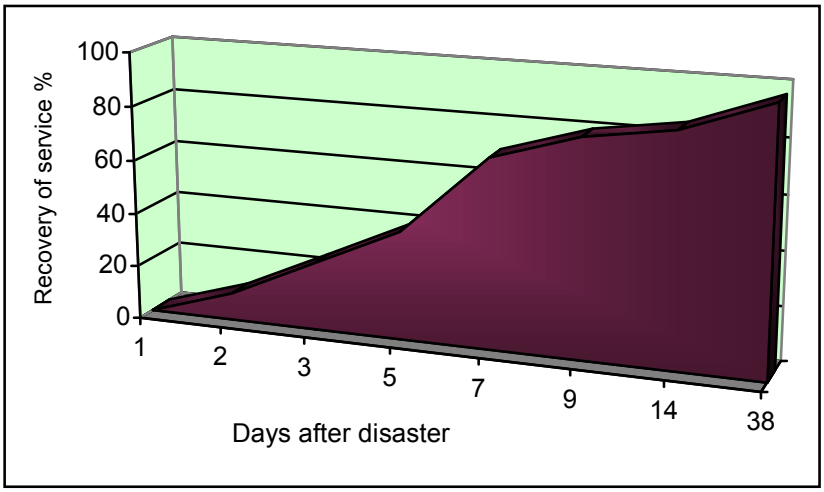
Water production and consumption in the first six months of 2004 was slightly above normal[6], due to a 3.1 percent increase in the rural areas. However, as described in the Agricultural sector of the report total rainfall was 30.3 percent below the 40-year mean.

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 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 restored (see 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 percent 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. Estimates 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[6]. 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 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 $578.8 million (US$9.3 million), of which direct damage amounted to $90 million and indirect losses were $488 million. Due to the need to import some equipment and materials from abroad, a $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)

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						
- Labour	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 partly responsible for increased morbidity rates, as described in chapter three of this report. In addition, the temporary absence of safe water at homes has forced people to resort to purchase bottled water for consumption, thus affecting their household budget.

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, 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 Parish councils. The storm surge caused heavy damage to the highway connecting Kingston and Norman Manley international airport (See photograph 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 river channels. As result of saturated soils, heavy rainfall and the eroding action of river and streams, slippage of entire sections of roads occurred. High river stages and floods scoured river channels and adjacent roads and related works. Roadway carpeting was badly damaged and 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 Parish 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 three to five 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 – these 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 $3199 (US$ 51.6 million), of which $2403 million refers to direct damage and the remaining $796 million represents the underestimated value of indirect losses. Imported equipment and materials for the sector will have an estimated impact of $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)

Component	Damage and losses			Sector		Effect on external sector
	Total	Damage	Losses	Public	Private	
Total	**3199.1**	**2403.2**	**795.9**	**3199.1**	**---**	**1280**
Main roads	1271.5	1271.5		1271.5		
Parish 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 for a period of three days of Norman Manley airport in Kingston and of Donald Sangster airport in Montego Bay, which handle international air passenger and cargo transport.

Winds damaged roofing in the cargo areas in the runway lighting system, and broke windows at the Norman Manley airport. In addition, several light planes were swept away 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 income from concessionaires established at the airports.

The total impact of the disaster on the subsector was estimated at $60 million, of which $47 million are direct damages and $13.1 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)

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 neighbouring parishes without telephone communications. The submarine fiber optic cable that links the island with the United States, through which nearly 80 percent of the traffic – including Internet – is routed, was severed in its land section in the Cayman Islands. Traffic was 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 were unable to use their phones as they lacked capacity to recharge their units. The utilities incurred into increased operational costs and this resulted in 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 $198.6 million, as required for the repairs and reconstruction of the assets[6]. Scant information available for two of the utilities would indicate that indirect losses would be around $1336.7 million. Therefore, the total amount of the impact of the hurricane on the sector would reach $1535 million, as shown in the following table. It is expected, 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)

Component	Damage and losses			Sector		Effect on external sector
	Total	Damage	Losses	Public	Private	
Total	**1,535.3**	**198.6**	**1,336.7**	**---**	**1336.7**	**120**
Damage to physical plant	198.6	198.6				
Increased operational costs	252.0		252.0			
Decreased revenues	1084.7		1084.7			

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

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.

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. When social and economic dislocation result 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 one 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 the agricultural sector, roads, houses and personal effects. This area had a similar experience from Ivan.

The south coast marine environment 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 percent 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 20 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 and 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 three 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; and damage to fishing settlements /beaches including extensive losses at Old Harbour Bay, Rocky Point, Portland Cottage, Alligator Pond, Calabash and Great Bays.

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[7].

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 partly buried and bleaching has already been observed[8]. 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 it was reported that waves were as high as 20 metres[9].

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.

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.

---

[7] Personal communication from Ainsley Henry, National Environment and Planning Agency.
[8] Personal communication from Brandon Hay, Coastal Conservation Area Management.
[9] Personal communication , Karl Hanson, Negril Marine Park.

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 siting of settlements, and the need for well-informed zoning and rigid enforcement by government authorities.

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 deposit in the channel. Housing on marginal hillsides faced collapse and inappropriate clearing of unstable slopes damaged and/or threatened houses downslope.

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 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.

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 is perhaps best captured as indirect loss.
Damage (landslides and siltation) to water intakes, flooding of works, turbidity levels, washout of mains, 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 re-examined.

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 death of corals due to stress, physical damage, or smothering by sand. The damage to the reef structures will have an impact on coastal protection.

The 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 Environmental Damage and Losses

The total amount of damage to the environment has been estimated as $3 754.5 million. This is 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.

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, etc.	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*

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

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.

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
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						

TABLE 5-1: **Recovery Time and Cost**						
Environmental Asset	**Damage Quality/Extent**	**Service Loss/Indirect**	**Cost**	**Recovery Period**	**Restoration Cost**	**Notes**
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
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

TABLE 5-1: **Recovery Time and Cost**						
Environmental Asset	**Damage Quality/Extent**	**Service Loss/Indirect**	**Cost**	**Recovery Period**	**Restoration Cost**	**Notes**
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
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

VI. SUMMARY OF OVERALL DAMAGE AND LOSSES

The total impact of hurricane Ivan on Jamaica, as described in previous chapters of this report, amounts to $35 931 million Jamaican dollars, or its equivalent of US$ 580 million.[10] In spite of some limitations imposed by the lack of sufficient data in some sectors or activities, the above figure reflects the amount of damage and losses sustained by the country.

Of the total figure quoted above, 62 per cent ($22 227 million) refers to damage to physical assets and the remaining 38 per cent ($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[11]. Partial information from the insurance industry indicates that an estimated amount of $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 is equivalent to 8 per cent 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 represent much higher figures[12], 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:

	$ million	Per cent
Destruction and damage to assets	22 278	62
Production losses	9 987	28
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.

---

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

[11] 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.

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

The private sector sustained damage and losses of $26,062 million (73 per cent of the total estimated impact), while the public sector suffered the remaining 27 per cent of the impact. Nevertheless, the government has already indicated its 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 $13 375 million, followed by the social sectors ($12 729 million), while infrastructure suffered a comparatively lower impact ($6 988). (See Table 6-1 below). However, the single most affected sector is that of housing which sustained total damage and losses of $11,164 million, or 31 per cent of the total impact, followed by Agriculture and Livestock ($8,550 million and 24 per cent), and Transport ($3,256 million and 9 per cent). When only indirect losses are considered, the most affected sector is that of Agriculture ($5,143 or 37 per cent of total losses), followed by Food Processing ($1,995 million or 14 per cent of total losses), Telecommunication (1,337 million or 10 per cent of total losses) and Tourism ($1,124 million or 8.2 per cent of total losses).

Table 6-1
Summary of Damage and Losses caused by Hurricane Ivan in Jamaica
($ million)

Sector and subsector	Damage and losses			Sector	
	Total	Direct	Indirect	Public	Private
Total	**35,930.9**	**22,226.8**	**13,704.1**	**9,768.8**	**26,062.2**
Social sectors	12,729.2	11,987.9	741.3	1,565.3	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	
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	5,235.8	1,652.1
- Electricity	1,397.9	589.0	808.9	1,397.9	
- 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[13]	2,560.6	2,560.6	…	2,560.6	
Emergency expenditures	277.6	---	277.6	94.9	182.7

Source: ECLAC.

[13] 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[14]. 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.[15]

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

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

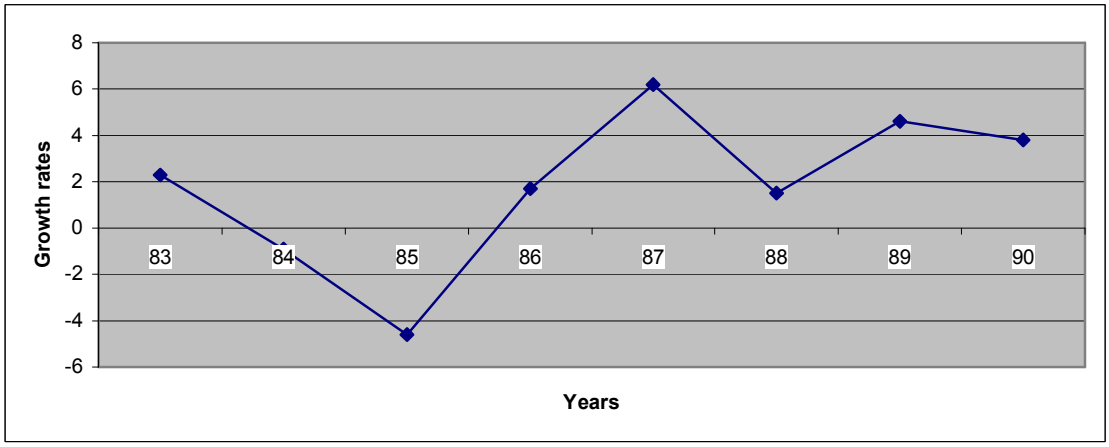
[15] Prior to Hurricane Gilbert, Jamaica was affected by a Hurricane in 1980 and by floods in 1986 and 1991. The respective losses are estimated at 2%, 3% and 6% of GDP respectively. See, Charveriat, C. *Natural Disasters in Latin America and the Caribbean: An Overview of Risk*. IDB, Working Paper #434, 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 deathts. 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 manufacturig sector (1%, 0.3% annd 1% in 1987, 1988 annd 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 Hurrricane Gilbert. See Figure 6-1). In 1989 GDP growth recovered to 4.6% and stabilised 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 OF THE DAMAGE

VII.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.

For 2004, overall GDP is projected grow by 1.9 percent in the aftermath of hurricane Ivan compared with 2.6 percent in the pre-disaster scenario. The most affected sectors include agriculture (-0.8 percent and -5 percent in the pre and post Ivan scenarios), electricity and water (3.7 percent and 2.2 percent in the pre and post Ivan scenarios), transport storage and communications (3.4 percent and 2.6 percent for both scenarios respectively) and to a lesser extent manufacturing (4.7 percent and 4.2 percent for both scenarios respectively) and mining (9.9 percent and 9.0 percent 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 4percent 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 percent and 10 percent 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.

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

1. Main trends

During 2003 the Jamaican economy registered the strongest growth performance in more than a decade (1.1 percent and 2.3 percent in 2002 and 2003). The behaviour of economic activity responded to the ongoing dynamism of mining (4.8 percent) and the recovery of the agriculture and tourism sectors (5.7 percent and 6.0percent respectively). (See Table III.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 percent versus -4percent of GDP) [16].

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 percent).

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 percent and -12.4 percent 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.

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

2. Economic policy

a) Fiscal policy

During FY 2003/2004 the authorities adopted a contractive policy managing to reduce the previous fiscal year's deficit from 7.3 percent to 5.8 percent 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 percent 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 same 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 1.7percent points (24.56 percent and 26.36 percent of GDP in FYs 2002/2003 and 2003/2004 respectively). 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 percent and 187 percent 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 percent of the total followed by human capital enhancement expenditures such as education (4 percent 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.

b) 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.

As a result, monetary policy underwent 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, which was visibly intense in the first five months of the year. The monthly exchange rate depreciated by 18 percent between January and May 2003 ($51.59 in January and $61.08 in May per 1 US$). The depreciation was triggered by the significant deterioration of the fiscal accounts in FY 2002/2003.

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

The overall result was a contraction in high-powered money (-5 percent), 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 (US$470 million) 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 period the exchange rate halted its rate of depreciation (4.7 percent for the June quarter) and stabilised at $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 percent and base money and money supply expanded, 15 percent and 13 percent 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 percent and 4.6 percent 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 stabilisation efforts by the Bank of Jamaica, pinned up the demand for loans (22 percent in real terms). Personal loans, tourism and transport and communication accounted for 47 percent of the total.

3. Evolution of main variables

a) Economic activity

The expansion of economic activity (2.3 percent) 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 percent and 5 percent in 2002 and 2003 respectively) is accounted for by domestic agriculture as export agriculture declined (14 percent and –6 percent respectively). This was in response 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 percent and 4.8 percent in 2002 and 2003 respectively) reflected an increase in capacity utilization of alumina plants in JAMALCO and ALPART and higher prices due to favourable external demand conditions.

Manufacturing output contracted as in the previous year (-0.8 percent and –1.0 percent in 2002 and 2003 respectively). This was due to declines in the two major manufacturing components beverage, food and tobacco and other manufacturing (-0.6 percent and –1.5 percent, respectively). The behaviour 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 percent and 1.1 percent in 2002 and 2003, respectively) 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 percent and 6 percent in 2002 and 2003 respectively). The performance of this sector capitalised 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 y 17 percent and 8 percent, respectively.

b) Prices, wages and employment

The rate of inflation reached double digits (7.3 percent and 14.1 percent 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 percent and 13 percent of the total) followed by fuels and other components and housing expenses (9 percent for both).

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 percent and 13 percent for 2002 and 2003, respectively) due mainly to a decline in the registered labour force rather than due to an increase in the number of employed. The labour force fell from 1 124.4 to 1 098.8 thousands, while the employed labour force remained at 954. The decomposition of labour force statistics by gender category shows that the decrease in the labour 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 percent and 10 percent for males; and 21 percent and 18 percent for females for 2002 and 2003 respectively).

c) Evolution of the external sector

The global result of the balance of payments was negative, as the current account deficit (-13.3 percent and -12.4 percent of GDP in 2002 and 2003, respectively) was not offset by the surplus in the capital and financial account. As a result, the stock of net international reserves declined (US$1 600 million in 2002 and US$1 169 million in 2003).

The trade balance worsened (20 percent and 26 percent of GDP in 2002 and 2003 respectively) as a result of the increase in the petroleum import bill (29 percent). 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 percent and –14 percent 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.

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

The Services balance widened its surplus (US$271 and US$444 million in 2002 and 2003, respectively) due to the expansion of tourist arrivals (13 percent.) This reflected favourable 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 percent and 29 percent in 2002 and 2003, respectively).

Remittances, which constitute one of the main sources of external finance and of foreign exchange inflows, expanded (13 percent of GDP in 2002 and 17 percent of GDP in 2003). This was in response 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 (-US$17 million for both 2002 and 2003) while the financial account narrowed its surplus in relation to the previous year (US$1135 and US$1020 million in 2002 and 2003 respectively). 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 (US$77 million and –US$368 million).

The impending macroeconomic disequilibrium 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 (US$814 million in 2002 and US$956 million in 2003) albeit at a lower rate than expected as a result of the lower levels of activity in the Telecommunications and Financial sector services.

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

1. Main trends

In the first two quarters prior to the disaster, GDP recorded a 2.7 percent growth in relation to the corresponding period of the previous year. Growth was fuelled by the Mining, Manufacturing and Tourism sectors (10 percent, 6 percent and 9 percent 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 billion and $14.3 billion for the budget and the actual fiscal balance, respectively).

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 –US$709 million to –US$687 million. 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.

2. Economic policy

2.1 Fiscal policy

Fiscal operations yielded a surplus in the first quarter of the year, equivalent to 1.2 percent of GDP, and a deficit of 2.7 percent 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 the second quarter in 2003.

For their part expenditures rose above the planned target for the first quarter of the year due to increases in the two most important categories, wages and salaries and interest payments. However, 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 government's 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 US$710 million US$ which represented a 4.8 percent increase with respect to March.

2.2 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 sterilisation 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 percent, 0.1 percent and 1.5 percent respectively. In the same vein the main tenors of the Bank of Jamaica decreased from 14.85 percent to 14.20 percent; 16.0 percent to 15.05 percent and from 15.57 percent to 14.98 percent for the 30-day, 180-day repo and 180-day treasury bills, respectively. The commercial banks and the weighted average loan rate decreased from 19.10 percent to 17.75 percent 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 and $60.76 in May 2003 and May 2004 respectively).

3. Evolution of the main economic variables

3.1 Economic activity

The level of economic activity picked up 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 percent). Growth was fuelled by the dynamism of the Mining, Manufacturing and Tourism sectors.

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

The Mining sector (9 percent on average for the first two quarters) responded to favourable 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 percent on average). This was the highest level of increase in the past eight years. This reflected the increased output in cement production, food processing, and in the output of beverages and tobacco. It also responded to the stability in the operations of the local petroleum refinery.

Construction activities grew moderately (2 percent) maintaining the trend of the past year 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 percent and 11 percent for the first and second quarters of the year) as stopover arrivals increased their numbers by 10 percent. Similarly, tourism expenditure grew by 7 percent. Cruise passengers who have less of an effect on the economy expanded by 1.5 percent.

3.2 Prices, wages and employment

In the first six months of the year, the rate of inflation declined from 5.6 percent to 3.8 percent 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 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 category (28 percent of the total) and housing and other expenses categories (26 percent of the total). In the second quarter, the food and drink category was the main driver of inflation (80 percent of the total). Prices within this category were affected by supply shortages due to drought conditions, which reduced the availability of agricultural products and a ban on beef imports from the United States of America.

3.3 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 US$439 million and the stock of net international reserves grew from US$1220 to US$1604 million 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 favourable 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.

VII. 4 The expected performance of the economy without the disaster

1. Main trends

The Jamaican economy was expected to expand by 2.6 percent 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 percent 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, close to the one digit level relative to the previous year, as a result of price and exchange rate stability and in spite of the rise in international oil prices.

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 percent to 10 percent of GDP. The deficit was expected to be amply financed by official financial flows due to the issue of Euro and regional bonds resulting in an increase in the stock of net international reserves.

2. Economic policy

2.1 Fiscal policy

For the fiscal year 2004/2005 the fiscal deficit was expected to decline from –5.6 percent to 3.8 percent of GDP and projected to reach equilibrium by FY 2005/2006. The expected result for FY 2004/2005, is predicated on a growth rate of 3-4percent and an inflation rate of 9 percent with focus mainly on constraining the growth of the two most important categories of expenditures, wages and interest payments on the domestic debt (which represent 34 percent and 40 percent, respectively of total expenditure) and to a lesser extent by an increase in tax collections.

Part of the wage-controlled growth depended on the said Memorandum of Understanding 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 to March 31 2006. Interest payments on 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 percent to 27.5 percent of GDP between FY 2003/2004 and 2004/2005. For its part expenditure was forecasted to decline from 36.7 percent to 34.45 percent of GDP. Within this category recurrent expenditures, and in particular wages and salaries and interest payments, were expected to drop from 12.4 percent to 11.1 percent and from 18.15 percent to 16.9 percent between FY 2003/2004 and 2004/2005. The authorities projected a primary surplus of 13 percent of GDP and as a consequence a decline in the public debt to GDP ratio from 145 percent in FY 2003/2004 to 136 percent in FY 2004/2005.

2.2 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 percent and 24percent to 14.40 percent and 14.55percent respectively. Accordingly the nominal exchange rate depreciated in line with the fall in interest rates ($60.61 and $61.18 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

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 totalling US$250 million 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.

3. Evolution of main variables

3.1 Economic activity

For 2004 the economy was forecasted to expand by 2.7 percent 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 percent and –2 percent growth for the first and second quarters and –5 percent 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 percent) on the basis of favourable external conditions (in particular higher aluminium prices), expansion in productive capacity and its higher rate of utilization.

The Manufacturing sector was projected to increase by 4percent .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 sub sectors within the manufacturing industry.

The Construction sector was projected to maintain a moderate rate of growth (2percent). 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 percent and 2.6 percent 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 (10percent with respect to 2003). Cruise ship arrivals, which account for a small part of visitor expenditures, were expected to grow at a very moderate rate. Prior to Hurricane Ivan, the industry registered a temporary decline in its activity due to Hurricane Charley. Tourism performance reflected the full recovery of the industry following the effects of September 11th and responded in greater part to the favourable economic conditions in developed economies.

3.2 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 14percent to 9percent on a calendar year basis and from 17 percent to 10 percent 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 should reign in the rate of growth of the wage bill for a two-year period. Under the agreement wages are expected to increase by less than 3 percent.

3.3 The evolution of the external sector

The current account deficit was projected to decline (-12 percent and –10 percent 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 US$93 million (US$1604 and US$1666 millions for the first and fourth quarter, respectively of the year).

The performance of merchandise exports (15 percent) responded favourably to 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 percent and 3.8 percent for the first and second quarter, respectively), which was projected to moderate in the second semester. The projected behavior of merchandise imports (11 percent) 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 (US$560 and 606 million) 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 percent) 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 and to private foreign direct investment flows in the Tourism and Mining sectors.

VII.5 The evolution of the economy with the disaster

1. 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 percent and 1.9 percent pre and post Ivan respectively) (See Table III.1 and Figure III.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.

The disaster will have a negative impact on the balance of payments as exports are expected to decline and imports will increase. The event will also affect to a lesser extent the behaviour 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.

2. The fiscal outlook

The authorities remained poised to maintain a primary balance of roughly 13percent in their fiscal accounts notwithstanding the effects of the natural disaster. The fiscal deficit with and without grants is projected to be –4.2 percent and –5percent (See Tables III.1. and III.2) and respectively not taking into account off-budget expenditures which amount to close to 3 percent 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.[17]

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) and capital expenditures due to the reconstruction and recovery efforts (see footnote 2).

---

[17] It is asssumed that the government asumes roughly 30percent 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 (11percent and 16percent 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.

TableIII.2

Central Government Operations 2004/05 - Prior to Hurricane Ivan

Millions of J$

	Actual	Budget	Projected	Projected	Prior to Ivan		Post Ivan Projected	
	Apr-Aug		Sept-Dec	Jan-March				
	2004		2004	2004	2004/2005	percent of GDP	2004/2005	percent 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

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 analysing 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.

3. 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 4percent 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.

3. Evolution of the main variables

3.1 Economic activity

Taking into account the effects of the disaster on the productive sectors the level of economic activity will register a 1.9percent growth for 2004 (2.6percent 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 (-1percent and –5percent 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

Table III.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 Instituti	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 III.1 (Conclusion)

	1995	1996	1997	1998	1999	2000	2001	2002	2003a/	2004	2004	2005
Prices												
Rate of change of the consumer price index (decembe	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 (decembe	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	

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 ag
g/ On a fiscal year basis. The estimates for FY 2004/2005 with t
that total revenue does not change in the scenarios prior and pos
h/ Includes grants.
i/ Excludes interest payments.

also have an impact on employment. Available data for the banana sub sector 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 (4.7percent and 4.2percent 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 9.1percent (10percent 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 (3.7percent and 2.2percent 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 (3.4percent and 2.6percent 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 III.3
Ratio of value added to gross output by economic sector (In percentages)
2003

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
Tinancing & 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 (STATIN).

The construction sector will increase its rate of growth (2.2percent and 3.4percent 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 1.5percent to 0.6 percent 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 (7percent and 6percent 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).

3.2 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 10percent to a range comprised between 11percent and 12percent. 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.

3.3 The evolution of the external sector

The current account deficit will expand from 10percent to 11percent of GDP in the pre and post Ivan scenarios) (See Table III.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 28percent to 30percent 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 –6percent. In spite of the effects of the Hurricane, the services surplus will increase by 3percent 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.

Table III.4
Balance of payments
2003-2004
Prior and post Hurricane Ivan
Millions of USD

		Pre-Ivan	Post-Ivan
	2003	2004	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

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 6percent to 7percent when comparing the behavior of that item with and without the effects of the natural disaster (and 17percent 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.

VII. GUIDELINES FOR A REHABILITATION AND RECONSTRUCTION PROGRAMME

1. Rehabilitation stage

This initial phase 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 rehabilitation programme focused on vital and basic needs, and on controlling 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 psycho-social 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 over time and paired with external resources in the form of donations or concesionary loans. The 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.

4. A list of projects suggested for consideration

What follows is a list of projects identified by the government suggested for funding. They arise from the discussions as raised in the document. Some of them are already taken into account under the current post-disaster estimated budget, as follows:

- Reconstruction projects: US$7.03 million.
- Additional government expenditure (pre-Ivan): J$2.3 billion.
- Expenditure for reconstruction needs: J$4.8 billion.