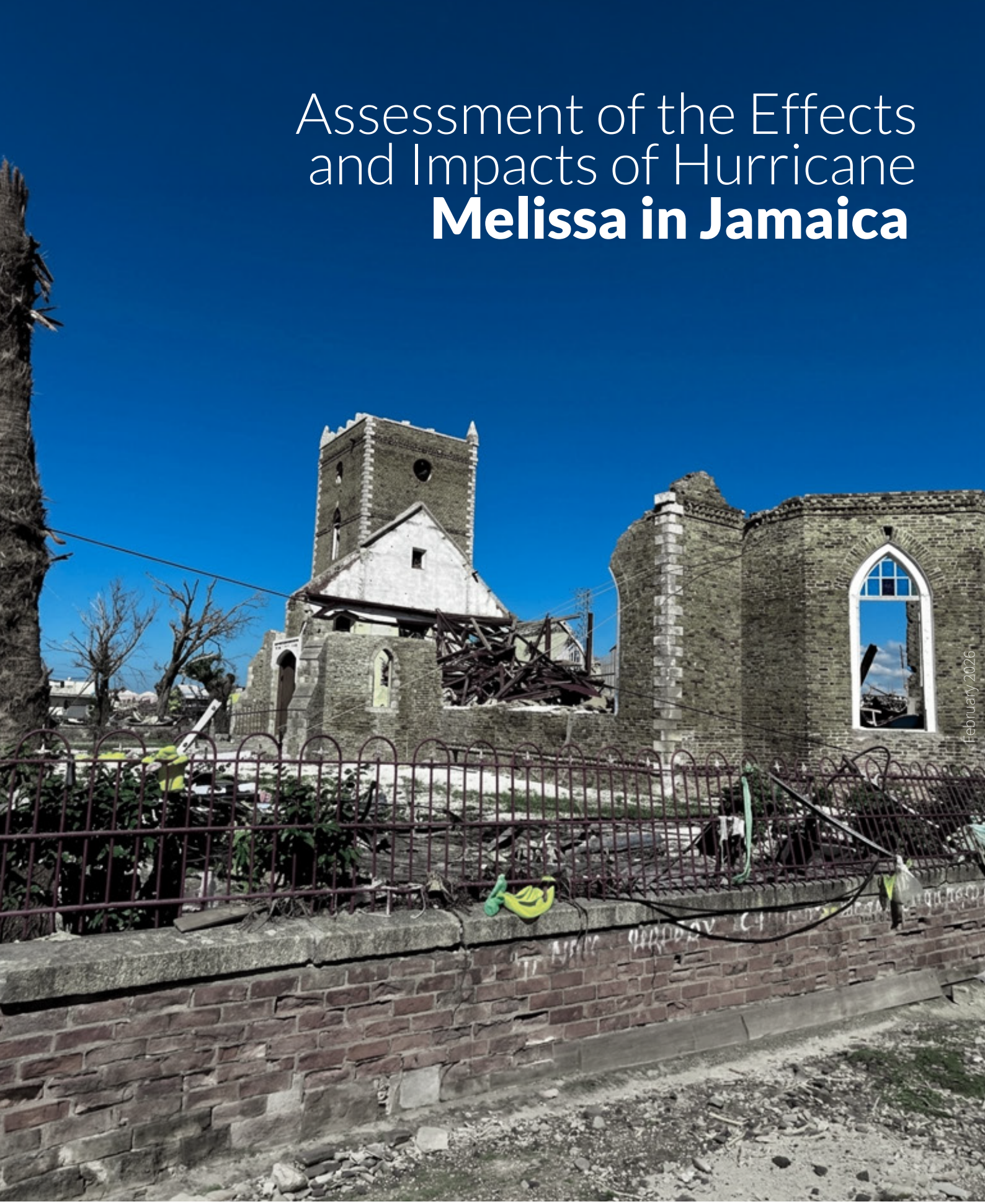
# Assessment of the Effects and Impacts of Hurricane **Melissa in Jamaica**



February 2026

UNITED NATIONS
ECLAC

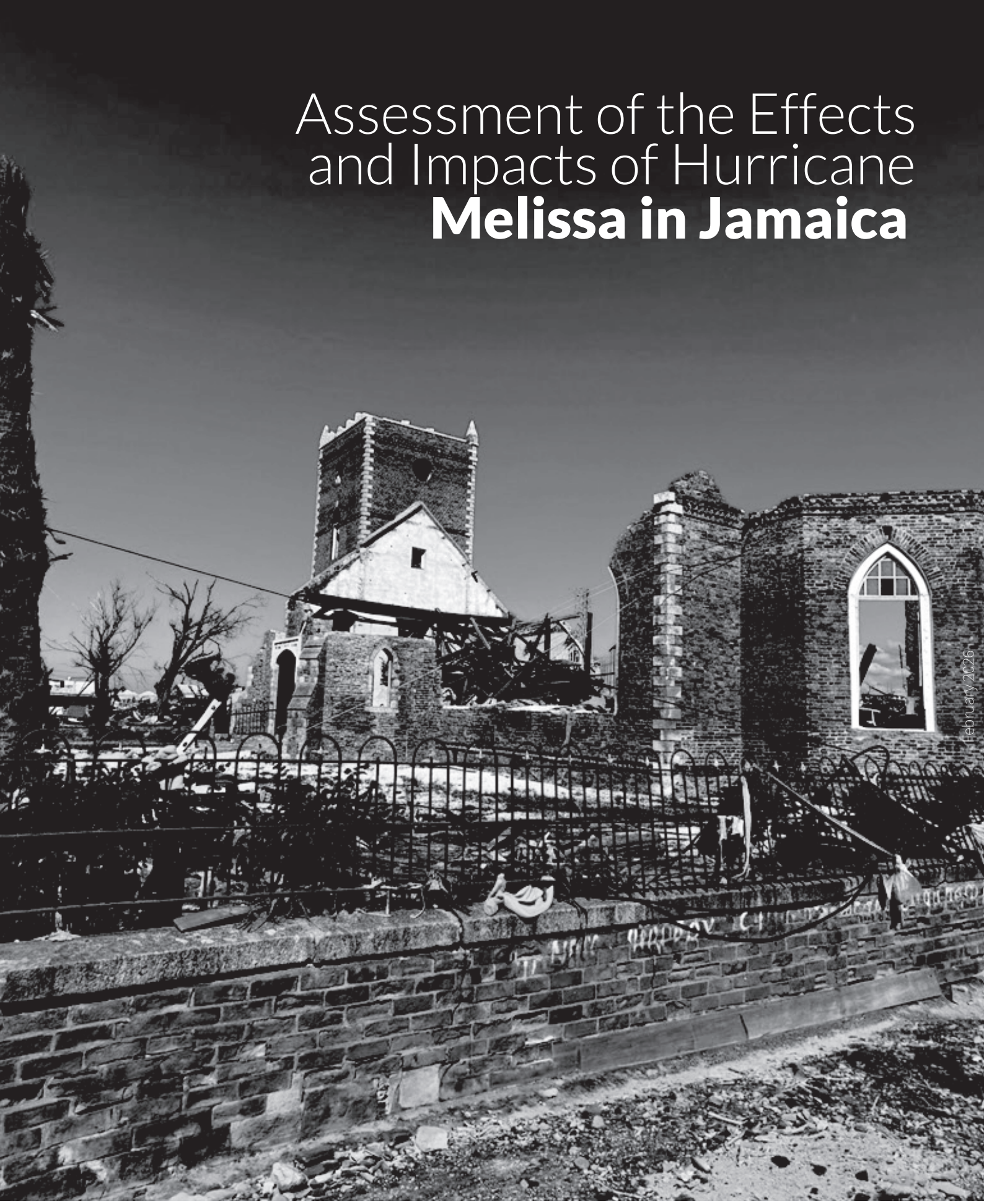
JAMAICA

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| | |
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# Acronyms

| Acronym | Name |
|---|---|
| **AA** | Anticipatory Action |
| **AAJ** | Airports Authority of Jamaica |
| **ASP** | Adaptive Social Protection |
| **BCP** | Business Continuity Planning |
| **BFB** | Build Forward Better |
| **BMIS** | Beneficiary Management Information System |
| **BSA** | Building Safety Assessment |
| **CCL** | Can-cara Limited |
| **CDEMA** | Caribbean Disaster Emergency Management Agency |
| **CPI** | Consumer Price Index |
| **CSEC** | Caribbean Secondary Education Certificate |
| **CTECH** | Caribbean Technical Assistance and Education Centre for Health |
| **DEML** | Dynamic Environmental Management Limited |
| **DLR** | German Aerospace Center |
| **DMA** | District Metered Area |
| **DRM** | Disaster Risk Management |
| **ECI** | Early Childhood Institution |
| **ECPs** | Education Continuity Plans |
| **EM-DAT** | Emergency Events Database |
| **EMTs** | Emergency Medical Teams |
| **EWS** | Early Warning System |
| **FAO** | Food and Agriculture Organization |
| **FAOSTAT** | Food and Agriculture Organization Corporate Statistical Database |
| **FY** | Fiscal Year |
| **GBD** | Gender-Based Violence |
| **GDI** | Gender Development Index |
| **GDP** | Gross Domestic Product |
| **GII** | Gender Inequality Index |
| **GIS** | Geographic Information System |
| **HADR** | Humanitarian Assistance and Disaster Relief |
| **HDI** | Human Development Index |
| **HEOC** | Health Emergency Operations Center |
| **IB-EWS** | Impact-Based Early Warning System |
| **ICZM** | Integrated Coastal Zone Management |
| **IDB** | Inter-American Development Bank |
| **IHDI** | Inequality-Adjusted Human Development Index |
| **IMS** | Information Management System |
| **IOM** | International Organization for Migration |
| **ISIC** | International Standard Industrial Classification |

| Acronym | Name |
|---|---|
| JCDC | Jamaica Cultural Development Commission |
| JCF | Jamaica Constabulary Force |
| JDF | Jamaica Defence Force |
| JHDINA | Jamaica Household Damage, Impact and Needs Assessment |
| JISA | Jamaica Independent Schools Association |
| JMD | Jamaican Dollar |
| JNHT | Jamaica National Heritage Trust |
| JPS | Jamaica Public Service Company Limited |
| JUTC | Jamaica Urban Transport Company |
| KSA | Kingston and St. Andrew |
| LU2 | Combined Rate of Time-Related Underemployment and Unemployment |
| LU-LULCF | Land Use / Land Use Change and Forestry |
| MBJ | MBJ Airport Limited |
| MCGES | Ministry of Culture, Gender, Entertainment and Sport |
| MET | Meteorological Service of Jamaica |
| MGI | MONA Geomatics Institute |
| MHPSS | Mental health and Psychosocial Support |
| MICS | Multiple Indicator Cluster Survey |
| MLSS | Ministry of Labour and Social Security |
| MoAFM | Ministry of Agriculture, Fisheries and Mining |
| MOESYI | Ministry of Education, Skills, Youth & Information |
| MOHW | Ministry of Health and Wellness |
| MPI | Multidimensional Poverty Index |
| NbS | Nature-based Solutions |
| NCD | Non-Communicable Disease |
| NEET | Not in Employment, Education, or Training |
| NEOC | National Emergency Operation Center |
| NEPA | National Environment and Planning Agency |
| NFA | National Fisheries Authority |
| NHC | National Hurricane Centre |
| NOAA | National Oceanic and Atmospheric Administration |
| NRW | Non-Revenue Water |
| NSMD | National Spatial Management Branch |
| NWA | National Works Agency |
| NWC | National Water Commission |
| OCHA | United Nations Office for the Coordination of Humanitarian Affairs |
| ODPEM | Office of Disaster and Preparedness and Emergency Management |
| OSM | Open Street Map |
| OUR | Office of Utilities Regulation |
| PAHO | Pan American Health Organization |
| PAJ | Port Authority of Jamaica |

| Acronym | Name |
|---|---|
| **PATH** | Programme of Advancement Through Health and Education |
| **PHL** | Port Handlers Limited |
| **PIOJ** | Planning Institute of Jamaica |
| **PPP** | Purchasing Power Parity |
| **PPPs** | Public–Private Partnerships |
| **PSS** | Psychosocial Support |
| **Q3** | Third Quarter |
| **RADA** | Rural Agricultural Development Authority |
| **RBWCL** | Runaway Bay Water Company Limited |
| **RDL** | Rose Hall Development Limited |
| **RWEC** | Ranny Williams Entertainment Centre |
| **SIDS** | Small Island Developing States |
| **STATIN** | Statistical Institute of Jamaica |
| **TAJ** | Tax Administration Jamaica |
| **TUM** | Technical University of Munich |
| **UN** | United Nations |
| **UNDESA** | United Nations Department of Economic and Social Affairs |
| **UNDP** | United Nations Development Programme |
| **UNFPA** | United Nations Population Fund |
| **UNICEF** | United Nations Children's Fund |
| **UNOPS** | United Nations Office for Project Services |
| **US$** | United States Dollar |
| **WB** | World Bank |
| **WCK** | World Central Kitchen |
| **WFP** | Word Food Programme |
| WRA | Water Resources Authority |

## Methodology

On 7 November, the Economic Commission for Latin America and the Caribbean (ECLAC) received an official request from the Planning Institute of Jamaica (PIOJ) to conduct a full DaLA (Damage and Loss Assessment) of the impacts caused by Hurricane Melissa. In response, ECLAC activated its standard procedures and is coordinating the assessment jointly with the Inter-American Development Bank (IDB), our most important partner in the last eleven years on these assessments, the Panamerican Health Organization (PAHO), the UN Resident Coordinator Office of Jamaica, the World Bank, the United Nations Development Programme (UNDP), the United Nations Office for Disaster Risk Reduction (UNDRR). The process follows a whole-of-UN approach, ensuring methodological coherence and complementarity and close collaboration.

The estimation of the effects and impacts of the Hurricane Melissa in Jamaica follows the third edition of the Damage and Loss Assessment (DaLA) methodology developed by ECLAC[1].

The methodology allows standardized data collection and analysis on a sectoral basis, applying the same criteria to every sector under study. In this regard, the following concepts are used in the assessment:

(i) Effects: Damage, Losses and Additional costs

- Damage: the effect the disaster has on the assets of each sector, expressed in monetary terms. Assets may include buildings, machinery, equipment, transportation, furnishings, roads, ports, stocks of final and semi-finished goods, among others.
- Losses: goods that go unproduced and services that go unprovided during a period running from the time the disaster occurs until full recovery and reconstruction is achieved.
- Additional costs: outlays required to produce goods and provide services because of the disaster. These represent a response by both the public and the private sectors and may take the form of additional spending or a shift in expenditure.

(ii) Impacts: consequences of the effects on macroeconomic variables, such as Gross Domestic Product (GDP), and public finance.

The assessment includes the following sectors: (i) the social sector analysis focuses on the affected population, education, health, housing, and culture; (ii) the productive sectors analysed are agriculture and livestock, fisheries and aquaculture, tourism and commerce and industry; (iii) the infrastructure sector comprises transportation, power, water and sewerage, and telecommunications.

Additionally, the report includes a cross-cutting assessment of the effects suffered by the environmental sector and the macroeconomic impacts. All the effects and impacts are estimated in Jamaican dollars (JMD). The exchange rate used in this document is the average daily rate from January 1 to October 27, 2025, amounting to JMD 159.6743.

The DaLA team visited Jamaica from 24-28 November 2025, to collect data and obtain an overview of the effects of the Hurricane Jamaica on the country. In addition, it held meetings remotely and interviews with representatives from government agencies responsible for each sector under analysis.

[1] ECLAC (2014). Handbook for disaster assessment. See https://www.cepal.org/sites/default/files/publication/files/36823/S2013817_en.pdf

The assessment used official data provided by the government, interviews with the private sector, and observations from the field visits. In this sense, the team of the PIOJ played a relevant and active role in the evaluation process by providing contacts, facilitating site visits, and organizing and participating in meetings.

The assessment of the tourism and housing sectors was supported by a substantive technical contribution from RiskHUB under the IDB Ready and Resilient Americas Initiative, financed through grant TC JA-T1258.

However, as it will be detailed in each pertinent sector, the main limitation of the assessment was access to information, either due to unavailability during the assessment or because it is not yet collected/ produced in the country. This limitation was overcome by creating reasonable assumptions where data was unavailable. Both official information and informed assumptions were used to estimate the effects of the hurricane and are presented in each section.

## Executive Summary

Hurricane Melissa was a highly destructive Category 5 Atlantic hurricane that affected Jamaica, Haiti, Cuba, and The Bahamas in late October and early November 2025. It was the thirteenth named storm, fifth hurricane, fourth major hurricane, and third Category 5 hurricane of the 2025 Atlantic hurricane season. The system developed and intensified rapidly under exceptionally favorable environmental conditions in the Caribbean Sea, including very high sea surface temperatures, elevated ocean heat content, and low wind shear. Melissa reached its peak intensity with sustained winds of 185 mph (295 km/h) and a minimum central pressure of 892 mbar, ranking among the most powerful hurricanes ever recorded in the Atlantic basin.

Jamaica was directly impacted by Hurricane Melissa on October 28, from midday through the early hours of the night. The hurricane made landfall near New Hope in Westmoreland Parish at Category 5 strength and crossed the island from southwest to northeast, causing catastrophic impacts before weakening and continuing toward Cuba and The Bahamas. During the event, the Meteorological Service of Jamaica issued 58 advisories and alerts, which, together with guidance from the Office of Disaster Preparedness and Emergency Management (ODPEM), supported Government decision-making. These actions included the declaration of the entire island as a threatened and subsequently a disaster area, activation of national and parish emergency operations centers, opening of emergency shelters, and the issuance of mandatory evacuation orders for high-risk communities.

The passage of Hurricane Melissa resulted in 45 confirmed fatalities and caused severe damage to basic infrastructure, particularly in western Jamaica. The parishes of St. Elizabeth, Westmoreland, Hanover, St. James, Trelawny, and St. Ann experienced the most significant impacts, primarily due to hurricane-force winds, storm surge, intense rainfall, flooding, and landslides. Recorded wind speeds exceeded 190 km/h in several locations, while storm surge affected both southern and northern coastal areas. Rainfall accumulations surpassed long-term October averages across most parishes, with totals exceeding 500 mm in some areas, leading to widespread flooding along river floodplains and in low-lying and landslide-prone terrain.

Field observations conducted between November 24 and 28 confirmed that the community of Black River, in St. Elizabeth Parish, experienced the most catastrophic impacts. Extensive damage was observed to housing, public services, productive infrastructure, and livelihoods, highlighting the severe humanitarian and socio-economic consequences of the event. Overall, Hurricane Melissa represented a high-impact, multi-hazard disaster for Jamaica, underscoring the country's vulnerability to extreme tropical cyclones and the need to strengthen resilience, preparedness, and risk reduction measures in the most exposed areas.

Hurricane Melissa had devastating effects on Jamaica. The estimated overall cost was approximately JMD 1,953 billion (USD 12.23 billion). That cost is equivalent to more than four times the cost of Hurricane Gilbert, which had previously been the costliest hurricane in the country's history. The private sector accounted for 80 percent of the total effects of the disaster. This represents 92 percent of the damage, 67 percent of the losses, and 14 percent of the additional costs. The share of the private sector increases to 89 percent when the environment is excluded.

**Table 01:** Total effects, in thousands of JMD

| | Public | Private | Total |
|---|---|---|---|
| *Damage* | 94,820,926 | 1,120,816,010 | 1,215,636,936 |
| *Losses* | 202,196,664 | 418,565,835 | 620,762,499 |
| *Additional Costs* | 101,011,633 | 15,770,297 | 116,781,930 |
| ***Total*** | **398,029,223** | **1,555,152,142** | **1,953,181,365** |

*Source: DaLA team, 2025.*

**Table 02:** Effects by sector, in thousands of JMD

| | Damage | Losses | Additional costs |
|---|---|---|---|
| *Social* | 725,748,888 | 19,752,706 | 76,542,533 |
| *Productive* | 387,183,041 | 378,745,132 | 26,560,799 |
| *Infrastructure* | 78,828,318 | 37,007,890 | 13,678,524 |
| *Environment* | 23,876,689 | 185,256,771 | 74 |
| ***Total*** | **1,215,636,936** | **620,762,499** | **116,781,930** |

*Source: DaLA team, 2025.*

Three subsectors account for 81 percent of the overall impact: tourism, housing, and environment. Social sectors suffered 60 percent of total damage, 3 percent of losses, and incurred 66 percent of additional costs. Within these sectors, Housing accounted for 95 percent of the damage and the additional costs, and Education suffered 51 percent of the losses. The productive sectors suffered 32 percent of the total damages, 61 percent of the losses, and incurred 23 percent of the additional costs. Within these sectors, tourism was the most severely affected: it accounted for 81 percent of total damage, 70 percent of total losses, and 77 percent of additional costs.

**Table 03:** Summary of effects, in thousands of JMD

| | Damage | Losses | Additional costs |
|---|---|---|---|
| *Social* | 725,748,888 | 19,752,706 | 76,542,533 |
| *Education* | 19,528,863 | 10,003,509 | 741,122 |
| *Health* | 13,091,726 | 3,144,358 | 2,505,640 |
| *Housing* | 688,169,622 | 6,590,559 | 73,042,791 |
| *Culture* | 4,958,677 | 14,280 | 252,980 |
| *Productive* | 387,183,041 | 378,745,132 | 26,560,799 |
| *Agriculture and livestock* | 10,045,486 | 22,617,976 | 3,450,000 |
| *Fisheries y aquaculture* | 5,883,968 | 1,758,699 | 96,000 |
| *Tourism* | 315,419,390 | 265,232,104 | 20,502,260 |
| *Commerce* | 55,834,197 | 89,136,353 | 2,512,539 |
| *Infrastructure* | 78,828,318 | 37,007,890 | 13,678,524 |
| *Transport infrastructure* | 29,620,786 | 10,455,414 | 8,008,294 |
| *Power* | 38,555,731 | 9,675,893 | 4,513,881 |

**Table 03:** Summary of effects, in thousands of JMD *(continuation)*

| | Damage | Losses | Additional costs |
|---|---|---|---|
| *Telecommunications* | 8,415,924 | 11,636,583 | 342,053 |
| *Water and sewerage* | 2,235,877 | 5,240,000 | 814,296 |
| *Environment* | 23,876,689 | 185,256,771 | 74 |
| ***Total*** | **1,215,636,936** | **620,762,499** | **116,781,930** |

*Source: DaLA team, 2025.*

The environment suffered 2 percent of the total damages, and 30 percent of the losses. Infrastructure sectors suffered 7 percent of total damage, 6 percent of the losses and incurred 6 percent of additional costs. Within these sectors, the power sector accounted for 49 percent of total damage and 33 percent of additional costs, while the transport sector represented 37 percent and 59 percent, respectively. Taken together, these two sectors, along with telecommunications, accounted for 86 percent of total losses across the infrastructure sectors.

Prior to the passage of Hurricane Melissa, the Jamaican economy was projected to grow by 2.2 percent in fiscal year 2025/26 and 1.0 percent in 2026/27 (Government of Jamaica 2025). Post-disaster, the economy of Jamaica is expected to contract by 1.4 percent in fiscal year 2025/26 and 1.0 percent in fiscal year 2026/27. This implies that the estimated impact of Hurricane Melissa is a reduction of 3.6 percentage points and 0.0 percentage points in real GDP growth in fiscal years 2025/26 and 2026/27, respectively.

In 2026, an increase in construction activity in line with reconstruction activity would be expected; however, this is not included in the estimate, and including this would reduce the estimated impact on GDP. Finally, these estimates are based on the calendar year. Since the hurricane arrived at the end of October, ten months of economic flows in 2025 were undisturbed. If the estimates were based on the fiscal year the impact would be more significant.

Regarding the impacts on production factors, it is estimated that Compensation of employees by JMD 70.1 billion (USD 0.439 billion), and *Operating surplus and mixed income* by JMD 58.8 billion (USD 0.368 billion). The largest declines in factor incomes were in the productive sectors, with the largest decreases all factors of production in the tourism sector.

Hurricane Melissa will lead to significant short-term fiscal slippage. The overall fiscal deficit is projected to be 3.5 percent of GDP (Government of Jamaica 2025), compared to the balanced budget which was originally targeted. The fiscal outturn will be adversely affected by developments on both the revenue and expenditure sides.

The results and highlights of each sector chapter are presented below:

## Description of the Event and Affected Population

- **Affected Population**

Hurricane Melissa had severe and widespread impacts on the population of Jamaica, with the primary affected population comprising individuals who experienced direct and immediate consequences of the disaster. Based on official government and health-sector reports, the hurricane resulted in 45 confirmed deaths, 13 persons reported missing, and approximately 340 injuries. In addition, post-disaster public health conditions significantly exacerbated human impacts, including a declared

leptospirosis outbreak with 30 confirmed cases and 12 associated deaths, as well as two tetanus cases, one of which was fatal. Large-scale housing damage was the dominant driver of direct impact, with an estimated 85.127houses with some level of damage or destroyed, affecting approximately 261,527 persons nationwide. Displacement was significant, with 972 persons evacuated prior to landfall and shelter occupancy peaking at 7,208 individuals across 513 active shelters immediately after impact, while prolonged shelter use was concentrated in the western and south-western parishes. These direct effects were most pronounced in the Government-designated "Big Five" parishes of St. Elizabeth, Westmoreland, St. James, Trelawny, and Hanover, where extensive flooding, wind damage, and infrastructure disruption resulted in loss of life, displacement, health risks, and the destruction of homes and personal assets.

The secondary affected population includes those who suffered indirect and longer-term impacts arising from service disruptions, livelihood losses, and social and economic dislocation. Hurricane Melissa severely disrupted Jamaica's productive sectors, particularly agriculture and fisheries, with an estimated 66,986 farmers and 8,235 fisherfolk experiencing livelihood losses due to widespread crop damage, livestock losses, and destruction of fishing vessels and gear. The tourism sector, a cornerstone of national employment, was also heavily affected, with approximately 168,000 tourism workers facing income losses linked to damage to hotels, attractions, and supporting infrastructure, especially in Montego Bay, Negril, and Ocho Rios. In the social sector, approximately 407,000 students were impacted by school closures, with an estimated 15 per cent of schools projected to reopen only in January 2026 due to damage and the continued use of facilities as emergency shelters. Beyond sector-specific effects, large segments of the population experienced indirect adverse impacts due to prolonged electricity, water, and telecommunications outages, isolation of rural and marooned communities, and disruptions to access to health, education, and social services. Collectively, these secondary impacts significantly undermined household incomes, food security, and human capital, amplifying the disaster's national development and recovery challenges.

## Social Sectors

- **Education**

Hurricane Melissa generated widespread and systemic impacts across Jamaica's education sector, affecting at least two-thirds of the educational institutions nationwide. Although the most severe impacts were concentrated in the western regions of the island, damage was reported across the entire territory. As a result of system-wide closures and phased reopening, all students were affected at some level, with learning disruptions impacting around 450,000 students in primary, secondary, and tertiary education, and more than 24,000 children in early childhood development institutions. Approximately 15 percent of schools are projected to reopen for classes only at the start of the following academic term, in January 2026.

The total cost of Hurricane Melissa for the education sector is estimated at JMD 30.3 billion (USD 0.190 billion). Given that more than 90 percent of enrolment in Jamaica is concentrated in public institutions, the impacts are overwhelmingly borne by the public sector, with independent schools representing only a small share of total costs, 7.2 percent. Damage constitutes the largest component, summing up JMD 19.5 billion (USD 0.122 billion) and amounting to approximately two-thirds of total impacts, driven primarily by widespread roof damage affecting classrooms, electrical systems, furniture, and equipment. Educational losses were also substantial, reaching JMD 10 billion (USD 0.063 billion) and reflecting the prolonged suspension of classes across the system. All schools were closed in the week of the event, and in the aftermath, nearly half were unable to reopen. Closures were prolonged not only by the extent of physical damage, but also by the continued use of structurally resilient schools as

emergency shelters for displaced populations—a necessary and justified response that nonetheless extended learning disruption for a large share of students.
Additional costs, though smaller in magnitude, highlight important operational challenges faced during early recovery. These costs are dominated by cleaning and debris removal, which account for almost 80 percent of the JMD 0.7 billion (USD 0.004 billion) of additional expenditure. In practice, a significant share of these activities was undertaken through voluntary labor, community-led clean-up efforts, and in-kind contributions, often in the absence of timely financial or technical support. While such collective action contributed to the rapid restoration of basic functionality in many schools, it also reflects capacity gaps in organized debris management and resulted, in some cases, in suboptimal practices, such as burning debris within school premises. Together, these additional costs underscore the critical role of communities in early recovery while highlighting the need for more structured support mechanisms for post-disaster school rehabilitation.

- **Health**

Hurricane Melissa caused severe and widespread impacts on Jamaica's public health sector, representing the most significant damage recorded since Hurricanes Gilbert, Dean, and Ivan. Total effects are estimated at JMD 18.7 billion (USD 0.1171 billion), comprising JMD 13.1 billion (USD 0.0820 billion) in damages, JMD 3.1 billion (USD 0.0194 billion) in losses, and JMD 2.5 billion (USD 0.0157 billion) in additional costs. The most affected areas were the western parishes of St. Elizabeth, St. James, Westmoreland, Hanover, and Trelawny, where the concentration of damaged health infrastructure and service disruptions was highest.

Damages to the health sector were primarily driven by hurricane-force winds, flooding associated with extreme rainfall, and storm surge, particularly in facilities located in coastal and low-lying areas. A total of 143 public health facilities sustained some level of damage, including 18 hospitals, 120 health centers, and 5 health department offices. Among these, five hospitals experienced major damage, with Black River Hospital in St. Elizabeth being the most critical case. This facility is currently completely out of service due to extensive structural damage, destruction of biomedical equipment, failure of electrical and water systems, and severe storm surge impacts resulting from its proximity to the coastline.

Total damages are estimated at JMD 13.1 billion (USD 0.0820 billion), of which 44 percent corresponds to health center infrastructure, 41 percent to hospital infrastructure, and the remainder to biomedical equipment, administrative facilities, and vehicles. St. Elizabeth accounts for the largest share of total damages at 30 percent, followed by St. James with 16 percent, Westmoreland and Hanover with 14 percent each, and Trelawny with 13 percent. Damages to pharmacy services within health centers were reported; however, due to the absence of detailed information on lost medicines and supplies, these losses are not included in the current estimates.

Losses in the health sector, estimated at JMD 3.1 billion (USD 0.0194 billion), are mainly associated with reduced service delivery resulting from the temporary closure of damaged facilities and preparedness-related service suspensions. All losses correspond to the public sector and were calculated based on the duration of facility closures and wage costs of medical and administrative staff. Hospitals account for approximately 60 percent of total losses, while health centers represent the remaining 40 percent. The closure of five severely affected hospitals is projected to result in at least 31,000 patients being unable to access clinical specialty and radiology services during the latter part of the year and the beginning of the next.

Additional costs, estimated at JMD 2.5 billion (USD 0.0157 billion), reflect emergency expenditures already incurred by the Ministry of Health and Wellness (MOHW) to ensure continuity of services and manage public health risks. The largest share corresponds to environmental health response

accounting for 87 percent, followed by epidemiological surveillance and risk disease control program at 3 and health response coordination at 1 percent.

- **Housing**

The housing sector suffered extensive damage from Hurricane Melissa. The most affected parishes are Westmoreland, St. Elizabeth, and St. James, accounting for 91.6 percent of the total damage. This assessment has distinguished four levels of damage: minor (damage to windows and doors), moderate (damage to roofing sheets), severe (damage to roof structures and metal sheets), and destruction. In those parishes where stone, brick, or concrete walls with metal roofing predominate, most of the walls suffered minor damage, and the damage was mainly to the roofs.

The total cost of Hurricane Melissa for the housing sector was estimated at JMD 767.8 billion (USD 4.809 billion); attributed to damages amounting to JMD 688.2 billion (USD 4.310 billion), losses amounting to JMD 6.6 billion, and additional costs amounting to JMD 73 billion (USD 0.457 billion). The damage was caused by strong winds and, in specific areas, by storm surges and flooding. These estimates were made based on field visits, institutional interviews, and analysis of georeferenced data.

The greatest impact on the housing sector corresponds to the private sector, amounting to JMD 693.8 billion (USD 4.345 billion), primarily involving damage to residential properties and household goods. The public sector was affected by a total of JMD 74.1 billion (USD 0.464 billion), which corresponds to the removal and final disposal of debris, adaptation and operation of shelters, as well as institutional costs for field assessments, assistance, and monitoring of affected families.

- **Culture**

Hurricane Melissa caused an unprecedented level of disruption to Jamaica's cultural heritage. Cultural assets in Jamaica encompass a wide range of sites and institutions, including historic buildings, places of worship, museums, educational institutions, and community heritage spaces, many of which carry layered historical, social, and symbolic meanings and play an important role in social cohesion, cultural continuity, and livelihoods linked to cultural and tourism activities. Damage to these assets, therefore, entails not only material loss but also disruptions to collective memory, identity, and the transmission of cultural practices.

Total damages amount to approximately JMD 5 billion (USD 0.031 billion), while documented losses derived primarily from cancelled events and interrupted venue rentals reach JMD 14.3 million (USD 0.090 million). Additional costs, total JMD 248 million (USD 1.553 million). Together, these effects result in an overall impact of JMD 5.2 billion (USD 0.033 billion) for those components that could be quantified under the DaLA methodology. It is important to underscore that these monetary figures reflect only those cultural activities for which concrete financial data were available, meaning they represent only a partial view of the true impact experienced by the sector.
Productive Sectors

- **Agriculture and Livestock**

Jamaica's agricultural and livestock production, together with its productive assets, economic flows, and overall productive diversity, was significantly affected by the passage of Hurricane Melissa. Productive areas and animal husbandry systems were exposed to hurricane-force winds, heavy rainfall, flooding, landslides, extreme soil saturation, high humidity, and other severe conditions associated with the storm. The economic effect includes JMD 10 billion (USD 0.063 billion) in damage to assets and productive infrastructure, JMD 22.6 billion (USD 0.142 billion) in losses to productive flows, and

approximately JMD 3.5 million (USD 0.022 million) in additional costs required to restore productive capacity.

Plantations, irrigation systems, farm buildings, greenhouses, research facilities, government offices, and farm roads sustained severe damage. The hurricane also affected or killed 650,000 laying hens, 462 dairy cows, and thousands of beehives. Livestock production infrastructure—including animal houses for layers, broilers, pigs, cattle, sheep, and rabbits, as well as associated fencing systems—was destroyed or partially damaged.

Losses occurred across 51 crops and 7 livestock species, with the greatest impacts concentrated in the parishes of St. Elizabeth, Trelawny, Westmoreland, Manchester, St. James, Hanover, and Clarendon. In total, agricultural and livestock losses affected 48,016 hectares of crops and approximately 1.5 million animals of various species, economically impacting an estimated 66,986 farmers.

- **Fisheries and Aquaculture**

Hurricane Melissa devastated Jamaica's fisheries and aquaculture sector with unprecedented storm surges, powerful waves, and winds reaching 185 mph, severely impacting key productive assets and infrastructure. The estimated economic impact of the event amounts to JMD 5.9 billion (USD 0.037 billion) in damage to assets, JMD 1.8 billion (USD 0.011 billion) in losses to economic flows, and approximately JMD 96 million (USD 0.601 million) in additional costs required to restore the island's landing and fishing capacity. In total, 3,301 vessels were damaged, 52 landing sites or beaches and their associated infrastructure were affected, and 39.3 hectares of aquaculture production were impacted. Significant damage was recorded across storage sheds, jetties, storage houses, NFA offices, beach areas affected by erosion, cold-storage facilities, fences, pumps, farm light posts, piping systems, feed inventories, bulldozers, farmhouses, containers, and other minor infrastructure.

Sector losses reflect a 35 percent reduction in landing capacity and a 22 percent decline in the fleet's fishing capacity.

- **Tourism**

Hurricane Melissa had a severe impact on Jamaica's tourism sector, affecting the country's main destinations and disrupting tourism activity even prior to landfall. The assessment estimates total effects of JMD 601 billion (USD 3.764 billion), comprising JMD 315 billion (USD 1.973 billion) in damages, JMD 265 billion (USD 1.660 billion) in losses, and JMD 20.5 billion (USD 0.128 billion) in additional costs. Impacts were geographically concentrated in the parishes of St. James, St. Ann, Trelawny, Hanover, Westmoreland, and St. Elizabeth, which together account for the vast majority of Jamaica's tourism infrastructure and visitor flows. Physical damages were driven primarily by non-structural impacts to buildings, extensive losses of furniture and equipment due to water intrusion, and damage to utilities, landscaping, and common areas. St. James alone accounted for nearly 44 percent of total damages, reflecting the high concentration of assets around Montego Bay, while St. Elizabeth experienced the most serious damage relative to its tourism baseline, raising concerns regarding recovery capacity among small, less-insured establishments.

Tourism losses were dominated by reduced stopover arrivals, which represented over 96 percent of total losses, while cruise-related losses were comparatively small but socially significant due to their concentration around port-based livelihoods. Losses are estimated to be most severe in late 2025 and throughout 2026, reflecting the coincidence of the recovery phase with peak tourism seasons and the uneven pace of infrastructure restoration, particularly electricity supply. Recovery trajectories vary by resort area, with eastern parishes expected to recover rapidly and losses on the South Coast extending into 2027. Additional costs were substantial, reflecting emergency power and water generation, clean-

up activities, and support provided by resorts to workers and surrounding communities. The findings underscore the importance of accelerating infrastructure restoration in key destinations—particularly Montego Bay—strengthening data systems for tourism recovery monitoring, and expanding access to insurance and risk-management instruments, especially for small tourism operators.

- **Commerce and Industry**

Hurricane Melissa had a significant impact on Jamaica's commerce sector, disrupting domestic commercial activity across the country. Total effects on the sector are estimated at JMD 147 billion (USD 0.921 billion), comprising JMD 56 billion (USD 0.351 billion) in damages, JMD 89 billion (USD 0.557 billion) in losses, and JMD 2.5 billion (USD 0.016 billion) in additional costs. These estimates exclude commerce activity associated with international tourism to avoid double-counting, as those impacts are addressed separately in the tourism chapter. Physical damages were driven primarily by losses to inventories, furniture, and equipment caused by water intrusion, while structural damage to buildings was more limited. The most affected parishes in terms of damages were Westmoreland and St. Elizabeth, which together accounted for nearly 40 percent of total commerce-sector damages, reflecting both the direct exposure to Hurricane Melissa and construction characteristics common in commercial facilities.

Commerce-sector losses were more geographically widespread than damages, reflecting the temporary shutdown of economic activity following the storm, prolonged power outages, and supply-chain disruptions. Losses are estimated to be concentrated in 2026, accounting for approximately 65 percent of the total, as recovery coincided with uneven restoration of infrastructure and differentiated demand across commercial subsectors. St. Elizabeth experienced the highest losses, representing about 34 percent of the total, followed by St. James and St. Andrew, the latter driven primarily by its large commercial base rather than the severity of physical damage. Additional costs were mainly associated with debris removal, facility cleaning and remediation, and the self-generation of electricity and water during periods of infrastructure disruption. The findings highlight the vulnerability of Jamaica's highly decentralized and largely uninsured small-business sector, underscoring the importance of improved commercial data systems, faster infrastructure restoration, and expanded access to insurance and risk-management instruments to strengthen resilience against future shocks.

## Infrastructure Sectors

- **Transport Infrastructure**

Hurricane Melissa had a significant impact on Jamaica's transport sector, causing widespread damage to infrastructure. The total economic impact on the sector is estimated at JMD 48 billion (USD 0.301 billion). Of this total, JMD 29.6 billion (USD 0.185 billion) corresponds to damage to transport infrastructure, JMD 10.4 billion (USD 0.065 billion) reflects economic losses associated with reduced operational capacity and a decline in transport demand, and JMD 8 billion (USD 0.050 billion) represents additional costs related to emergency response, debris clearance, temporary measures, and early recovery activities. Road infrastructure accounts for the largest portion of total impacts, representing approximately 72 percent of the sector total, with damage reported across all parishes. The most severely affected parishes in terms of road damage were Clarendon, Westmoreland, and St. Ann, reflecting the extensive fragility and exposure of the road network. Furthermore, St. James and Trelawny experienced the greatest impacts on ports and airports, consistent with their role as key tourism hubs heavily reliant on transport connectivity.

Road damage amounts to JMD 27.1 billion (USD 0.170 billion), representing more than 93 percent of total sectoral damage and reflecting the widespread impacts of Hurricane Melissa across the country.

Airport damage totals JMD 0.6 billion (USD 0.004 billion) and is entirely associated with Sangster International Airport, where moderate damage occurred to five gates, fencing, and selected equipment. Port-related damage is estimated at JMD 1.7 billion (USD 0.011 billion) and affected cargo and cruise ports in Montego Bay, the cruise port in Falmouth, and the yacht pier in Black River.

Total losses in the transport sector are estimated at JMD 10.5 billion (USD 0.066 billion) and are largely driven by the decline in passenger arrivals at Sangster International Airport in Montego Bay following Hurricane Melissa. As the country's busiest airport and the primary international gateway for tourism, Sangster International Airport accounts for the largest share of transport-related losses. Losses are assessed over a one-year period. However, the most significant impacts are concentrated in the months immediately following the hurricane, reflecting disruptions during the peak tourism season. Of the total estimated losses, approximately JMD 5.5 billion (USD 0.034 billion), equivalent to 52 percent, are projected to occur in 2025, with the remaining JMD 5 billion (USD 0.031 billion) expected in 2026.

Additional costs in the transport sector are estimated at approximately JMD 8 billion (USD 0.050 billion) and are mainly associated with emergency response and early recovery activities following Hurricane Melissa. These costs include road clearance, demolition and debris removal, temporary measures to restore connectivity, and preparedness actions undertaken prior to the event. The largest portion of additional costs, nearly 92 percent, is linked to road clearance and emergency works carried out by the National Works Agency (NWA).

- **Power**

Jamaica's power sector infrastructure suffered catastrophic and unprecedented destruction. The western parishes—St. Elizabeth, Westmoreland, St. James, Hanover, Trelawny, and Manchester—were the hardest hit. Following Hurricane Melissa, the immediate priority was emergency response and the restoration of essential electricity services.

At the peak of the crisis, over 532 thousand customers, approximately 77 percent of the total customer base, were without power. The effects on the sector were estimated at JMD 52.7 billion (USD 0.330 billion). Infrastructure damage amounted to JMD 38.6 billion (USD 0.242 billion), losses from undelivered electricity totaled JMD 9.7 billion (USD 0.061 billion), and additional costs were estimated at JMD 4.5 billion (USD 0.028 billion).

- **Water and Sanitation**

The intense rainfall, flash flooding, and prolonged power outages that occurred in the wake of Hurricane Melissa severely affected the physical integrity and functional performance of some water treatment plants, pipe networks, sewerage systems, and on-site sanitation infrastructure. These impacts occurred against an already vulnerable backdrop of aging assets, limited redundancy, and high exposure to hydrometeorological hazards.

The hurricane also generated immense quantities of diverse solid waste, such as vegetation debris, construction and demolition waste, and damaged personal property. This waste had accumulated and blocked essential infrastructure, posing a significant health and mobility hazard.

In the wake of Hurricane Melissa, the water and sanitation sector in Jamaica was severely impacted, with effects estimated to cost JMD 8.3 billion (USD 0.052 billion). St. James and Trelawny were the parishes that had the most damage, accounting for some 77 percent of the estimated JMD 2.2 billion (USD 0.014 billion) for physical damage to facilities that belong to NWC and private operators.

- **Telecommunications**

Hurricane Melissa caused severe damage to Jamaica's telecommunications sector, which is critical for disaster response and recovery. The storm destroyed infrastructure such as utility poles, towers, and transmission systems, reducing national connectivity to 30 percent immediately after the event. Restoration efforts have progressed, with Digicel and Flow reporting significant recovery of fixed and mobile networks, though challenges remain due to power outages and damaged assets. Broadcasting services were also heavily affected, leaving 20 percent of licensees non-operational and creating urgent needs for financial and psychosocial support.

The economic impact on the sector is estimated at JMD 20.4 billion (USD 0.128 billion), including JMD 8.4 billion (USD 0.053 billion) in infrastructure damage, JMD 11.6 billion (USD 0.073 billion) in service-related losses, and approximately JMD 0.3 billion (USD 0.002 billion) in additional recovery costs. Western parishes such as St. Elizabeth, Westmoreland, and St. James experienced the greatest disruption. These figures highlight the scale of the financial and operational challenges and underscore the importance of investing in resilient telecommunications infrastructure to support future disaster response and recovery.

- **Environment**

Overall, the total effects of Hurricane Melissa on the environmental sector are estimated at JMD 209 billion (USD 1.309 billion). Losses associated with the interruption and degradation of ecosystem services account for the largest share of impacts, totaling JMD 185 billion (USD 1.159 billion), while damage to environmental assets is estimated at approximately JMD 24 billion (USD 0.150 billion). The results are not disaggregated between public and private effects, as environmental assets and the ecosystem services they provide generate non-excludable benefits shared by society as a whole. In addition, available information allows for the identification of public and mixed ownership areas, but does not provide sufficient detail to distinguish areas under exclusively private ownership. Consistent with previous ECLAC DaLA environmental assessments, recovery and restoration investments are therefore assumed to be predominantly public in nature, particularly in the case of forests, mangroves, and protected areas, whose related policy, regulation, management, and long-term conservation fall under governmental responsibility, even when ecosystems are not managed publicly.

### Recommendations for a Resilient Recovery

The recommendations are framed with reference to the Sendai Framework for Disaster Risk Reduction 2015–2030 and are intended to directly address the structural and institutional vulnerabilities revealed by Hurricane Melissa.

For the purposes of this summary, the recommendations are organized along three complementary time horizons:

- Rehabilitation (0–12 months).
- Resilient Reconstruction (6 months–5 years).
- Building Long-Term Resilience (2–10 years).

## Impact of Hurricane Melissa: A Synthesis of the Drivers Behind Asymmetric Impacts

In recent years, the Government of Jamaica has made sustained progress in strengthening disaster risk management (DRM) governance and has established a relatively robust legal and policy framework at the regional level. Nevertheless, Hurricane Melissa revealed that these institutional arrangements

did not always translate into effective performance on the ground, exposing implementation gaps and structural vulnerabilities at the operational level.

Although Hurricane Melissa was an extremely high-intensity event, its impacts were not uniform. Rather, damages and losses were amplified in specific locations and sectors where pre-existing vulnerabilities overlapped.

The main characteristics observed include:

- Concentration of damage in roofs of housing and public facilities, with widespread failures linked to inadequate fastening and deterioration of corrugated galvanized steel ("zinc") roofing systems.
- Cascading failures triggered by vulnerabilities in the electricity infrastructure, whereby prolonged power outages disrupted water supply, health services, telecommunications, education, and commercial activities.
- Disruption of road and logistics networks due to debris, landslides, and drainage failures, constraining access and recovery operations.
- Uneven recovery capacity at the local level, where community-led efforts played a critical role, while formal institutional support remained limited.
- Severe impacts on ecosystems (forests, mangroves, and coastal ecosystems), with greater damage observed in areas where natural protective functions had already been degraded.

These impacts should not be interpreted as the result of a "natural disaster" alone, but rather as the outcome of long-accumulated institutional, infrastructure, and land-use challenges that were exposed by an extreme event.

## Main Recommendations

- **Rehabilitation Phase**

***Objective:*** Rapidly restore minimum living and economic functionality while laying the groundwork for reconstruction.

*(1) Accelerated Debris Management*

- Prioritize clearance of roads, schools, health facilities, and electricity and water supply corridors.
- Establish temporary debris collection and segregation sites (wood, metal, bulky debris).
- Mobilize private contractors and community organizations to support rapid debris removal.

*(2) Safe Self-Recovery (Roof Repairs)*

- Issue simplified, practical standards for safe roof repair.
- Distribute roof repair kits (materials and fasteners).
- Provide short-term technical training for local carpenters and roofers.
- Complement self-recovery with temporary or transitional housing options for households unable to return safely.

*(3) Restoration of Lifeline Services*

- Clearly prioritize electricity and road access as top recovery objectives.
- Provide temporary power supply to hospitals, schools, and water treatment facilities.
- Ensure availability of alternative communication systems.

*(4) Reactivation of Local Economies and Social Life*

- Support the early reopening of MSMEs, fisheries, and tourism-related activities.
- Implement short-term livelihood support measures, including cash-for-work programs.
- Provide psychosocial support services at the community level.

*(5) Preparation for Building Safety Assessments (BSA)*

- Clarify objectives and target building types for assessment.
- Establish the technical foundation needed to guide future reconstruction investment decisions.

- **Resilient Reconstruction**

***Objective:*** Implement risk-informed Build Forward Better (BFB) reconstruction to reduce future losses, strengthen institutional and system-wide resilience, and avoid the re-creation of pre-existing vulnerabilities.

Resilient reconstruction following Hurricane Melissa should be organized around four mutually reinforcing pillars, aligned with the Sendai Framework and the analytical findings of the DALA.

**A. Understanding disaster risk**

Resilient reconstruction must be grounded in a systematic understanding of why and how damage occurred during Hurricane Melissa.

A key priority is the implementation of forensic analysis of structural and systemic failures, focusing on:

- Roof failures in housing and public facilities, including fastening, detailing, and maintenance practices.
- Vulnerabilities in electricity transmission and distribution systems.
- Exposure, vulnerability, and criticality of schools, health facilities, roads, and drainage infrastructure.
- Risks arising from land-use patterns and settlement locations.
- Exposure of productive assets in agriculture and fisheries.

These analyses should explicitly examine gaps between existing design standards and their actual application and enforcement, particularly at the local level.

To operationalize this approach, temporary cross-sectoral forensic teams should be established at both national and parish levels, integrating damage data, hazard information, asset exposure, and vulnerability characteristics.

The findings should directly inform revisions of standards, risk information systems, land-use decisions, and investment prioritization.

Strengthening information management systems (IMS) during reconstruction—such as a national disaster infrastructure registry and geo-referenced asset databases—is essential to sustain evidence-based decision-making throughout recovery and reconstruction.

**B. Strengthening disaster risk governance to manage disaster risk.**

Effective resilient reconstruction requires a dual-level governance system, combining strong central coordination with empowered local implementation.

- Central government should provide strategic direction, coordinate reconstruction programs, mobilize financing, review and activate standards, and ensure transparency, quality control, and monitoring.
- Parish governments should lead prioritization and implementation of reconstruction activities on the ground, including public facilities, local infrastructure, land-use adjustments, and livelihood reactivation.

To align these roles, Jamaica should develop a Strategic Framework for Resilient Reconstruction, building on the National DRM Policy 2020–2040 and existing recovery frameworks.

This framework should clarify institutional roles, define short-, medium-, and long-term priorities, and establish a light but systematic Monitoring, Evaluation, and Learning (MEL) mechanism.

In parallel, participatory reconstruction planning should be institutionalized through parish-level workshops that engage residents, farmers, fishers, MSMEs, and social service providers.

Such processes enhance legitimacy, improve prioritization, and strengthen social cohesion while supporting risk-informed land-use and community redevelopment.

**C. Investing in disaster risk reduction for resilience.**

Resilient reconstruction investments should focus on strengthening and upgrading damaged systems, rather than simply restoring them to pre-disaster conditions.

A Resilient Reconstruction Investment Portfolio (5-year horizon) should be developed and integrated into national and parish reconstruction programs, prioritizing cost-effective, risk-reducing interventions, including:

- Housing: roof retrofitting, improved fastening systems, and wind-resistant detailing.
- Electricity: strengthening pole foundations, selective replacement in high-risk areas, and deployment of distributed energy solutions.
- Water, health, and education: integrated lifeline resilience with backup power and continuity of operations.
- Transport: drainage improvements, slope stabilization, and targeted retrofitting of vulnerable road sections.
- Agriculture and fisheries: restoration and protection of productive assets, safe mooring facilities, and access infrastructure.

Public works programs should maximize the use of local materials, skills, and MSMEs, and where feasible, incorporate community-based labor arrangements to support livelihoods and accelerate implementation.

**D. Enhancing disaster preparedness for effective response and to "Build Forward Better" in recovery, rehabilitation, and reconstruction.**

Physical reconstruction alone is insufficient to prevent future system-wide failures. Hurricane Melissa demonstrated that a lack of redundancy and preparedness can trigger cascading impacts even where structural damage is limited.

Key priorities during the resilient reconstruction period include:

- Strengthening emergency response and service continuity planning for critical facilities (hospitals, schools, water treatment plants, pumping stations).
- Increasing redundancy in electricity, telecommunications, and water systems, including phased introduction of distributed energy solutions.
- Modernizing early warning systems by shifting from hazard-based alerts toward Impact-Based Early Warning Systems (IB-EWS).
- Developing technical and operational frameworks that link impact forecasts to predefined early actions at national and local levels.
- Investing in multi-hazard shelters at strategic locations to reduce reliance on schools and minimize disruption to education services.

Enhancing preparedness and response capacity is a core component of Build Forward Better, ensuring that reconstructed systems can continue functioning during future high-intensity events.

- **Building Long-Term Resilience**

*Objective:* Institutionalize disaster and climate risk reduction as a core component of Jamaica's long-term development pathway, moving from reactive response to predictive, preventive, and risk-informed governance and investment.

Long-term resilience building should be structured around four interrelated pillars, ensuring continuity from resilient reconstruction to nationwide resilience.

**A. Understanding disaster risk**

Building long-term resilience requires consolidating the empirical insights generated during Hurricane Melissa and the resilient reconstruction phase into a national, multi-hazard understanding of risk.

Priority actions include:

- Scaling up post-disaster forensic findings into a national multi-hazard risk information system, integrating data on hazards, exposure, vulnerability, and observed impacts.
- Establishing a National Risk Information Platform that incorporates:
  - Structural vulnerability of buildings (including roof fragility).
  - Exposure and criticality of road networks and electricity grids.
  - Resilience diagnostics of water systems, schools, and health facilities.
  - Coastal erosion, flooding, storm surge, and landslide risk.
  - Exposure of agricultural and fisheries assets.

This platform should serve as the evidence base for land-use planning, infrastructure design, public investment decisions, and regulatory enforcement, shifting decision-making from hazard-based to impact- and risk-based approaches.

**B. Strengthening disaster risk governance to manage disaster risk**

Sustaining long-term resilience requires strengthening institutional arrangements at both national and local levels, with clearly defined roles and coordination mechanisms.

Key priorities include:

- Clarifying and reinforcing the national coordination mandates of ODPEM and other core DRM institutions, supported by formal inter-agency protocols.
- Strengthening the operational and technical capacity of Municipal Corporations and Parish Disaster Coordinators, particularly in risk-informed land-use planning, recovery planning, and emergency management.
- Institutionalizing mechanisms for community participation, volunteer mobilization, and inclusion of women, youth, and persons with disabilities.
- Strengthening the implementation and enforcement of building codes and land-use regulations through improved inspection capacity and streamlined administrative processes.

These governance reforms are essential to ensure that risk information is translated into enforceable standards and effective action on the ground.

**C. Investing in disaster risk reduction for resilience.**

Long-term resilience investments (5–10 years) should systematically address the structural vulnerabilities revealed by Hurricane Melissa at scale.

Priority investment areas include:

- Nationwide roof retrofitting and structural strengthening programs.
- Hardening of critical infrastructure, including power, water, transport, and telecommunications.
- Redesign and upgrading of vulnerable road sections based on modern climate-resilient engineering standards.
- Redundancy improvements in electricity and water systems.
- Protection and climate-proofing of productive assets in agriculture and fisheries.

Investment prioritization should be risk-based, using the National Risk Information Platform to target assets and areas with the highest exposure and vulnerability.

Financing should combine domestic resources with climate finance (e.g., GCF, Adaptation Fund), recognizing the dual DRR and climate-adaptation benefits of these investments.

**D. Enhancing disaster preparedness for effective response and to "Build Forward Better" in recovery, rehabilitation, and reconstruction.**

Long-term resilience depends not only on stronger assets but also on stronger preparedness and operational continuity.

Key actions include:

- Integrating business continuity planning (BCP) across critical services and lifeline sectors.
- Institutionalizing Impact-Based Early Warning Systems (IB-EWS) linked to predefined early actions at national and local levels.

- Strengthening preparedness for high-risk livelihoods, particularly agriculture and fisheries, through anticipatory action mechanisms.
- Enhancing evacuation planning, shelter systems, and community-level preparedness training.

Together, these measures ensure that Jamaica's social and economic systems can continue functioning during future disasters, reducing losses and accelerating recovery.

# Description of the **Event and Affected Population**




# 1 DESCRIPTION OF THE EVENT

# Chapter I - Description of the event

Hurricane Melissa was a destructive Category 5 Atlantic hurricane that impacted Jamaica, Haiti, Cuba, and The Bahamas, in late October and early November 2025. It was the thirteenth storm, fifth hurricane, fourth major hurricane, and third Category 5 hurricane of the 2025 Atlantic hurricane season.

Jamaica was impacted by hurricane Melissa from midday through the early hours of the night on October 28. The passage of Hurricane Melissa on the island resulted in 45 confirmed deaths and causes significant damages to the basic infrastructure mainly in the western part of the Island. These effects were primary caused by hurricane force winds, storm surges, flooding and landslides. The specific areas that suffered the greatest damage to property and infrastructure were the western Parishes of St. Elizabeth, Westmoreland, Hanover, St. James, Trelawny and St. Ann which is north central in location.

According to observations made during the field mission conducted between November 24 and 28, among the areas visited, the community of Black River in St. Elizabeth parish, in the southwest of the country, was where the most catastrophic impacts were evident affecting the population, housing, basic services, and productive infrastructure.

## A. Historical events in Jamaica

Historically, various events such as droughts, floods, storms, hurricanes, and epidemics have caused disasters and emergencies in Jamaica. Among them, hydro – climatic events such as storms have been the most frequent, accounting for 23 of the 38 recorded events since 1960.

Hurricane Gilbert, which hit Jamaica in 1988, is the deadliest storm in the country´s history, causing the death of 49 people. Additionally, it is the costliest disaster, with damages and losses estimated at 2023 USD 2.5 billion. However, the disaster with the highest number of fatalities in Jamaica was the flooding of 1986, which resulted in 54 deaths.

**Table I 1:** Historical events in Jamaica, total deaths, and total damage (In thousands of 2024 USD)

| Type | Frequency | Total deaths | Damage |
|---|---|---|---|
| *Drought* | 3 | 0 | 26,766 |
| *Epidemic* | 3 | 3 | 0 |
| *Flood* | 9 | 141 | 403,143 |
| *Storm* | 23 | 144 | 5,112,662 |
| ***Total*** | **38** | **288** | **5,542,571** |

*Source: EMDAT, 2025.*

Specifically, regarding disasters caused by storms, including hurricanes, Jamaica was affected by 23 such events between 1963 and 2017 (Table I 2). Hurricane Gilbert, which occurred in 1988, had the greatest impact on the population, resulting in 49 deaths. It was followed by Hurricane Ivan (2004) and Tropical Storm Nicole (2010), each of which caused 15 fatalities. Additionally, Hurricane Gustav (2008) and Hurricane Flora (1963) resulted in 12 and 11 deaths, respectively.

In terms of total affected population, Hurricane Gilbert (1988), Hurricane Ivan (2004), Hurricane Sandy (2012), and Hurricane Matthew (2016) were the most impactful events during the 1963-2017 period, with a combined total of 1.5 million people affected. Regarding economic damage, Hurricanes Gilber

(1988), Ivan (2004), Charley (2004), and Dean (2007) accounted for 88 percent of the total damage recorded during this period.

**Table I 2:** Historical storms in Jamaica, total deaths, total affected population, and total damage (In thousands of 2024 USD)

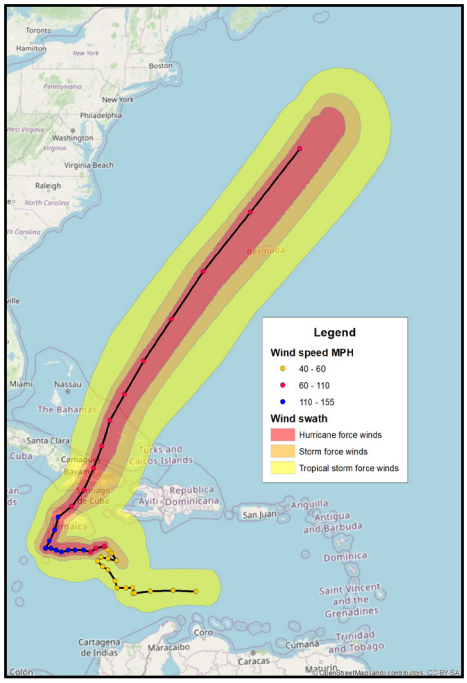
| No. | Year | Event Name | Total Deaths | Total Affected Population | Damage |
|---|---|---|---|---|---|
| 1 | 1963 | Hurricane Flora | 11 | | 110,134 |
| 2 | 1973 | Hurricane Gilda | 6 | 2,510 | 11,205 |
| 3 | 1980 | Hurricane Allen | 6 | 30,009 | 227,282 |
| 4 | 1985 | Hurricane Kate | 7 | 300 | 14,148 |
| 5 | 1988 | Hurricane Gilbert | 49 | 810,000 | 2,474,708 |
| 6 | 1994 | Tropical Storm Gordon | 4 | | 1,974 |
| 7 | 1996 | Hurricane Marco | | 800 | 5,597 |
| 8 | 2001 | Hurricane Michelle | 1 | 200 | 91,709 |
| 9 | 2002 | Hurricane Lili | 4 | 1,500 | 49 |
| 10 | 2002 | Hurricane Isidore | | | 1,627 |
| 11 | 2004 | Hurricane Charley | 1 | 126 | 464,818 |
| 12 | 2004 | Hurricane Ivan | 15 | 350,000 | 921,890 |
| 13 | 2005 | Hurricane “Dennis” | 1 | 8,000 | 44,957 |
| 14 | 2005 | Hurricane Emily | 4 | 2,296 | 1,499 |
| 15 | 2005 | Hurricane “Wilma” | 1 | 100 | 5,245 |
| 16 | 2007 | Hurricane Dean | 4 | 33,188 | 423,437 |
| 17 | 2007 | Hurricane Noel | 1 | | |
| 18 | 2008 | Tropical Storm “Fay” | 1 | | |
| 19 | 2008 | Hurricane “Gustav” | 12 | 4,000 | 89,981 |
| 20 | 2010 | Tropical storm ‘Nicole’ | 15 | 2,506 | 201,317 |
| 21 | 2012 | Hurricane Sandy | 1 | 215,850 | 21,085 |
| 22 | 2016 | Hurricane ‘Matthew’ | | 125,000 | |
| 23 | 2017 | | | 5,000 | |
| **Total** | | | **144** | **1,591,385** | **5,112,662** |

*Source: EMDAT, 2025.*

## B. Hurricane Melissa in the Caribbean

Based on the reports and advisories of the National Hurricane Centre (NHC), Hurricane Melissa was the thirteenth named storm, fifth hurricane, fourth major hurricane, and third Category 5 hurricane of the 2025 Atlantic hurricane season (see Map I 1).

**Map I 1:** Path of Hurricane Melissa across the Atlantic




*Source: DaLA team using data of the National Hurricane Center (NHC), 2025.*

Between October 16 and 21, the NHC monitored a tropical wave that moved westward across the Windward Islands into the Caribbean Sea. As the system slowed, it consolidated into a well-defined circulation, developing a distinct center and an organized eye, accompanied by deep, persistent convection. Weak steering currents between surrounding high – pressure ridges caused Hurricane Melissa to drift slowly and erratically. Persistent westerly wind shear from an upper – level trough initially limited intensification, but as the trough moved away, the storm ´s structure improved, and it began to move gradually northward by October 25.

Very favorable environmental conditions, including sea surface temperatures of 30 – 31° C, high ocean heat content, decreasing wind shear, and elevated mid-level humidity, allowed Hurricane Melissa to rapidly intensify after becoming a hurricane on October 25. Based on the bulletins (Tropical Storm Melissa Advisory Number 17 and Hurricane Melissa Advisory Number 20) issued by NHC between October 25 and 26, the system significantly increased its wind speed within 18 hours and reached Category 5 status on October 27 without undergoing an eyewall replacement cycle, an uncommon behavior for such an intense storm. Melissa peaked with sustained winds of 185 mph (295 km/h) and a central pressure of 892 mbar near the coast of Jamaica, making landfall near New Hope in Westmoreland Parish at maximum intensity before weakening over the island ´s mountainous terrain.

After crossing Jamaica, Melissa emerged as a Category 4 hurricane and continued toward Cuba, making landfall east of Chivirico on October 29 as a Category 3. The rugged terrain further weakened the system, which later re-emerged into the Atlantic and briefly fluctuated between Category 1 and 2 strengths while accelerating northeastward across the Bahamas and toward Bermuda. By October 31, Melissa had completed its transition into a powerful extratropical cyclone. Notably, the hurricane produced a record dropsonde-measured wind gust of 252 mph (406 km/h), the highest ever documented.

## C. Hurricane Melissa in Jamaica

The Meteorological (MET) Service of Jamaica began monitoring when Hurricane Melissa reached Tropical Storm status on October 20. Since that date, 58 advisory bulletins and alerts have been issued. This information, along with guidance from the Office of Disaster and Preparedness and Emergency Management (ODPEM), formed the basis for the Jamaican Government´s decision-making regarding the various declarations issued for emergency management. Below is a summary of the key points.
The MET Service issued the first Hurricane Alert on October 24 at 08:00 pm local time, through Bulletin No. 26, stating:

*"HURRICANE WARNING NOW IN EFFECT FOR JAMAICA WITH TROPICAL STORM MELISSA EXPECTED TO RAPIDLY INTENSIFY.*

*A HURRICANE WARNING is now in effect for Jamaica, as Tropical Storm Melissa is expected to rapidly strengthen while moving closer to the island.*

*At 7:00 p.m, the center of Tropical Storm Melissa was located... about 360 kilometers (225 miles) south west of Port – au – Prince, Haiti, and about 254 kilometers (159 miles) southeast of Morat Point, and 310 kilometers (190 miles) southeast of Kingston, Jamaica.*

*...On the forecast track, the center of Melissa is expected to move from south to north over central Jamaica early next week and over easter Cuba by the middle of the week.*

*Tropical Storm Melissa is expected to be a major rainfall producer over Jamaica. Rainfall amounts reaching 300 to 400 millimeters (12 to 16 inches) are forecast for the island over the weekend, starting in eastern parishes and gradually spreading westward across the island during the course of next week. Locally higher amounts are possible, and residents should take note..."*

Based on this alert, on October 24, the Government issued the Disaster Risk Management Act, declaring the whole of Jamaica as a threatened area for Tropical Storm Melissa. Moreover, on October 25, ODPEM activated the National Emergency Operation Center (NEOC) at high alert as Hurricane Melissa rapidly intensified into a major hurricane. The Parish Emergency Operations Centers and all Emergency Shelters have been activated as well.

In the following days, Melissa, already classified as a major hurricane, continued its west trajectory across the Caribbean Sea, reaching Category 4. Therefore, on October 26, The MET Service issued Bulletin No. 35, stating:

*"MELISSA NOW A CATEGORY 4 HURRICANE... HURRICANE WARNING REMAINS IN EFFECT FOR JAMAICA.*

*A HURRICANE WARNING remains in effect for Jamaica, as Melissa has further strengthened into a Category 4 hurricane on the Saffir – Simpson Hurricane Wind Scale.*

*At 04: a.am., the center of Hurricane Melissa was located... 178 kilometers (111 miles) south-southeast of Morant Point, or 195 kilometers (120 miles) south – southeast of Kingston, Jamaica.*

*Melissa is moving slowly toward the west at nearly 7 km/h (5mph). A slow westward motion is expected today, followed by a turn to the north and northeast on Monday or Tuesday. On the forecast track, the center of Melissa is expected to move closer to Jamaica during the weekend and over the island on Tuesday..."*

Immediately, given the threat conditions posed by Category 4 Hurricane Melissa, on October 26, the Government issued the evacuation order, establishing the following:

*"...1. This Order may be cited as the Disaster Risk Management (Hurricane Melissa) Evacuation Order, 2025, and shall remain in force during so long as the Disaster Risk Management (Hurricane Melissa) Evacuation Order, 2025, and shall remain in force during so long as the Disaster Risk Management (Declaration of Threatened Area) (Tropical Storm Melissa) Order, 2025 remains in force.*

*2. All persons are required to evacuate the following areas with immediate effect: a) Port Royal, Kingston; b) Portland Cottage, Clarendon; c) Rocky Point, Clarendon; d) Old Harbour Bay, St. Catherine; e) Taylor, Bull Bay, St. Andrew; f) New Haven, St. Andrew; g) Riverton City, St. Andrew..."*

On October 27 at 5:00 am local time, conditions became favorable for Melissa to strengthen and reach Category 5. MET Service reported this in its Bulletin No. 42, stating:

*"MELISSA NOW A CATEGORY 5 HURRICANE AND EXPECTED TO TURN ARDS JAMAICA TOTAY... HURRICANE WARNING REMAINS IN EFFECT.*

*A HURRICANE WARNING remains in effect for Jamaica, as Melissa becomes a powerful Category 5 Hurricane south of the island.*

*At 4:00 a.m. the center of Hurricane Melissa was located near latitude 16.4 degrees North, longitude 77.8 degrees West. This is 205 kilometers (130 miles) south – southwest of Kingston, or 167 kilometers (104 miles) south of Treasure Beach in St. Elizabeth, Jamaica..."*

In the afternoon of October 27 at 05:00 p.m. local time, Category 5 Hurricane Melissa shifted from east to northwest and began its trajectory toward Jamaica. The MET Service issued Bulletin No. 46, stating:

*"POWERFUL CATEGORY 5 HURRICANE MELISSA BEGINS TO TURN TOWARD JAMAICA ... HURRICANE WARNING STILL IN EFFECT*

*A HURRICANE WARNING remains in effect for Jamaica, as powerful Hurricane Melissa has begun to turn toward Jamaica while moving over the Caribbean Sea south of the island.*

*At 04:00 p.m the center of Hurricane Melissa was located...225 kilometers (140 miles) southwest of Kingston, or 178 kilometers (111 miles) south of Negril Point, Jamaica.*

*Melissa is moving toward the northwest near 6 km/h (3 mph). A slow turn toward the north is expected this evening, followed by a turn toward the northeast and a faster forward speed on Tuesday..."*

Starting October 27, conditions began to worsen, and the trajectory of Category 5 Hurricane Melissa was taking a direct course towards Jamaica. By midday on October 28, the MET Service issued Bulletin 52, stating:

*"CATEGORY 5 HURRICANE MELISSA MAKES LANDFALL.*

*A HURRICANE WARNING remains in effect for Jamaica as catastrophic Category 5 hurricane Melissa has made landfall on the island.*

*This means that the center of the hurricane has intersected the coastline.*

*At 12:00 noon, the center of Hurricane Melissa made landfall on the southwestern coast of Jamaica near New Hope, Westmorland. This is near latitude 18.1 degrees North, longitude 78.0 degrees West.*

*Melissa is moving toward the north – northeast at 15 km/h (9mph).*

*Maximum sustained winds are near 295 km/h (185 mph) with higher gusts, making Melissa a major Category 5 hurricane...*

*Hurricane – force winds extend outward up to 45 km (30 miles) from the center, and tropical -storm force winds extend outward up to 315 km (195 miles)..."*

Over the following six hours, Hurricane Melissa moved across the western region of Jamaica, directly impacting the Parishes located along its path (Map 2). The MET Service used Bulletin No. 53 at 2:00 pm, stating:

*"EXTREMELY DANGEROUS CATEGORY 5 HURRICANE MELISSA CROSSING WESTERN JAMAICA... HURRICANE WARNING REMAINS IN EFFECT FOR THE ISLAND.*

*A HURRICANE WARNING remains in effect for Jamaica near latitude 18.2 degrees North, longitude 78.0 degrees West. This is across Jamaica´s western parishes.*

*Melissa is moving toward the north – northeast at nearly 13 km/h (8mph). A turn toward the northeast with an increase in forward speed is expected later today, followed by a faster northeastward motion on Wednesday and Thursday. On the forecast track, the core of Melissa will cross western Jamaica during the next few hours and then move back into the Caribbean Sea...*

*Hurricane force winds extend outward up to 45 km (30 miles) from the center and tropical – storm – force winds extend outward up to 315 km (195 miles).*

*Doppler radar and satellite images show that bands of heavy rainfall associated with Hurricane Melissa have spread across Jamaica. Data obtained from the weather station network indicate amounts exceeding 250 mm (10 inches) in parts of southern parishes.*

*Hurricane Melissa is expected to produce rainfall amounts reaching 350-750 mm (15 – 30 inches) over parts of Jamaica in the next couple of days, especially over central parishes, with higher amounts over hilly terrain. Catastrophic flash floods and landslides are likely.*

*Catastrophic hurricane – force winds are spreading over Jamaica within the eyewall of Melissa. This will track northeastward across the island from St. Elizabeth to Trelawny..."*

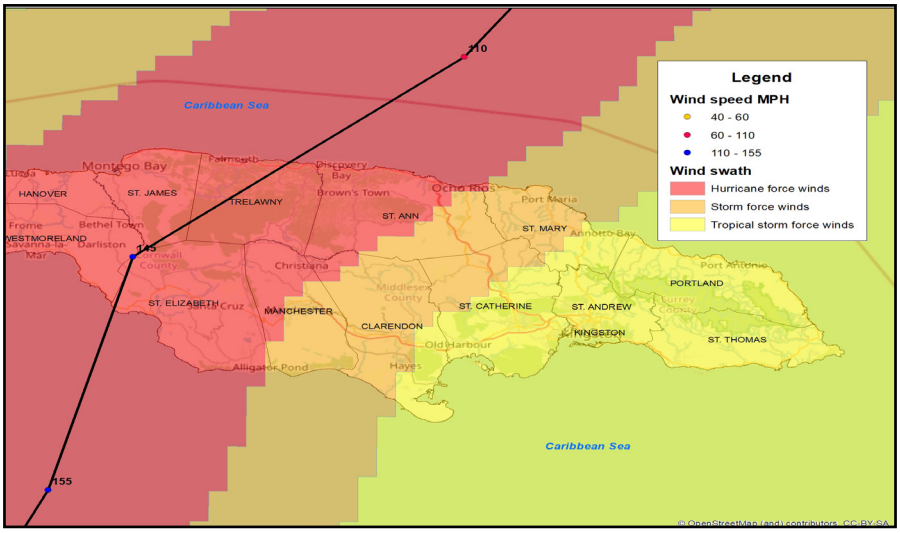
At 4:00 p.m. on October 28, the MET Service issued Bulletin No. 54, in which it maintains the alert and reports that Hurricane Melissa, now a Category 4, has emerged off the northern coast of western Jamaica, with its center located just off the country´s northwestern shoreline. Subsequently, at 7:00 p. m., through Bulletin No. 55, the MET Service reported that Hurricane Melissa is moving away from Jamaica toward eastern Cuba, the alert remains in effect.

On October 29, in Bulletin No.57, a Tropical Storm Alert was issued for Jamaica. Later that same day, at 8:00 a.m., the alert was discontinued as the system was moving away from the island. However, it was reported that events such as flash flooding were being monitored in the northern, southwestern, and south-central parishes due to increased rainfall, which could lead to localized flooding and landslides, especially in low-lying and flood-prone areas.

In keeping with the Disaster Risk Management Act, on October 29, the Government formally declared the entire island a disaster area. They also issued mandatory evacuation orders for specified high- risk communities in the immediate lead-up to the landfall of the hurricane.

Afterwards, on October 30, following updated guidance from the MET Service and ODPEM, the Government issued the national "all clear."

**Map I 2:** Path of Hurricane Melissa across Jamaica




*Source: DaLA team using data from the National Hurricane Center (NHC), 2025.*

## D. Affected Areas

The passage of Category 5 Hurricane Melissa over Jamaica affected the entire island, but its greatest impact was felt in the western region. The parishes of St. Elizabeth, Westmoreland, Hanover, St. James, Trelawny, and St. Ann bore the brunt of the disaster, with most impacts concentrated on the population, public service infrastructure, productive sectors, and areas of environmental and cultural significance. The damage was associated with the events triggered by the hurricane, primarily related to hurricane-force winds, flooding, storm surge, and landslides.

With respect to wind impacts, the island experienced hurricane-force intensities in areas near the hurricane´s path, primarily affecting the western parishes. According to the MET Service, between 3:00 a.m. and 11:00 p.m., local time, on October 28, the highest recorded wind speed reached 211 km/h (131 mph) at New Hope Primary station in Westmoreland parish. Likewise, maximum wind speeds range from 211. (131 mph) to 157.8 km/h (98 mph) were recorded at stations in St. Elizabeth, Westmoreland, and St. Ann. Meanwhile, in the parishes of Manchester, Clarendon, and St. Mary, peak wind speeds ranged between 119.1 (74 mph) and 106.3 km/h (66 mph). Notably, in the capital city Kingston, the highest recorded wind speed was 101.5 km/h (63 mph) at the University of the West Indies (UWI) station.

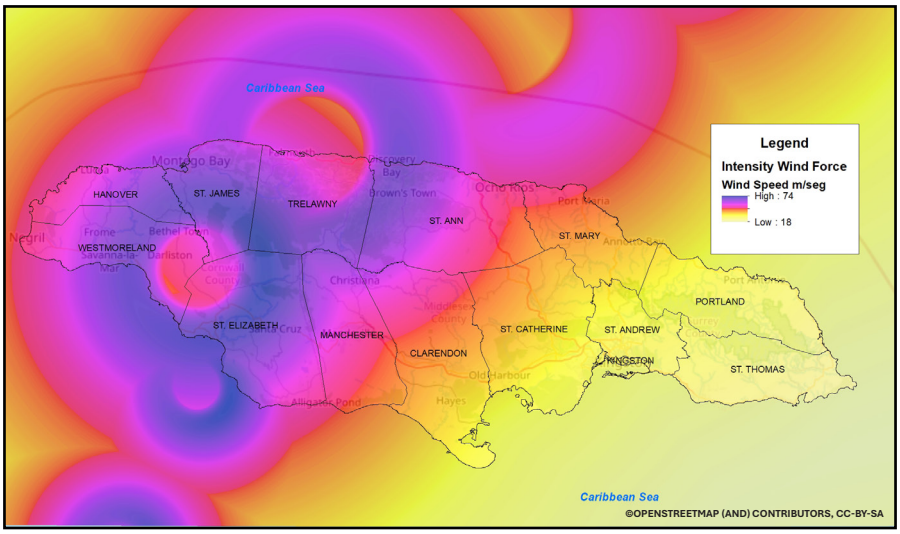
Regarding the average wind speed measurements recorded throughout October 28, the same pattern was observed: the stations located in the western parishes, St. Elizabeth, Westmoreland, and Trelawny, through which Hurricane Melissa passed, reported the highest intensities, ranging from 106.3 (66 mph) to 103.2 km/h (64 mph).

One of the most destructive events caused by intense winds is storm surge. In the case of hurricane Melissa, this phenomenon was mainly observed along the southwestern coast of St. Elizabeth, the southern and southeastern coasts of Westmoreland, and the northern shoreline of Hanover, St. James, Trelawny, and St. Ann.

According to alerts issued by the MET Service, a storm surge accompanied by large and destructive waves was forecast along the southern coast of the country, from St. Elizabeth and St. Catherine, with expected heights ranging from 9 to 13 feet above ground level. On the northwestern coast, storm surge levels were estimated to range between 1 and 3 feet above ground level.

To geographically illustrate these events, the following Map I 3 presents a wind intensity model of Hurricane Mellissa over the island based on G. Holand (2008) model, generated by applying CLIMADA. It shows that the central areas of the parishes of St. Elizabeth, Westmoreland, and St. James, as well as the southeastern zone of Hanover and the southwestern part of Trelawny, experienced the highest wind intensities.

**Map I 3:** Hurricane Melissa's intensity force winds model across Jamaica



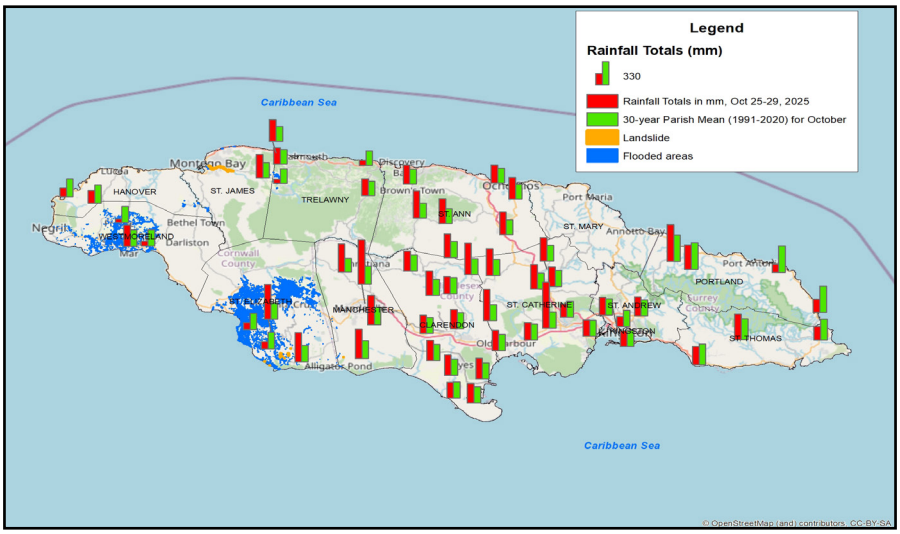

*Source: DaLA team using data from the International Best Track Archive for Climate Stewardship - NOAA, 2025.*

Another event associated with Hurricane Melissa that caused significant impacts was the high rainfall amounts recorded in Jamaica during the days the system affected the island. According to data from the MET Service, between October 25 and 29, 41 out of 57 weather stations across the parishes registered five-day accumulated rainfall totals that exceeded the expected monthly average for October (This average was calculated based on a 30-year climatological period 1991-2020 specific to each parish instead of the station mean due to the station being in existence less than 30 years). Map I 4 shows the location of the weather stations, along with bar charts comparing the accumulated rainfall recorded during the five days of hurricane Melissa´s influence (red bar) with the expected average rainfall for the month of October (green bar).

Based on these data, the highest levels of accumulated rainfall recorded between October 25 and 29 ranged from 500 to 668 mm. These values were observed at weather stations located in the parishes of St. Catherine (668.2 mm), Manchester (647 mm and 631.8 mm), Portland (536.2 mm), and St. Elizabeth (508.25 mm). Meanwhile, stations in the parishes of St. Mary (409.85 mm), St. Ann (397.73 mm), St. Thomas (369.4 mm), St. James (339 mm), and Westmoreland (310.82 mm) recorded maximum accumulated rainfall levels ranging between 300 and 410 mm.

As a result of the excessive rainfall during this period, flooding occurred in various areas along river flood plains, as well as in low-lying and flood-prone zones. For example, as shown in Map 4, extensive areas in the south -central part of St. Elizabeth parish, along the Broad and Black River valleys, and in Westmoreland, within the Cabarita River basin, experienced flooding. Additionally, in steep and canyon-like terrain, landslides were reported.

**Map I 4:** Rainfall totals October 25-29, 2025, flooded area and landslides in Jamaica, Hurricane Melissa




*Source: DaLA team using data from the Meteorological Service of Jamaica (Weather Stations: Rainfall 25-29 October, 30 years Parish Mean for October) and Programme of the European Union Copernicus – Emergency Management Flooded areas, landslides), 2025.*

Based on the above, the following section presents satellite images and aerial photographs taken before and after the event in various affected areas within the parishes of St. Elizabeth, Westmoreland, Hanover, and St. James.

In St. Elizabeth, one of the most heavily affected communities was Black River. The impacts on the population and infrastructure were catastrophic, causing extensive destruction to homes, businesses, public services, infrastructure, and the road network. The town was struck by hurricane – force winds, storm surge, and flooding (see Map I 5).

**Map I 5:** Affected areas Black River - St. Elizabeth

a) Vantor Images: December 28, 2024



b) NOAA Imagery: October 31, 2025



*Source: DaLA team using data from a) Vantor Imagery, 2024; b) NOAA Hurricane Melissa Imagery, 2025.*

Savanna la Mar is another town that suffered significant damage from Hurricane Melissa. Located in the southern part of Westmoreland parish, the town experienced storm surge along the coast and hurricane-force winds. In addition, residents interviewed during the field mission conducted between November 24 and 28 reported heavy rainfall, which caused overflows and localized flooding (see Map I 6).

**Map I 6:** Affected areas, the western part of Savanna la Mar – Westmoreland

a) Vantor Images: April 2, 2025



b) NOAA Imagery: November 31, 2025



*Source: DaLA team using data from a) Vantor Imagery, 2025; b) NOAA Hurricane Melissa Imagery, 2025.*

In the northern part of the country, in Trelawny parish, significant damage was also reported. For example, in Falmouth, hurricane – force winds and storm surge impacted the northern coastline, affecting areas of tourist interest such as the city´s cruise ship terminal (see Map I 7).

**Map I 7:** Affected areas, western north of Falmouth – Trelawny

a) Vantor Images: October 21, 2021



b) NOAA Imagery: November 31, 2025



*Source: DaLA team using data from a) Vantor Imagery, 2021; b) NOAA Hurricane Melissa Imagery, 2025.*

In the mountainous areas of Montego Bay, in Sain James parish, heavy rainfall combined with the topography along the Montego River, also known as South Gully, resulted in the formation of landslides and powerful torrents that carry large amounts of debris and vegetation. This led to the destruction of areas surrounding the canyon, like riverbeds (see Map I 8).

**Map I 8:** Affected areas Montego Bay (South Gully) – St. James

a) Vantor Images: September 2, 2025



b) NOAA Imagery: November 31, 2025



*Source: DaLA team using data from a) Vantor Imagery, 2021; b) NOAA Hurricane Melissa Imagery, 2025.*

Box I 1 presents the findings of the Global Rapid Post-Disaster Damage Estimation (GRADE) conducted following Hurricane Melissa. Developed through a collaborative effort between the World Bank and the IDB, the assessment highlights the distribution of these impacts across key sectors and parishes

**Box I 1:** Global Rapid Post-Disaster Damage Estimation (GRADE)

The Global Rapid Post-Disaster Damage Estimation (GRADE) estimated the damage to physical assets caused by Hurricane Melissa in Jamaica as USD 8.8 billion. The GRADE was completed by the World Bank, in collaboration with IDB, and was published around 4 weeks after Melissa made landfall in Jamaica (World Bank, 2025). GRADE employs a remote rapid methodology that combines multiple techniques, including catastrophe modelling and calibration and validation with historical and reported damage data from the ground from multiple sources, including government, humanitarian agencies, and social media. Damage estimations are provided by asset classes (residential, non-residential, infrastructure, and agriculture) and by parish (see Table I 3). The DALA team had early sight of the GRADE findings, and data sources and modelling outputs were shared between teams to support the DALA process.

**Table I 3:** GRADE damage estimation results for Hurricane Melissa in Jamaica

| *Parish* | Total Residential Damage incl. Contents (USD mn) | Total Non-Residential Damage incl. Contents (USD mn) | Total Infrastructure Damage (USD mn) | Total Agriculture Damage (USD mn) | Total Damage (USD mn) |
|---|---|---|---|---|---|
| *St. Elizabeth* | 997.2 | 389.5 | 763.6 | 135.7 | 2,286.0 |
| *St. James* | 704.2 | 506.1 | 587.0 | 24.8 | 1,822.1 |
| *Westmoreland* | 690.9 | 220.0 | 434.0 | 64.2 | 1,409.1 |
| *Trelawny* | 266.8 | 154.4 | 296.5 | 29.0 | 746.8 |
| *Manchester* | 305.4 | 102.4 | 252.9 | 28.4 | 689.1 |
| *St. Ann* | 221.9 | 155.0 | 154.8 | 20.4 | 552.1 |
| *Hanover* | 158.1 | 66.7 | 141.8 | 20.1 | 386.7 |
| *Clarendon* | 133.1 | 54.2 | 112.0 | 19.3 | 318.6 |
| *St. Catherine* | 93.2 | 47.8 | 91.4 | 22.3 | 254.8 |
| *St. Andrew* | 52.5 | 53.8 | 30.6 | 2.7 | 139.5 |
| *St. Mary* | 30.6 | 11.0 | 26.9 | 15.5 | 84.1 |
| *Portland* | 13.1 | 4.6 | 11.7 | 2.2 | 31.7 |
| *St. Thomas* | 6.8 | 2.1 | 6.3 | 4.3 | 19.5 |
| *Kingston* | 2.6 | 4.4 | 7.0 | 0.0 | 14.0 |
| ***Total*** | **3,676.4** | **1,772.2** | **2,916.4** | **389.1** | **8,754.2** |

*Source: World Bank. (2025). Global Rapid Post-Disaster Damage Estimation Report: Hurricane Melissa 2025 Jamaica. Available at: https://www.gfdrr.org/en/JamaicaGRADE*



# 2 AFFECTED POPULATION

# Chapter II - Affected Population

This chapter presents an overview of the effects of Hurricane Melissa on the population of Jamaica, with an emphasis on the description and quantification of the affected population. Based on the Handbook for Disaster Assessment (ECLAC, 2014), the affected population consists of:

- Primary affected population: People affected directly by the disaster, that is, those who died, were injured or became ill, were disabled (primary trauma victims), were displaced and living in shelters, or suffered material losses as a direct and immediate consequence of the disaster.
- Secondary affected population: People who suffered indirect or secondary effects of the disaster, including deficiencies in the provision of public services, trade, employment, or education, as well as isolation.

This overview will be structured into four interrelated components. The first section outlines the socioeconomic conditions of the population of Jamaica, establishing the baseline context for understanding differential vulnerabilities. The second section analyses the direct effects of the hurricane on the population, detailing the primary impacts documented during and immediately after the event. The third section describes the secondary affected population, and the final section describes the measures undertaken by the Government of Jamaica in the emergency response and relief phase, including an estimate of the additional costs incurred in accordance with the DaLA methodology (ECLAC, 2014).

Overall, the effects of Hurricane Melissa on the population of Jamaica were substantial, given the impacts in the southwestern and western parishes of the country. Based on official reports from government entities responsible for disaster preparedness, emergency coordination and health surveillance, there were 45 confirmed deaths and 13 people still reported as missing as of December 4, 2025. During this same time period, health authorities also reported approximately 340 related injuries. Based on epidemiological surveillance, an outbreak of leptospirosis on November 21, 2025, was officially declared by the Ministry of Health and Wellness (MOHW), following an increase in suspected, probable, and confirmed cases linked to flooding and contaminated water exposure. As of December 10, 2025, 30 confirmed leptospirosis cases had been reported, including 12 deaths (7 officially confirmed) associated with the outbreak. Two cases of tetanus, including one resulting in death, were also reported. The greatest damage occurred in the housing sector as a result of destructive winds, severe flooding, and extensive debris fall which caused widespread damage to homes and personal assets across the most affected parishes. The DaLA Team estimates that approximately 60,868 persons experienced some sort of damage to their homes and assets, while 7,208 individuals sought refuge in shelters in the aftermath of the hurricane. Beyond physical losses, the quality of life of the population temporarily decreased due to disruptions in telecommunications, electricity and water.

As with most Caribbean Small Island Developing States (SIDS), a hurricane of this magnitude will have national implications. The hurricane significantly affected those working in the tourism sector, especially in Montego Bay (St. James), Negril (Westmoreland), and Ocho Rios (St. Ann); and the agricultural and fishing sectors, especially in the parishes of St. Elizabeth, Trelawny, and Westmoreland. Disruptions in the school system also impacted students who would have lost several weeks of teaching instruction. Despite the magnitude of the hurricane, early warnings and advisories issued by the relevant authorities played a pivotal role in reducing casualties and mitigating impacts. Public adherence to these early warnings contributed significantly to reducing loss of life and limiting the scale of human impacts across the island. Subsequent chapters analyze these factors in depth. See Table II 1 for an overview of the main affected population.

**Table II 1:** Summary of the main affected population

| *Affected Population* | *Estimated Number of Persons* |
|---|---|
| ***Primary Affected Population*** | |
| *Deaths* | 45 |
| *Indirect Deaths (post-disaster related)* [a] | 13 |
| *Persons missing* | 13 |
| *Injuries* | 340 |
| *Persons who suffered disease/sickness as a result of the hurricane* [b] | 32 |
| *Persons evacuated* | 972 |
| *Persons in Shelters* | 7,208 |
| *Persons who suffered damaged or destructions to their homes* | 261,527 |
| ***Secondary Affected Population*** | |
| Farmers | 66,986 |
| Fisherfolk | 8, 235 |
| Tourism sector employees | 168,000 |
| Students | 407,000 |

*Source: DaLA Team 2025, based on information from ODPEM, NEOC, MOHW, MLSS and MAFM.*

[a] Post-disaster related deaths as a result of leptospirosis outbreak (12) and tetanus (1) as of 10 December 2025.

[b] Post- disaster disease outbreak (30 confirmed leptospirosis) and 2 cases of confirmed tetanus.

The analysis draws on three principal sources of information. First, a review of official sector assessments and reports was undertaken, with particular reliance on data from the Office of Disaster Preparedness and Emergency Management (ODPEM), the Statistical Institute of Jamaica (STATIN), the Ministry of Labour and Social Security (MLSS), the Ministry of Health and Wellness (MOHW), and other relevant government entities. Supplemental information was also provided by United Nations agencies and other regional organizations such as the United Nations Office for the Coordination of Humanitarian Affairs (OCHA), the United Nations Office for Project Services (UNOPS), the Pan American Health Organization (PAHO), the International Organization for Migration (IOM), the United Nations Children's Fund (UNICEF), Word Food Programme (WFP) and the Caribbean Disaster Emergency Management Agency (CDEMA). Second, interviews were conducted with officials from public institutions engaged in the disaster response, as well as with representatives of organizations involved in humanitarian and relief operations, such as the Jamaica Defence Force (JDF) and NGOs like World Central Kitchen (WCK). Third, field visits were carried out in the most affected areas, enabling the collection of primary information from both the impacted population and local actors who played a central role in the immediate response. The preparation of this chapter benefited from the collaboration of several national institutions and agencies. Special appreciation is extended to The Planning Institute of Jamaica (PIOJ), members of the National Emergency Operations Centre (NEOC), and several parish coordinators. The Inter-American Development Bank (IDB) and United Nations Development Programme (UNDP) are also acknowledged for their valuable contributions.

## A. Socioeconomic Characteristics

The 2022 Population Census recorded 2,774,538 residents, a 2.8 percent increase relative to the previous census. Population distribution remains highly concentrated in Kingston & St. Andrew (2.4%) and St. Catherine (20%), which together account for 44 percent of the total. The parishes showing the fastest growth were Clarendon (5.5%), St. Catherine (5.1%), Portland (4.0%), and Trelawny (3.0%), while Hanover registered the lowest increase (0.4%). Moderate growth occurred in St. James (2.6%), Westmoreland (1.5%), and St. Elizabeth (2.0%) (STATIN, 2025).

According to the population density map of Jamaica, density is classified into five categories: Very Low Density (≤ 200 persons per $km^2$), Low Density (201–300 persons per $km^2$), Moderate Density (301–400 persons per $km^2$), High Density (401–500 persons per $km^2$), and Very High Density (≥ 501 persons per $km^2$). Kingston and St. Andrew are the parishes with the highest population density, while 8 of the 14 parishes fall into the very low-density category and have, on average, around 62 percent of their enumerated districts classified as rural, as is the case for St. Elizabeth and Westmoreland. St. Elizabeth also has the largest share of rural districts nationally, with 75 percent, well above the national average of 39 percent. In contrast, the parishes with moderate density (St. James), high density (St. Catherine), and very high density (Kingston and St. Andrew) each have less than 25 percent of their enumerated districts classified as rural, reflecting their more urban settlement patterns.

**Table II 2:** Population, Density and Enumeration Districts by Parish, Census 2022

| *Parish* | Population[a] | | Urban-Rural Enumeration Districts[c] | | |
|---|---|---|---|---|---|
| | 2022 | Density[b] | Urban ED | Rural ED | Total |
| *Clarendon* | 258,643 | 216 | 277 | 329 | 606 |
| *Hanover* | 69,780 | 155 | 75 | 123 | 198 |
| *Kingston* | 89,186 | 3,966 | 229 | 0 | 229 |
| *Manchester* | 193,694 | 231 | 180 | 272 | 452 |
| *Portland* | 84,972 | 104 | 76 | 132 | 208 |
| *St. Andrew* | 583,718 | 1,342 | 1,028 | 112 | 1,140 |
| *St. Ann* | 175,310 | 146 | 219 | 214 | 433 |
| *St. Catherine* | 542,763 | 455 | 987 | 262 | 1,249 |
| *St. Elizabeth* | 153,201 | 127 | 95 | 281 | 376 |
| *St. James* | 188,656 | 318 | 373 | 127 | 500 |
| *St. Mary* | 116,498 | 190 | 121 | 192 | 313 |
| *St. Thomas* | 94,485 | 127 | 96 | 167 | 263 |
| *Trelawny* | 77,427 | 89 | 86 | 155 | 241 |
| *Westmoreland* | 146,205 | 185 | 179 | 224 | 403 |
| ***Total*** | **2,774,538** | **253** | **4,021** | **2,590** | **6,611** |

*Sources: [a] Population Change by Parish. [b] Map Population Density by Parish 2022. [c] Urban-Rural Enumeration Districts by Parish - Census 2022 -Statistical Institute of Jamaica.*

For 2025, the population is estimated at 2,837,077, with females representing 50.6 percent. The median age is 32.7 years, and population density stands at 262 persons per $km^2$. Life expectancy at birth, estimated at 71.7 years, remains below the regional average[2] (UN, 2024; PAHO, 2024). The Labour Force Survey 2025 Q3 indicates that individuals aged 15–24 represent 22.7 percent, and those aged 15–44 approximately 61.0 percent.

Longer-term demographic patterns show continued population ageing. The share of children (0–14) declined to 21.8 percent (continuing its downward movement over time), while the working-age population (15–64) remained close to its peak at 68.0 percent. The proportion of older persons (65+) increased to 10.3 percent (in comparison with the 2019 round), and the reduction in the child population coincided with a smaller average household size of 2.8 persons (PIOJ & STATIN, 2021).

Historical data also illustrates the dynamics of economic mobility. Transition matrices for 2009–2010, based on the Jamaica Survey of Living Conditions, show fluid but uneven movement across consumption-based classes. Among every 100 poor households, 35 percent moved to the vulnerable group and 3 percent to the middle class. Of every 100 vulnerable households, 15 percent moved into the middle class, and 19 percent fell into poverty. Among middle-class households, 35 percent slipped into the vulnerable group and 2.2 percent into poverty. Overall, roughly 15 percent of the population experienced improvements in their economic situation during that period (UNDP, 2016).

In contrast, the Jamaica Survey of Living Conditions 2021 reports a deterioration in welfare indicators. The poverty rate rose to 16.7 percent, up from 11.0 percent in 2019. Rural areas recorded both the highest incidence (22.1%) and the largest increase (7.9 percentage points). Poverty remained relatively stable in Other Urban Centres (15.5%), while the Greater Kingston Metropolitan Area reached 10.4 percent, a 5.7-percentage-point increase (PIOJ & STATIN, 2021). Findings from the Multiple Indicator Cluster Survey 2022 show that almost two in five households reported experiencing moderate or severe food insecurity in the previous four weeks. However, based on more recent projections, the share of Jamaicans living on less than USD 8.30 per day declined from 22.9 percent in 2021 to 18.7 percent in 2025, with labor market improvements expected to contribute to further reductions in poverty (WB, 2025).

Income inequality also widened, with the Gini coefficient increasing from 0.3671 in 2019 to 0.3991 in 2021. As the Gini ranges from 0 (perfect equality) to 1 (maximum inequality), this rise indicates a more uneven distribution of income. Additional distributional indicators reinforce this pattern: the poorest 40 percent of the population hold 16.0 percent of total income, while the richest 10 percent account for 29.9 percent (2010–2023), and the richest 1 percent hold 17.9 percent of income in 2023 (UNDP, 2025a). Although nominal per capita consumption increased to JMD 430,516, representing a 4.7 percent real gain, this was not sufficient to offset the deterioration reflected in rising poverty and inequality (PIOJ & STATIN, 2021).

Jamaica's broader Human Development Index (HDI) profile places the country in the high human development category, with an HDI value of 0.720 in 2023, ranking 117 out of 193 countries. Since 1990, the HDI has increased by 8.8 percent, supported by improvements in education and income, even as life expectancy has declined slightly. When accounting for unequal distribution of achievements, the Inequality-Adjusted HDI (IHDI) falls to 0.590, reflecting an 18.1 percent loss in human development (UNDP, 2025b). Gender outcomes show relatively narrow gaps: the Gender Development Index (GDI) of 1.013 indicates similar levels of human development between women and men. However, the Gender Inequality Index (GII) value of 0.358—ranking Jamaica 88 of 172 countries—points to continuing

[2] For example, in 2019, life expectancy for the Americas was 77.2 years.
See https://www.paho.org/pub/en/leading-causes-death-disease-burden-americas/mortality-and-life-expectancy-in-the-americas.html

disparities in reproductive health, empowerment, and labor force participation (UNDP, 2025b). These disparities are visible in recent indicators: labor force participation among women is 63.1 percent in 2025, women hold 42.1 percent of Upper House seats and 27 percent of Lower House seats (2024), 22.9 percent of the active police force (2022); and 53 percent of women aged 15–49 have their need for family planning met with modern methods (2021).

Building on these measures of human development and gender inequality, the Multidimensional Poverty Index (MPI[3]) provides further insight into the specific deprivations affecting Jamaican households. Using 2018 data, 2.8 percent of the population (approximately 79,000 people) are classified as multidimensionally poor, while an additional 5.0 percent (142,000 people) are vulnerable to multidimensional poverty. Among those affected, the average intensity of deprivation is 38.9 percent, resulting in an MPI value of 0.011. Notably, the incidence of multidimensional poverty is 2.5 percentage points higher than poverty measured at the 2017 PPP US$2.15 line, showing that individuals who are not income-poor may still experience significant deficits in health, education, and living standards. These findings underscore the limitations of monetary measures and highlight the multidimensional nature of deprivation in Jamaica (UNDP, 2024).

**Table II 3:** National Socioeconomic Indicators

| *Indicator* | | Year |
|---|---|---|
| ***Population***[a] | | |
| *Total Population, as of 1 July (thousands)* | 2,837.08 | 2025 |
| *Male Population, as of 1 July (thousands)* | 1,402.54 | 2025 |
| *Female Population, as of 1 July (thousands)* | 1,434.54 | 2025 |
| *Population Density, as of 1 July (persons per square km)* | 261.965 | 2025 |
| *Births*[b] | 25,942 | 2024 |
| *Deaths*[b] | 20,497 | 2024 |
| *Life expectancy at birth*[c] | 71.6 | 2024 |
| *Population by age*[d] | | |
| · *15-24 yrs* | 489,600 | 2025 Q3 |
| · *25-34 yrs* | 464,300 | 2025 Q3 |
| · *35-44 yrs* | 368,200 | 2025 Q3 |
| · *45-54 yrs* | 320,500 | 2025 Q3 |
| · *55-64 yrs* | 248,700 | 2025 Q3 |

[3] The Multidimensional Poverty Index (MPI) captures acute poverty by assessing multiple, overlapping forms of deprivation experienced by individuals. It evaluates deprivations across ten indicators grouped into three equally weighted dimensions: health, education, and living standards. Health and education are each measured using two indicators, while living standards are assessed through six indicators, with all indicators carrying equal weight within their respective dimensions. The MPI is calculated as the product of two components: the incidence of multidimensional poverty (the proportion of people identified as multidimensionally poor) and the intensity of poverty (the average share of weighted deprivations experienced by those who are poor). As a result, the index reflects changes in both how many people are poor and how severely they are deprived.
A deprivation threshold of one-third of the weighted indicators is used to classify individuals as multidimensionally poor. Households with deprivation scores equal to or above this threshold are considered multidimensionally poor. Individuals with deprivation scores between one-fifth and one-third are categorized as vulnerable to multidimensional poverty, while those with deprivation scores of one-half or more are classified as living in severe multidimensional poverty. The MPI ranges from 0 to 1, with higher values indicating greater levels of multidimensional poverty.
Source: https://hdr.undp.org/sites/default/files/Country-Profiles/MPI/JAM.pdf

**Table II 3:** National Socioeconomic Indicators *(continuation)*

| Indicator | | Year |
|---|---|---|
| · *65+ yrs* | 264,600 | 2025 Q3 |
| ***Poverty*** | | |
| *Incidence of Poverty*[e] | 16.7 | 2021 |
| · *GKMA* | 10.4 | 2021 |
| · *OUC* | 15.5 | 2021 |
| · *Rural Areas* | 21.1 | 2021 |
| *Multidimensionally poor (head count)*[f] | 2.8 | 2018 |
| *Prevalence of Food Poverty*[g] | 5.8 | 2021 |
| · *GKMA* | 2.4 | 2021 |
| · *OUC* | 6.4 | 2021 |
| · *Rural Areas* | 8.1 | 2021 |
| ***Inequality***[h] | | |
| *Gini* | 0.3991 | 2021 |
| ***Human Development***[i] | | |
| *Human Development Index (HDI)* | 0.72 | 2023 |
| *Gender Development Index (GDI)* | 1.013 | 2023 |
| *Inequality-adjusted HDI (IHDI)* | 0.59 | 2023 |
| *Gender Inequality Index (GII)* | 0.358 | 2023 |
| ***Labour Force Indicators***[d] | | |
| *Labour Force Participation Rate* | 69.1 | 2025 Q3 |
| · *Youth (15-24 yrs)* | 41.2 | 2025 Q3 |
| · *Prime Working Age (25-54 yrs)* | 86.7 | 2025 Q3 |
| · *Pre-Pensionable & Pensionable Age (55+ yrs)* | 56.3 | 2025 Q3 |
| · *Male* | 75 | 2025 Q3 |
| · *Female* | 63.1 | 2025 Q3 |
| *Employment to Population Ratio* | 66.8 | 2025 Q3 |
| · *Youth (15-24 yrs)* | 37 | 2025 Q3 |
| · *Prime Working Age (25-54 yrs)* | 84.5 | 2025 Q3 |
| · *Pre-Pensionable & Pensionable Age (55+ yrs)* | 55.8 | 2025 Q3 |
| · *Male* | 73.3 | 2025 Q3 |
| · *Female* | 60.7 | 2025 Q3 |
| *Unemployment Rate* | 3.3 | 2025 Q3 |
| *NEET Rate* | 25.5 | 2025 Q3 |
| *Combined Rate of time -related underemployment and Unemployment (LU2)* | 5 | 2025 Q3 |
| ***Gender Indicators*** | | |

**Table II 3:** National Socioeconomic Indicators *(continuation)*

| Indicator | | Year |
|---|---|---|
| *Percentage Distribution of Houses of Parliament (Jamaica) by Sex* [j] | | |
| · *Upper House (female %)* | 42.1 | 2024 |
| · *Lower House (female %)* | 27 | 2024 |
| *Supreme Court Female Judges (female %)* [k] | 70 | 2021 |
| *Active Police Force (female %)* [l] | 22.9 | 2022 |
| *Proportion of Women of Reproductive Age (15-49 years) who have their need for family planning satisfied with modern methods* [m] | 53 | 2021 |
| *Percentage of women age 15-49 who have ever personally felt discriminated or harassed* [n] | 13 | 2022 |
| *Percentage of children age 5 to 17 years engaged in child labour (female %)* [n] | 3.3 | 2022 |
| ***Health*** | | |
| *Infant mortality rate* [b] | 18.6 | 2022 |
| *Under five mortality rate* [b] | 20.3 | 2022 |
| *Maternal mortality ratio* [b] | 161 | 2022 |
| *Health Insurance Coverage (%)* [e] | 21.4 | 2021 |
| *Children with functional difficulty (%)* [n] | 6 | 2021 |
| *NFH Card (beneficiaries)* [o] | 26,924 | 2022-23 |
| *Suicide Rate Per 100,000 Population* [b] | 2.41 | 2023 |
| *Education* [n] | | |
| *Average number of years of schooling* [c] | 9.7 | 2019 |
| *Out-of-school rate - Children of primary school age (6-11 years (%)* | 2 | 2021 |
| *Out-of-school rate - Children of lower secondary school age (12-14 years) (%)* | 3 | 2021 |
| *Children (7-14 years) with foundational reading skills (%)* | 60 | 2021 |
| *Children (7-14 years) with foundational numerical skills (%)* | 50 | 2021 |
| *Early childhood education (%)* | 71 | 2021 |
| *Migration* [p] | | |
| *Stock of emigrants* | 1,118,931 | 2020 |
| *Stock of immigrants* | 23,629 | 2020 |
| *Remittances (% GDP, 2022)* | 21.6 | 2022 |

*Sources: [a] World Population Prospects 2024. Population Division. Department of Economic and Social Affairs. United Nation. [b] Statistical Institute of Jamaica. [c] Jamaica - Country Profile PAHO 2024. [d] Labour Force Survey 2025 Q3, addition based on Labour Force Population and Outside Labour Force by age group. [e] Jamaica Survey of Living Conditions 2021. [f] Poverty, O., & Human Development Initiative. (2024). Global Multidimensional Poverty Index 2024: Poverty amid conflict. [g] Planning Institute of Jamaica. [h] Computed by Planning Institute of Jamaica (PIOJ) with data supplied by the Statistical Institute of Jamaica (STATIN). [i] Human Development Report. Data Center. [j] Houses of Parliament. [k] Supreme Court. [l] Jamaica Constabulary Force. [m] Reproductive Health Survey, 2021. [n] Multiple Indicator Cluster Survey 2022: The Situation of Women and Children Statistical Snapshot. [o] The National Health Fund, Annual Report 2022-2023. [p] Data Report: Trends in Caribbean Migration and Mobility (IOM, 2023).*

Jamaica's labor market indicators show an employment-to-population ratio of 66.8 percent, with participation varying across groups: 37 percent among youth (15–24), 84.5 percent among the prime working-age population (25–54), and 55.8 percent for persons aged 55 and older. By sex, the ratio is 73.3 percent for men and 60.7 percent for women. The unemployment rate is 3.3 percent, while the NEET rate—defined as the share of youth not in employment, education, or training—stands at 25.5 percent. The combined measure of time-related underemployment and unemployment (LU2) is 5.0 percent. Employment growth between July 2024 and July 2025 was driven by increases in the "Managers" and "Services and Sales Workers" occupational groups, while the largest industry-level gains occurred in Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles, followed by Manufacturing; additional growth in female employment was observed in Arts, Entertainment, Recreation and Other Services (STATIN, 2025b).

Building on these demographic and labor characteristics, Jamaica's health data also point to important population shifts and inequalities. Older adults show a high prevalence of non-communicable diseases (72.3% among persons 65+) (PIOJ & STATIN, 2021), combined with a low fertility rate of 1.9 children per woman (Reproductive Health Survey, 2021), highlighting a demographic profile increasingly shaped by ageing. Inequities across socioeconomic and geographic groups persist: reliance on public health facilities is highest in rural areas (63.3%) and among lower-income households, which also record the lowest health insurance coverage (6.5% in Quintiles 1–2) (PIOJ & STATIN, 2021). Health risks vary by sex as well, with higher NCD prevalence among women (31.1%), while men face significantly higher mortality from external causes (112 per 100,000, including 47.9 from homicides) (PAHO, 2024). Together, these patterns indicate differing health vulnerabilities shaped by age, income, location, and gender.

Aligned with these demographic conditions, education indicators offer additional insight into children's and youths' well-being. Data from the Jamaica Survey of Living Conditions 2021 show that gross enrolment rates remained stable relative to 2019, with small gender gaps except among older youth: enrolment was 53.1 percent for males vs. 74.4 percent for females at ages 17–18, and 16.8 percent vs. 23.7 percent at ages 19–24. Certification levels improved among those 14 years and older who were out of school, and 21.9 percent had received skills training (PIOJ & STATIN, 2021). According to the Multiple Indicator Cluster Survey 2022, primary school completion is nearly universal (99%), and lower secondary completion is 95 percent, though disparities exist between the richest (99%) and poorest (92%) households. Upper secondary completion reaches 86 percent among youth aged 19–21, ranging from 75 percent in the poorest households to 97 percent in the richest. Foundational learning indicators show that 60 percent of children aged 7–14 demonstrate basic reading skills, and 50 percent demonstrate basic numeracy skills, while early childhood education attendance stands at 71 percent. Gender differences persist at higher levels: 13 percent of boys aged 15–16 are out of school, compared with 7 percent of girls, with wealth-related attendance parity indices of 0.95 (primary), 0.87 (lower secondary), and 0.82 (upper secondary). Overall, Jamaica's population records an average of 9.7 years of schooling (PAHO, 2024).

Jamaica's emigrant population has grown from 588,450 in 1990 to 1,118,931 in 2020, an increase of 90 percent. Emigration rose by 46 percent between 1990 and 2000, after which rates declined by about 7 percent every five years through 2020. The main destinations for Jamaican emigrants in 2020 were the United States (70.8%), Canada (13.3%), and the United Kingdom (11.5%), with women representing 57 percent of the emigrant stock and men 43 percent. Jamaica's global total of refugees and asylum seekers is 5,213 (1,868 refugees and 3,345 asylum seekers). Remittances remain an important source of income: the share of GDP from remittances increased by 5.4 percentage points between 2019 and 2022 and represented 21.6 percent of GDP in 2022 (IOM, 2023).

Social protection coverage in Jamaica is extensive. According to MICS 2022, 7 out of 10 persons lived in households that received social transfers or benefits in the previous three months. Coverage was especially high among vulnerable groups: 6 out of every 10 households in the two lowest wealth

quintiles reported receiving transfers, and 9 out of 10 children lived in households benefiting from social assistance.

The Programme of Advancement Through Health and Education (PATH) remains the main non-contributory social assistance program. In FY 2023/24, PATH delivered a Back-to-School grant of JMD 371.168 million to 106,048 students, together with additional assistance totaling JMD 555.86 million, including JMD 440 million in tertiary bursaries and support for 1,021 post-secondary students (MLSS, 2024). As of February 2024, the program had 311,187 registered beneficiaries, concentrated in Kingston & St. Andrew (15.4%), St. Catherine (13.8%), and Clarendon (11.1%), with 52.5%being women (MLSS, 2024). Support for PATH was strengthened through the IDB Group Country Strategy (2022–2026), which financed system upgrades, including the national electronic labor exchange portal, issuance of 456,429 cash grants (USD 45 million), development of a School Feeding Policy, enhancements to the Beneficiary Management Information System, and the introduction of the Social Pension Programme (IDB, 2022).

**Table II 4:** Public Benefits by Parishes

| *Parish* | Path Registered Beneficiaries | | Social Pension Active Beneficiaries | | |
|---|---|---|---|---|---|
| | 2024 | 2023 | Male | Female | Total |
| *Clarendon* | 34,443 | 30,843 | 754 | 810 | 1,564 |
| *Hanover* | 15,026 | 13,656 | 292 | 194 | 486 |
| *Kingston & St. Andrew* | 47,974 | 41,058 | 572 | 849 | 1,421 |
| *Manchester* | 17,035 | 15,087 | 458 | 644 | 1,102 |
| *Portland* | 15,015 | 14,388 | 321 | 250 | 571 |
| *St. Ann* | 19,867 | 17,235 | 524 | 526 | 1,050 |
| *St. Catherine* | 42,932 | 35,157 | 756 | 974 | 1,730 |
| *St. Elizabeth* | 22,475 | 20,882 | 437 | 440 | 877 |
| *St. James* | 19,690 | 17,925 | 457 | 450 | 907 |
| *St. Mary* | 19,648 | 18,418 | 312 | 297 | 609 |
| *St. Thomas* | 15,605 | 14,016 | 275 | 166 | 441 |
| *Trelawny* | 16,874 | 15,064 | 214 | 246 | 460 |
| *Westmoreland* | 24,603 | 21,689 | 435 | 464 | 899 |
| ***Total*** | **311,187** | **275,418** | **5,807** | **6,310** | **12,117** |

*Source: Ministry of Labour and Social Security Annual Report 2023/2024 and 2022/2023.*

PATH participation spans all parishes. In 2024, in absolute terms, the parishes with the highest numbers of beneficiaries were Kingston & St. Andrew (47,974), St. Catherine (42,932), and Clarendon (34,443). By benefit group, the largest numbers of paid beneficiaries in FY 2023/24 were students (116,255), older persons (62,558), and children aged 0–6 (29,778), amounting to 246,686 paid beneficiaries (MLSS, 2024). Another relevant programme, the Social Pension Programme approved in 2021, provides support to Jamaicans aged 75 years and older who are not receiving a private or public pension, other retirement income, social protection benefits, or residing in a government-owned institutional facility. As of March 2024, the programme had 12,117 active beneficiaries, with 6,310 women and 5,807 men. The largest number of beneficiaries reside in St. Catherine (1,730 beneficiaries; 14.3%), followed by Clarendon (1,564; 12.9%) and Kingston & St. Andrew (1,421; 11.7%). Other parishes with over 1,000 beneficiaries include Manchester (1,102) and St. Ann (1,050). During the 2023/2024 financial year, total disbursements under the programme amounted to JMD 468,935,200 (MLSS, 2024).

**Table II 5:** Programme of Advancement Through Health and Education (PATH)

| *Benefit Group* | Avg. No. of Paid Beneficiaries (FY 2023/24) |
|---|---|
| *Children 0-6* | 29,778 |
| *Students* | 116,255 |
| *Adult Poor* | 11,340 |
| *Persons With Disabilities* | 15,882 |
| *Elderly* | 62,558 |
| *Pregnant/Lactating* | 837 |
| *Pad/ Poor Relief* | 10,036 |
| ***Total*** | **246,686** |

*Sources: Ministry of Labour and Social Security Annual Report 2023/2024.*

In governance and public integrity, Jamaica ranked 73rd of 180 countries in the 2024 Transparency International Corruption Perceptions Index, reflecting continued public concern about corruption despite reforms aimed at improving regulatory transparency and enforcement. Security challenges also remain relevant for the business environment. According to the Jamaica Constabulary Force, a total of 3,841 major crimes were reported in 2024, including 1,071 murders, 938 shootings, 806 persons injured, 298 rapes, 592 robberies, and 835 break-ins. Nonetheless, the country recorded improvements in public safety: the U.S. Department of State reports that homicides declined by 19 percent and major crimes by 14 percent compared with 2023 following increased investments in law enforcement capacity, intelligence-led policing, and community engagement initiatives (U.S. Department of State, 2025).

***Despite gains in human development, Jamaica faces marked income disparities—where the poorest 40 percent receive just 16 percent of national income—and seven out of ten people rely on social transfers. Low-density western parishes with extensive rural areas may also face lower fatality risks during certain natural disasters.***

## Affected Parishes

The effects of Hurricane Melissa were most pronounced in the southwestern region of the island, particularly in the parishes the Government of Jamaica has designated as the "Big Five": St. Elizabeth, Trelawny, St. James, Hanover, and Westmoreland; and to a lesser extent St. Ann, which experienced some moderate impact. Based on the 2022 Population Census, these parishes comprise about 635,269 inhabitants, with St. James being one of the more populous parishes in Jamaica (STATIN, 2025). Not all the population of these parishes was directly affected by the hurricane, as its intensity varied among settlements. Based on initial assessments done by the ODPEM and MLSS, over 170 communities were impacted due to severe structural damage to houses, road and bridge damage, severe flooding and landslides, and loss of essential services. The mainly affected communities are:

- St. Elizabeth: Black River, Santa Cruz, Brighton, Bogue, New Market, Lacovia, and surrounding rural districts.
- Trelawny: Falmouth and adjacent coastal communities.
- St. James: Montego Bay and surrounding communities.
- Hanover: Chigwell and surrounding inland/coastal communities.

- Westmoreland: Savanna-la-Mar, Seaford Town, Whitehouse, Smithfield, Strathbogie, Water Works, Whithorn, Town Head, Truro, Three Miles River.

## B. Primary Affected Population

As mentioned, the primary affected population would be those persons who were affected by the direct effects of the disaster and would include the dead, the injured or sick, those displaced and living in shelters, and those who suffered material losses as a direct and immediate consequence of the disaster.

### Deaths

According to ODPEM, a total of 45 deaths have been officially confirmed as directly attributable to Hurricane Melissa, with an additional 32 fatalities still under investigation (ODPEM, 2025)[4]. Local counts indicate that the parishes of Westmoreland and St. Elizabeth recorded the highest number of hurricane-related deaths. Jamaica's official disaster mortality count is maintained by ODPEM in coordination with the Jamaica Constabulary Force (JCF), JDF, and the MOHW. This system includes only those deaths conclusively linked to the immediate physical effects of the hurricane (for example, fatal injuries caused by high winds, flooding, landslides, or immediate storm impacts) and verified through established medical and investigative procedures (ODPEM, 2025). The 32 additional deaths that are currently under investigation to determine whether they should be included in the official disaster mortality count are subject to the Government's formal disaster mortality verification process.

- **Post-disaster related deaths**

Following the passage of Hurricane Melissa, public health authorities detected a rise in suspected leptospirosis cases across four parishes, prompting the activation of enhanced surveillance and environmental health assessments. These measures were implemented in response to heightened exposure risks associated with flooding, stagnant water, compromised water supply, electricity outages, population displacement, and interruptions to routine health services. On November 21, 2025, the Government of Jamaica officially declared a national leptospirosis outbreak. As of 10 December 2025, ODPEM reported 84 suspected and 30 confirmed cases of leptospirosis, with 12 leptospirosis-related deaths, seven of which had been officially confirmed through established verification processes. In addition, two cases of tetanus were reported, including one resulting in death, highlighting continued risks associated with wound contamination and delayed access to medical care in affected communities (MOHW, 2025).

Deaths arising from post-disaster health conditions, including those associated with the leptospirosis outbreak declared by the MOHW in the weeks following the hurricane, are tracked separately through the national epidemiological surveillance system. In accordance with national protocols, such deaths are not automatically included in the official hurricane mortality count unless individually reviewed and confirmed through ODPEM's disaster mortality verification process. These health-related fatalities nonetheless represent significant indirect impacts of the disaster and underscore the importance of sustained disease surveillance, environmental health interventions, and continuity of care during the recovery phase (MOHW, 2025; PAHO, 2025).

[4] During the field mission, the DaLA Team asked for disaggregated information (by sex and age) on the fatalities. At the time of writing this report this information was not received.

## Missing Persons

Another dynamic of the affected population that needs to be considered is the persons who have been reported as missing. In addition to the confirmed deaths, 13 persons are still missing and remain unaccounted for as of December 10, 2025 (ODPEM, 2025)[5]. Earlier in the response period, the number of missing persons had fluctuated as field assessments progressed; however, subsequent verification processes resulted in a stabilized count. The official missing persons list remains dynamic and may be updated as additional information becomes available through community reporting, search-and-rescue follow-up, and police investigations.

## Injured Person

As of December 4, 2025, the National Emergency Operations Centre (NEOC) reported a total of 340 persons injured as a result of Hurricane Melissa (NEOC, 2025). Earlier health-sector reporting documented 243 cumulative injuries among individuals treated in hospital Accident and Emergency (A&E) departments as of November 13, 2025 (MOHW, 2025). The DaLA Team did not receive information on the specific types or pathologies of injuries. These figures should therefore be interpreted as administrative counts generated through different response reporting systems, which may not be directly comparable across reporting dates, as they reflect distinct case definitions and data pipelines, namely, "persons injured" recorded through NEOC situation reporting versus injuries treated within the formal health system. In addition, access constraints and communication disruptions in severely affected areas may have delayed the notification, verification, and consolidation of injury data.

## Evacuated Persons

The Government of Jamaica is to be commended for maintaining consistent and transparent public communication in the lead-up to Hurricane Melissa. National authorities conducted frequent press briefings and issued emergency bulletins emphasizing vigilance, community support, and the protection of vulnerable populations. Early warnings were issued by ODPEM in collaboration with the Meteorological Service of Jamaica, and emergency communication channels were activated to deliver timely and accurate updates as forecasts deteriorated and preparedness levels were escalated.

To ensure legal authority for swift national action and activation of emergency powers, the Government issued an Order under the Disaster Risk Management Act declaring Jamaica a "threatened area," and a complementary Order under the Trade Act to prevent price gouging and protect consumers during the state of emergency preparedness, on October 26, 2025. On October 27, 2025, the Government issued the Disaster Risk Management Evacuation Order, mandating the evacuation of residents in identified high-risk communities immediately before the hurricane's landfall (ODPEM, 2025, October 27). The evacuation order was legally binding under the Disaster Risk Management Act, which meant that authorities could enforce compliance through established legal mechanisms. While the Act does not appear to explicitly provide for arrest solely based on non-compliance with an evacuation order, enforcement may occur through due legal process, including the imposition of fines or other penalties following conviction. Mandatory evacuation orders were issued for the following areas:

- Kingston: Port Royal.
- Clarendon: Portland Cottage, Rocky Point.
- St. Catherine: Old Harbour Bay.
- St. Andrew: Taylor Land, Bull Bay, New Haven, Riverton City.

[5] During the field mission, the DaLA Team asked for disaggregated information (by sex and age) on the missing people. At the time of writing this report this information was not received.

The Jamaica Urban Transport Company (JUTC) mobilized buses to facilitate evacuation, while the JCF was deployed to support relocation efforts and ensure compliance with the evacuation orders. Evacuees were directed primarily to government-designated emergency shelters, including schools, churches, and community centers activated under parish shelter plans. In advance of landfall, ODPEM reported that 881 emergency shelters were activated and more than 1,700 trained shelter managers were placed on standby nationally as part of preparedness measures. Despite these arrangements, pre-impact shelter occupancy remained relatively low, with approximately 972 persons occupying 76 shelters nationwide up to the morning of October 27, 2025. According to the Ministry of Local Government and Community Development, the parish of Clarendon recorded the highest shelter population (311 persons), followed by St. Thomas (227) and Kingston and St. Andrew combined (179). Several parishes recorded very low shelter occupancy levels, and four parishes reported no shelter occupants at that time.[6] The DaLA Team was informed that persons also relocated to private accommodation with relatives or friends, which were not systematically captured in shelter statistics, contributing to potential under-reporting of evacuation figures.

Government officials expressed concern that compliance with mandatory evacuation orders was limited, particularly in low-lying and flood-prone areas. They further indicated that misinformation, including false claims that fees were being charged for shelter use, discouraged some residents from utilizing shelters. Challenges were also reported in relocating homeless persons from the streets, despite targeted outreach efforts. Additionally, reports emerged of operational challenges where residents arrived at shelters that were temporarily closed while awaiting the arrival of shelter managers.

Overall, while evacuation orders and shelter systems were activated in a timely manner, publicly available records do not provide definitive national figures for pre-impact evacuations. Shelter occupancy data likely underestimate actual evacuation levels, as movements to private accommodation, delayed reporting, access constraints, and communication challenges affected the completeness of official statistics. This can represent a key data gap for post-disaster assessment and recovery planning.

## Displaced Population living in shelters

Evacuation and emergency sheltering constitute critical life-saving measures during disaster events, providing immediate protection and safety for affected populations. Official NEOC Situation Reports confirm that emergency shelters were activated across multiple parishes both in advance of and following the landfall of Hurricane Melissa on October 28, 2025, accommodating pre-impact evacuees as well as post-impact displaced persons (NEOC, 2025). While publicly available records do not present a single consolidated national figure on the cumulative number of shelters activated over the response period, official reporting consistently documented shelter activation status and occupancy levels at specific points in time during the emergency and early recovery phases.

At the height of the emergency between October 28 and 30, 2025, an estimated 30,000 persons were displaced islandwide, including individuals evacuated pre-emptively following official advisories, those rescued from flooded areas, and households fleeing unsafe or collapsing dwellings (OCHA, 2025). Of this total, approximately 15,000 persons reportedly sought refuge in official emergency shelters at the peak of shelter use on October 29, 2025. However, shelter data compiled by the Ministry of Local Government and Community Development (MLGCD) and the NEOC indicated that immediately following landfall, 513 shelters were active nationwide, accommodating a total of 7,208 occupants on October 29 (NEOC, 2025). As presented in Table II 6, the highest shelter occupancy at this stage was recorded in Clarendon (1,217 persons), followed by Kingston and St. Andrew (906), Portland (728), St.

[6] See Jamaica Observer. https://www.jamaicaobserver.com/2025/10/27/eyeonmelissa-972-people-registered-shelters-across-jamaica-mckenzie/; https://www.localgovjamaica.gov.jm/76-shelters-now-occupied/

Mary (688), and Westmoreland (667), reflecting the concentration of storm impacts in coastal, flood-prone, and low-lying areas.

By the period November 23-27, shelter use had declined substantially, with between 96 and 116 shelters remaining active and total occupancy reduced to between 1,058 and 1,445 persons. Residual displacement during this phase was concentrated primarily in Westmoreland, St. Elizabeth, St. James, Trelawny, and Hanover, while several parishes reported no active shelters, indicating significant return movements or transitions to alternative accommodation arrangements (NEOC, 2025; HEOC, 2025). The persistence of shelter use in western and south-western parishes reflects more prolonged displacement due to extensive housing damage and slower recovery progress.

It should be noted that these reported figures likely represent a conservative estimate of total displacement. Official shelter registries were still being compiled during the assessment period, and multiple reports indicate that displaced persons also sought refuge in informal facilities such as churches and community buildings, as well as within the private sector. In addition, the DaLA Team was informed that many affected households relied on informal hosting arrangements with relatives and neighbors, a common community coping mechanism in Jamaica, which is not fully captured in official shelter statistics.

**Table II 6:** Population in shelters

| *Parish* | Oct-28 | | Oct-29 | | Nov-23 | | Nov-27 | |
|---|---|---|---|---|---|---|---|---|
| | No. of Activated Shelters | Est. No. of People | No. of Activated Shelters | Est. No. of People | No. of Activated Shelters | Est. No. of People | No. of Activated Shelters | Est. No. of People |
| *Clarendon* | 41 | 875 | 51 | 1217 | 2 | 2 | -- | -- |
| *Hanover* | 20 | 354 | 30 | 457 | 12 | 103 | 12 | 103 |
| *Kingston & St. Andrew* | 48 | 870 | 64 | 906 | -- | -- | -- | -- |
| *Manchester* | 23 | 135 | 26 | 178 | 2 | 3 | 2 | 3 |
| *Portland* | 41 | 519 | 60 | 728 | -- | -- | -- | -- |
| *Portmore* | 8 | 74 | 8 | 74 | -- | -- | -- | -- |
| *St. Ann* | 18 | 285 | 40 | 444 | 4 | 22 | 4 | 22 |
| *St. Catherine* | 30 | 447 | 31 | 447 | 1 | 2 | | |
| *St. Elizabeth* | 28 | 310 | 28 | 322 | 26 | 266 | 24 | 213 |
| *St. James* | 34 | 259 | 38 | 272 | 29 | 214 | 28 | 163 |
| *St. Mary* | 27 | 508 | 42 | 688 | -- | -- | -- | -- |
| *St. Thomas* | 39 | 609 | 39 | 609 | -- | -- | -- | -- |
| *Trelawny* | 17 | 374 | 17 | 374 | 7 | 222 | 8 | 158 |
| *Westmoreland* | 33 | 505 | 38 | 667 | 33 | 611 | 18 | 396 |
| ***Total*** | **407** | **6,124** | **513** | **7,208** | **116** | **1,445** | **96** | **1,058** |

*Note: (1) Information was not disaggregated by sex or age to reflect the differential effects of the hurricane on each segment of the population. (2) Figures represent running totals and are subject to fluctuation due to communication constraints, ad hoc daily shelter arrivals/departures, and phased shelter closures. (3) Reductions over time reflect return movements, consolidation of shelters, and transition to alternative accommodation arrangements. (4) Under-reporting is possible, particularly for persons sheltering in informal facilities (e.g., churches, community buildings) or the private sector.*

While the shelter system played a critical role in providing immediate protection, post-event assessments identified constraints related to capacity, accessibility, and resource adequacy. Several shelters required additional support to manage increased occupancy, including sleeping cots, water, sanitation, and hygiene (WASH) materials, medical supplies, and protection services. Disruptions to electricity, water supply, and telecommunications further affected the continuity of medical care, social-assistance verification, and shelter data management (MLSS, 2025). In response, the MOHW, in collaboration with the JDF, conducted regular shelter inspections to ensure environmental health and food-safety standards were maintained. At the same time, the Government of Jamaica, through the MLSS, coordinated the provision of food, water, and essential relief items with support from the Jamaica Red Cross, United Nations agencies, and other NGOs. Nationally, more than 100,000 tarpaulins were mobilized to address urgent shelter needs, with approximately 75 percent distributed by early December (OCHA, 2025). Collectively, these findings highlight the need to strengthen shelter standards, improve the pre-positioning of supplies, and enhance cost-tracking mechanisms for evacuation, shelter operations, and emergency relief within the DaLA framework.

Women, children, older persons, and persons with disabilities experienced heightened vulnerability during the sheltering phase. Damage to health facilities in St. Elizabeth and Westmoreland disrupted maternal and child health services, prompting the MOHW, with support from PAHO, to deploy mobile clinics to provide antenatal care, psychosocial support, nutritional counselling, and health education in affected communities such as Black River and Savanna-la-Mar (HEOC, 2025). UNICEF and partners established child-friendly spaces and temporary learning facilities to support continuity of care and education, while UNFPA and the Jamaica Red Cross coordinated the distribution of dignity kits, infant formula, and the establishment of “safe corners” to support breastfeeding mothers in shelters (UNFPA, 2025).

Protection risks were also evident, particularly in overcrowded shelters lacking segregated spaces. Such conditions increased the risk of gender-based violence (GBV). In response, the UNFPA, the JCF and other local organizations carried out a number of awareness campaigns, as well as other activities such as the deployment of female officers and trained volunteers, improved lighting, and the establishment of separate areas for women and girls. While no major incidents of GBV or child abuse were reported, prevention and monitoring activities remain ongoing (UNFPA & MLSS, 2025).

Older people and people with disabilities were among the most affected groups, with many losing assistive devices or access to essential medications. Accessibility challenges were widespread, as several shelters lacked ramps or accessible sanitation facilities. The Jamaica Council for Persons with Disabilities coordinated targeted measures, including priority access to relief distribution and relocation of mobility-impaired individuals to more accessible venues, while mobile health and psychosocial teams were deployed to major shelters to support ongoing care and protection monitoring (HEOC Report, 2025).

Overall, while Jamaica’s shelter system played a critical life-saving role during Hurricane Melissa, the assessment identified persistent gaps in infrastructure suitability, human-resource capacity, data management, and resource allocation. In particular, the absence of standardized and disaggregated shelter registration data constrained the assessment’s ability to analyze differential impacts by sex, age, disability status, medical needs, and household composition. The DaLA Team was not provided with such disaggregated information for shelter occupants, limiting the identification of the most affected population groups and their specific needs. This underscores the need to establish a standardized national protocol for shelter registration, requiring the systematic documentation of key demographic and vulnerability characteristics for all shelter occupants and ensuring consistency across shelters.

Many of the facilities used as emergency shelters, particularly schools and churches, were not designed for prolonged habitation. Extended occupancy placed strain on basic infrastructure and limited the

ability of these facilities to resume their primary functions. In the case of schools, continued use as shelters delayed the return to in-person instruction, disrupted academic calendars, and affected students' access to safe learning environments. Prolonged sheltering in non-residential facilities also increased maintenance needs and recovery costs, underscoring the importance of identifying alternative temporary accommodation solutions and accelerating housing repair programs to facilitate timely deactivation of shelters and the restoration of essential social services.

In addition, prolonged shelter occupancy resulted in significant human-resource fatigue among shelter managers, many of whom operated for extended periods with limited personnel support and minimal rotation. The DaLA Team was informed that several shelters were managed by one or two individuals on a voluntary basis, placing a strain on operations and record-keeping. These conditions highlight the need to expand the pool of trained shelter managers, strengthen parish-level volunteer networks, and institutionalize staff-rotation mechanisms to ensure continuity of care, accurate data collection, and compliance with national shelter standards during prolonged emergency responses.

## Population who suffered damage or destruction to their home

The primary affected population also includes individuals or families who suffered damage or destruction of their homes. After all the clearings were given, the MLSS conducted a Household Damage Assessment across the impacted parishes, and as of January 30, 2026, a total of 86,616 household assessments had been completed (MLSS, 2026). The DaLA Team confirmed that the western parishes of Westmoreland, St. Elizabeth, St. James, and St. Ann experienced the highest concentration of severe structural damage and destruction, making them the most heavily affected by the hurricane's passage. In these parishes, housing damage was primarily observed to structural components, such as frames, walls, roofs, doors, and windows, as well as to furnishings, appliances, and other household equipment. An estimated 85,127houses throughout the country suffered some type of effects, of which approximately 74 percent had some kind of damage ranging from minor to major damage. An additional 17 percent of the affected houses were considered destroyed due to structural instabilities that cannot be repaired. Given that the average household size in the affected parishes ranges from 2.6 to 3.1 persons per household, approximately 261,527 persons would have suffered some type of damage or destruction to their homes and assets (see Table II 7).

**Table II 7:** Affected population with damage to homes

| *Parish* | Total Households Assessments (Yes) | Total Affected Persons |
|---|---|---|
| *St. Thomas* | 285 | 868 |
| *St. Catherine* | 3,161 | 10,594 |
| *Kingston* | 145 | 463 |
| *Manchester* | 3,777 | 13,044 |
| *St. Andrew* | 612 | 1,744 |
| *St. Mary* | 4,413 | 13,499 |
| *Portland* | 3,327 | 9,869 |
| *St. Ann* | 8,515 | 27,686 |
| *St. James* | 11,774 | 34,858 |
| *Clarendon* | 3,061 | 9,917 |
| *Trelawny* | 4,789 | 14,386 |

**Table II 7:** Affected population with damage to homes *(continuation)*

| Parish | Total Households Assessments (Yes) | Total Affected Persons |
|---|---|---|
| *St. Elizabeth* | 16,662 | 49,100 |
| *Hanover* | 6,288 | 17,256 |
| *Westmoreland* | 19,807 | 58,243 |
| ***Total*** | **86,616** | **261,527** |

*Source: DaLA Team, 2026 based on information provided by the Ministry of Labour and Social Security's JHDINA Hurricane Melissa Relief Dashboard.*

The Government noted that the hurricane's impacts were disproportionately severe among low-income and informal settlements, with residents who often inhabit structurally weak housing constructed from light materials such as zinc sheets and plywood. Communities such as Grantham in Clarendon and sections of Seaview Gardens in Kingston suffered near-total destruction of informal dwellings (OPM, 2025). For many in these communities, the loss of homes has been compounded by the absence of insurance coverage, limited savings, and dependence on informal livelihoods. These households face the greatest barriers to recovery and are at heightened risk of negative coping mechanisms, such as food insecurity or exploitative borrowing. The Government of Jamaica has announced direct emergency cash support through the MLSS Solidarity Programme to assist individuals who fall outside the formal social protection system, including young people who are unemployed, older persons, and those aged 75 years and over who are not receiving NIS benefits and social pension, among other benefits.

Another concern that was highlighted was the "marooned" communities, especially in the rural settlements that were rendered inaccessible by debris, landslides, or collapsed bridges. As of November 18, 2025, ODPEM identified at least 29 communities (primarily in St. Elizabeth, St. James, and Trelawny), where residents were unable to access formal shelters or external assistance. These included the historic Accompong Maroon village in St. Elizabeth, which is home to approximately 788 residents. The hurricane caused severe impacts in Accompong, destroying more than 80 percent of homes, damaging culturally significant sites such as the Kindah Tree museum, and isolating the community from external aid, thereby displacing residents and placing its cultural heritage and historical identity at risk (Jamaica Observer, 2025).

The Jamaica Defence Force (JDF) established 22 forward operating humanitarian outposts to serve these marooned communities, located in areas such as Burnt Savannah, Darliston, Bluefields, and Bethel Town (Westmoreland); New Market and Springfield (St. Elizabeth); and Catadupa and Adelphi (St. James), to deliver food, water, tarpaulins, and other essential relief supplies (OPM, 2025). These outposts also facilitated aerial evacuations of the most vulnerable, including elderly and ill persons, to larger shelters and hospitals.

While national and local response mechanisms have been effective in providing emergency shelter and initiating assessments, sustained investment in resilient housing recovery, community-level preparedness, and integrated data systems will be essential to ensure inclusive, equitable, and durable recovery outcomes. The Jamaica Household Damage Impact and Needs Assessment (JHDINA), managed by MLSS, has been utilized as a national multi-agency data collection tool to assess household damage and provide a database to facilitate interventions with the affected population. The system represents a potential long-term tool for improving standardized, disaggregated data collection and case management for displaced populations during emergencies and recovery phases (MLSS, 2025). As of December 8, the MLSS had completed over 37,600 individual assessments and was accelerating data collection to finalize the national housing damage dataset. The DaLA Team notes that the JHDINA

system can support future targeting of reconstruction and cash assistance by linking verified household damage data to social protection registries such as PATH.

In the aftermath of Hurricane Melissa, mental health and psychosocial support (MHPSS) emerged as a critical component of the national emergency and recovery response, given the scale of displacement, housing damage, and disruption to livelihoods. National coordination of mental health and psychosocial support (MHPSS) interventions was led by the MOHW and PAHO. As part of this coordination, a national mental health communication strategy was developed to guide public messaging, encourage help-seeking behavior, and inform affected communities about available psychosocial services. The strategy contributed to broader post-disaster efforts to normalize mental health care and reduce stigma associated with psychosocial distress.

As part of this response, community psychiatric services were progressively restored in severely affected parishes, including St. Elizabeth, Westmoreland, and Trelawny, with priority attention given to displaced households and frontline responders (OCHA, 2025). Additionally, UNFPA, in partnership with the Caribbean Technical Assistance and Education Centre for Health (CTECH), supported the scale-up of psychosocial services through the engagement of 40 trained mental health counsellors to deliver individual and group-based interventions in shelters and communities (OCHA, 2025).

According to NEOC and Health Emergency Operations Centre (HEOC) reporting, MHPSS interventions were delivered to both affected populations and responders during the emergency and early recovery phases. As of mid-November, psychosocial support had been provided to 213 health-care workers in the worst-affected parishes through individual and group counselling sessions. In addition, a total of 506 affected persons received MHPSS support through the Jamaica Red Cross, while a further 368 individuals were supported through services delivered by CTECH (NEOC, 2025). These interventions addressed acute stress reactions, grief, anxiety, and burnout associated with prolonged emergency response and personal loss.

Overall, the scale and scope of MHPSS interventions following Hurricane Melissa demonstrate a concerted effort to address the psychosocial dimensions of the disaster alongside physical health and shelter needs. However, the experience also underscores the importance of sustained investment in community-based mental health services, strengthened surge capacity for MHPSS professionals, and the integration of psychosocial care into longer-term recovery and social protection frameworks, particularly in parishes experiencing prolonged displacement and slower recovery.

## C. Secondary Affected Population

The secondary affected population is those persons who suffer indirect or secondary effects of the disaster, such as interruptions in public services, trade, employment, and isolation. Regarding access to services, over half the national population was impacted by power and telecommunication outages and water service disruptions. At the time of this Assessment, a significant proportion of the population residing in the most affected parishes still remained without electricity and telecommunications services.

Hurricane Melissa had a severe and disproportionate impact on Jamaica's agriculture sector, striking the country's main productive belt and rural livelihood base, particularly in St. Elizabeth, widely regarded as the national breadbasket. Based on preliminary estimates from the Ministry of Agriculture, the DaLA Team confirmed that overall, 48,016 hectares of crops and 1,487,712 animals were affected, with an estimated 66,986 farmers experiencing some sort of economic impacts, thereby undermining household incomes and threatening short-term food availability. The fisheries sector also sustained major livelihood losses, particularly among small-scale coastal fishing communities along Jamaica's south coast, where rough seas and storm surge destroyed boats, engines, and fishing gear, effectively

halting operations in the immediate aftermath (World Bank, 2025). The National Fisheries Authority (NFA) of Jamaica reported catastrophic damage across the island's fishing sector, including the destruction of more than 3,301 fishing boats and widespread loss of gear and equipment belonging to small-scale fishers, which underscores the scale of livelihood disruptions among fisherfolk nationwide. Based on preliminary estimates, 8,235 fisherfolk were identified as severely affected.

The hurricane had a significant and immediate impact on Jamaica's tourism-dependent population, particularly in the north-western and northern resort corridors, including Montego Bay (St. James), Negril (Westmoreland), and Ocho Rios (St. Ann). Damage to hotels, resorts, attractions, beaches, and supporting infrastructure resulted in widespread booking cancellations and temporary closures, effectively bringing tourism activity to a standstill in several locations during the critical lead-up to the winter season. Tourism plays a major role in the economy, driving related industries such as commerce, food services, and transportation. This sector employs approximately 168,000 (as of July 2025) - about 11.7 percent of the employed labour force in Jamaica, with a higher proportion of women in these roles (Government of Jamaica, 2025). As a result, workers, including hotel staff, tour operators, taxi drivers, craft vendors, and informal service providers, all experienced a loss or reduction of income following the hurricane. While several hotels and attractions were able to reopen relatively quickly, others in heavily affected areas such as Montego Bay and parts of the South Coast faced extended recovery timelines, prolonging income disruptions for workers and surrounding communities (World Bank, 2025).

Approximately 407,000 students across public and private primary and secondary institutions were affected by school closures following the hurricane. Although many schools progressively resumed operations, it is estimated that about 15 percent will only reopen at the start of the January 2026 academic term, extending learning disruptions for a substantial number of students. The prolonged closures were not solely the result of physical damage but were also driven by the continued use of educational facilities for emergency response. As of December 10, 2025, 59 schools remained in operation as shelters for displaced populations, preventing their return to educational use. While this underscores the critical role of schools in disaster response, it also illustrates the challenge of balancing emergency shelter needs with ensuring minimal disruption to education during natural disasters.

## D. Relief Efforts and Emergency Costs

**Immediate emergency relief (late October- early November 2025)**

Immediately following the passage of Hurricane Melissa, the Government of Jamaica activated a large-scale emergency relief operation under the NEOC, led by ODPEM with extensive operational support from the JDF (see Table II 8). Emergency relief efforts focused on life-saving humanitarian assistance, access restoration, and the rapid distribution of food, water, shelter materials, and essential supplies to affected communities, particularly in western parishes that were mostly impacted. A major civil-military relief hub was established at Up Park Camp, Kingston, for the JDF to facilitate the preparation and dispatch of family care packages via ground convoys and air operations, including helicopter missions to isolated areas. This centralized logistics arrangement was further strengthened through the reassignment of ODPEM to the Office of the Prime Minister to accelerate coordination and decision-making for relief distribution (OPM, 2025; NEOC, 2025).

The DaLA Team was informed that during this phase, the JDF undertook extensive Humanitarian Assistance and Disaster Relief (HADR) operations, including aerial food drops, evacuations, engineering support, medical interventions, and convoy escorts. As of the end of November, the JDF had conducted over 200 flight operations, deployed to more than 300 communities, and distributed over 130,000 food packages provided by the MLSS, reflecting the unprecedented scale of military engagement in the humanitarian response (NEOC, 2025).

**Table II 8:** Emergency Relief Activities and Quantities

| *Activity* | Quantity |
|---|---|
| ***Emergency Food Assistance*** | |
| *Food packages (ODPEM)* | 98,367 packages |
| *Food packages (MLSS & JDF)* | 130,715 packages |
| *Hot and prepared meals (World Central Kitchen)* | >2.5 million meals |
| ***Emergency Shelter Support (Non-Food Items)*** | |
| *Tarpaulins* | 3,208 units |
| *Mattresses (double)* | 1,265 units |
| ***Water, Sanitation and Hygiene (WASH)*** | |
| *Water (cases/bottles)* | 6,590 cases |
| *Hygiene kits* | 6,035 units |
| *Sanitary hygiene items* | 2,025 units |
| ***Household Energy and Cooking Support*** | |
| *Stoves* | 304 units |
| *Logistics and Distribution* | |
| *Air and ground logistics (including helicopter sorties)* | >200 flight operations |

*Source: DaLA Team, 2025.*

*Note: (1) Information compiled from NEOC and MLSS Reports emergency shelter activation, food distribution, logistics operations, and humanitarian assistance following Hurricane Melissa. (2) The table presents a non-exhaustive summary of emergency relief and humanitarian assistance reported at the time of the Assessment; additional activities and in-kind contributions may not be captured due to reporting timelines, parallel delivery channels, or data limitations. (3) Cost information for the activities and items listed was not available at the time of the assessment and is therefore not reflected in this table.*

By January 30, 2026, the evaluation team received updated operational data regarding the volume of relief items distributed following recent disaster events. It should be noted that while the evaluation team received this update on January 30, 2026, the exact cutoff date for the cumulative totals reflected in Figure II 1 remains unconfirmed.

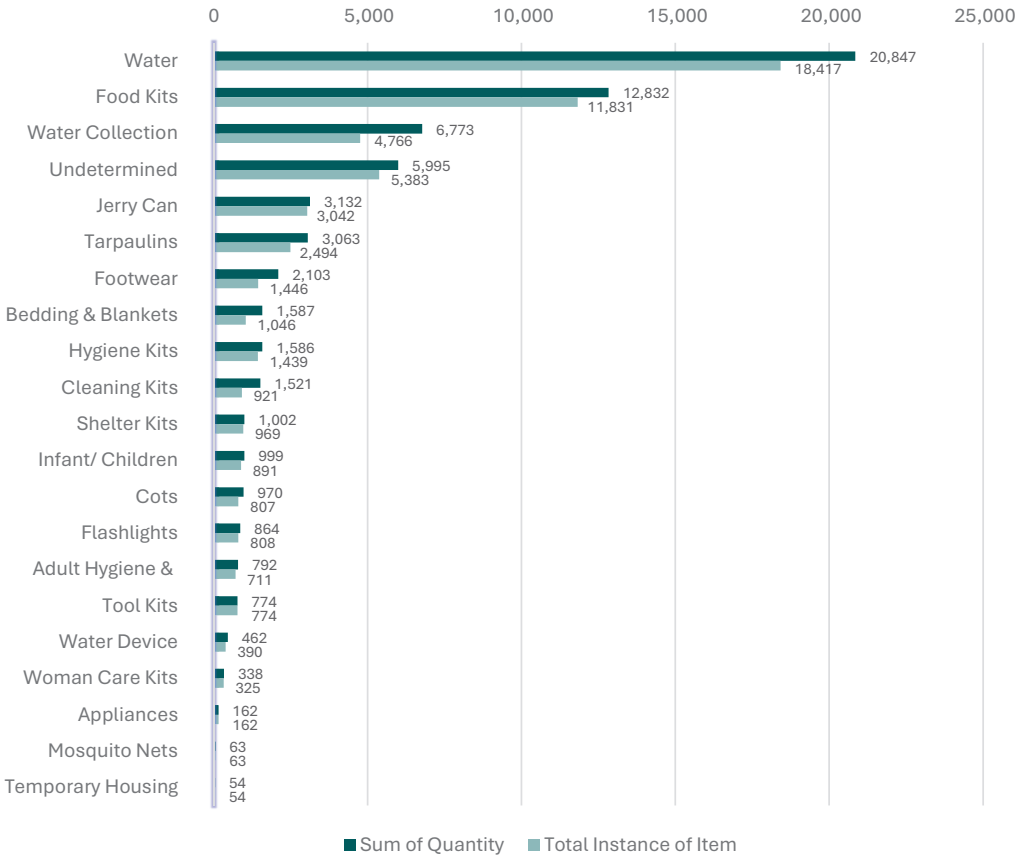
As illustrated in Figure II 1, the distribution strategy was heavily weighted toward immediate survival essentials, with Water (20,847 units) and Food Kits (12,832 units) constituting the vast majority of the total relief volume, which is aligned with the information previously presented in Table II 8.

Figure II 1 suggests two distinct distribution patterns:

- Bulk Supply Dynamics: In nearly every category, the Sum of Quantity exceeds the total instances of the item, indicating that multiple units are typically provided during a single distribution event. This disparity is most evident in items such as Water Collection (6,773 units vs. 4,766 instances) and Footwear (2,103 units vs. 1,446 instances), suggesting that localized distribution hubs or high-occupancy households required bulk replenishment.
- Targeted Unit Distribution: Conversely, specialized items—including Tool Kits, Appliances, Mosquito Nets, and Temporary Housing—exhibit a near 1:1 ratio between quantity and instances. This suggests these high-value resources are distributed as discrete units to individual recipients based on specific needs assessments.

Furthermore, while high-volume commodities dominate the aggregate figures, the inclusion of Infant/ Children and Women's Care Kits highlights a protection-centered response tailored to vulnerable demographics. However, the data also identifies an operational challenge: "Undetermined" items (5,995 units) represent the fourth-largest category. This significant volume of unclassified supplies suggests a critical need for enhanced real-time tracking and categorization protocols within the WFP/ ODPEM Control Tower during peak mobilization phases to ensure full institutional transparency.

**Figure II 1:** Quantity of Items distributed




*Source: Ministry of Labour and Social Security.*

**Humanitarian assistance and transition to early recovery (November–December 2025)**

As the response progressed, large-scale humanitarian assistance operations were sustained while gradually shifting toward early recovery objectives. The MLSS, as the lead agency for welfare and relief coordination, continued nationwide food-package distribution alongside household damage assessments, supported by the JDF, UN Agencies, international and local NGOs, and private-sector partners. By early December, more than 108,000 food packages had been dispatched nationwide, with assessments and distributions heavily concentrated in Westmoreland, St. Elizabeth, St. James, Hanover, St. Ann, and Trelawny, reflecting the geographic concentration of severe damage (MLSS, 2025; NEOC, 2025).

Humanitarian partners complemented government efforts through food assistance, shelter repair kits, tarpaulins, WASH supplies, health services, psychosocial support, and child protection interventions. As of November 18, there were over 30 international aid organizations in Jamaica. World Central Kitchen provided more than 2.5 million meals, while WFP coordinated food assistance and logistics tracking through a national monitoring dashboard. UNICEF supported health, nutrition, WASH, psychosocial care, and education through the provision of supplies and the establishment of temporary learning spaces. IOM, UNHCR, PAHO/WHO, and the Jamaica Red Cross supported shelter stabilization, health

outreach, and protection services, while UNDP scaled up debris removal and community clean-up activities.

**Donations, pledges, and financing for response and recovery**

The national response was supported by substantial domestic and international donations, pledges, and financing mechanisms (see Table II 9). Monetary donations were mobilized through ODPEM-managed platforms, including the Support Jamaica Platform and dedicated bank accounts, while the Government of Jamaica activated the National Disaster Fund and approved contingent credit financing to support relief procurement and distribution. Jamaica also received significant in-kind assistance from regional and international partners, including The Bahamas, Barbados, Cayman Islands, Grenada, Guyana, Trinidad and Tobago, Japan, Switzerland, the United Kingdom, the United States, and the European Union, among others. These contributions comprised shelter materials, mattresses, generators, WASH supplies, food assistance, medical equipment, emergency medical teams, and air-bridge logistics, which were critical in meeting immediate humanitarian needs, particularly in hard-to-reach and heavily affected communities. Multilateral development partners, including the World Bank, further supported the response through damage assessment processes and the activation of risk-financing instruments, providing rapid liquidity for early recovery (NEOC, 2025; CDEMA, 2025; OCHA, 2025). While in-kind assistance can assist with the alleviation of immediate financing pressures during the response phase, the limited valuation of donated goods and services underscores ongoing recovery financing gaps, reinforcing the need for improved cost-tracking, standardized valuation of in-kind contributions, and targeted public investment to address outstanding additional costs related to shelter rehabilitation, continuity of health services, and resilient infrastructure recovery.

**Table II 9:** Monetary Donations

| *Financing Source* | Amount (thousands of JMD) |
|---|---|
| ***Monetary Donations – Support Jamaica Platform*** | |
| *Support Jamaica platform (converted from USD)* | 195,631 |
| *Support Jamaica platform (JMD donations)* | 64,341 |
| ***Monetary Donations – ODPEM Accounts (National Commercial Bank (NCB) Accounts)*** | |
| *ODPEM NCB donations (converted from USD)* | 258,422 |
| *ODPEM NCB donations (JMD donations)* | 292,096 |
| ***Public Financing Mechanisms*** | |
| *National Disaster Fund (approved)* | 350,000 |
| *National Disaster Fund (allocated as at 26 Nov 2025)* | 83,605 |
| *Contingent Credit Facility (approved)* | 1,000,000 |
| ***External Donations & Pledges*** | |
| *Switzerland (SDC)* | 71,110 |
| *United Arab Emirates (via CDEMA)* | 77,500 |
| *United Kingdom (FCDO)* | 1,643,000 |
| *United States of America* | 3,410,000 |
| *The Bahamas* | 310,000 |
| *Belize* | 31,000 |
| *Canada* | 675,000 |

**Table II 9:** Monetary Donations *(continuation)*

| *Financing Source* | Amount (thousands of JMD) |
|---|---|
| *Caribbean Development Bank* | 7,750 |
| *Caribbean Development Fund* | 124,000 |
| *Cayman Islands* | 186,000 |
| *St. Kitts and Nevis* | 15,500 |
| *European Union (ECHO/ERCC)* | 476,000 |
| *World Bank – Catastrophe Bond* | 23,250,000 |
| *CCRIF (Caribbean Catastrophe Risk Insurance Facility)* | 14,800,000 |
| ***Total*** | **47,320,955** |

*Source: DaLA Team, 2025.*

*Note: (1) Information compiled from (NEOC) Situation Report No. 32: Hurricane Melissa Response (28 November 2025); Caribbean Disaster Emergency Management Agency (CDEMA). Hurricane Melissa Situation Report No. 17 (2025). (2) The table presents a non-exhaustive summary of emergency relief and humanitarian assistance reported at the time of the Assessment; additional activities and in-kind contributions may not be captured due to reporting timelines, parallel delivery channels, or data limitations.*

Social

# **Sectors**



# 3 EDUCATION

## Chapter III - Education

The impact of Hurricane Melissa on the education sector was felt across the entire territory of Jamaica; however, serious and systemic damage was predominantly observed in the western part of the island, particularly in the MoESYI administrative regions of Montego Bay (Region 4, comprising the parishes of St. James, Hanover and Westmoreland), Brown's Town (Region 3, parishes of St. Ann and Trelawny) and Mandeville (Region 5, parishes of Manchester and St. Elizabeth).

Jamaica's education system is overwhelmingly public, with more than 90 per cent of total enrolment concentrated in public institutions, a structural characteristic that significantly amplifies the fiscal and service-delivery implications of large-scale damage to the education infrastructure. Approximately two-thirds of all public schools in Jamaica (695 out of 1,033, across primary, secondary, and tertiary levels) reported some level of damage as a result of the hurricane. In addition, 56 private institutions reported damages through the Jamaica Independent Schools Association; however, this figure is certainly an underestimation, as there is no regularly updated registry for all independent schools, and participation in the damage survey was not mandatory. At the pre-primary level, 663 of 2,345 Early Childhood Institutions (ECIs), that serve children aged approximately 3–5 years old were affected.

**"The total cost of Hurricane Melissa for the country's education sector was estimated at JMD 30.3 billion."**

All students were affected at some level, as the entire education system was closed during the week of the event, causing an immediate nationwide disruption of learning. This suspension affected at least 381,349 students enrolled in public primary and secondary schools, 27 thousand students attending private institutions at the same levels, approximately 40 thousand students in the tertiary education sector, and more than 24 thousand children in early childhood development institutions. While many schools gradually resumed operations, at least 95 per cent of all Jamaican schools are projected to reopen only in the next academic term, in January 2026, prolonging learning disruptions for a significant share of students.

Based on a comprehensive assessment of the identified variables, Hurricane Melissa is projected to have imposed an estimated cost of JMD 30.3 billion for Jamaica's education sector. This impact reflects a combination of physical damages—among which roof damage was a major driver, exposing internal structures, furniture, and electrical installations to wind and storm— as well as substantial educational losses resulting from the prolonged suspension of classes in many schools.

**Table III 1:** Summary of the effects in the education sector, in thousands of JMD

| *Effect* | Public | Private | Total |
|---|---|---|---|
| *Damages* | 18,398,790 | 1,130,073 | 19,528,863 |
| *Losses* | 8,999,319 | 1,004,190 | 10,003,509 |
| *Additional costs* | 707,212 | 33,910 | 741,122 |
| **Total** | **28,105,321** | **2,168,173** | **30,273,494** |

*Source: DaLA team using data of the MOESYI, 2025.*

The estimates presented in this section are based on information provided by the Ministry of Education, Skills, Youth & Information (MOESYI) and by the Jamaica Independent School Association (JISA), STATIN

Jamaica, field interviews conducted during the assessment mission, and UNICEF. The estimates were calculated with information received up to January 9, 2026.

## A. Damages

Jamaica's education system is predominantly public, and the assessment of damages is therefore largely anchored in the public education network. The MOESYI maintains an official registry of 1,033 public educational institutions, covering primary, secondary, and tertiary levels, which served as the backbone for the damage assessment. This registry contains baseline information for each institution, including geographic location, enrolment, physical capacity, and numbers of teachers and non-teaching staff, and was complemented after Hurricane Melissa with impact-related variables such as level of damage, preliminary estimates of repair costs, demolition and rubble removal needs, and categories of priority repair. Specifically, the level of damage—described in Table III 2—was used as the primary variable to estimate total repair costs.

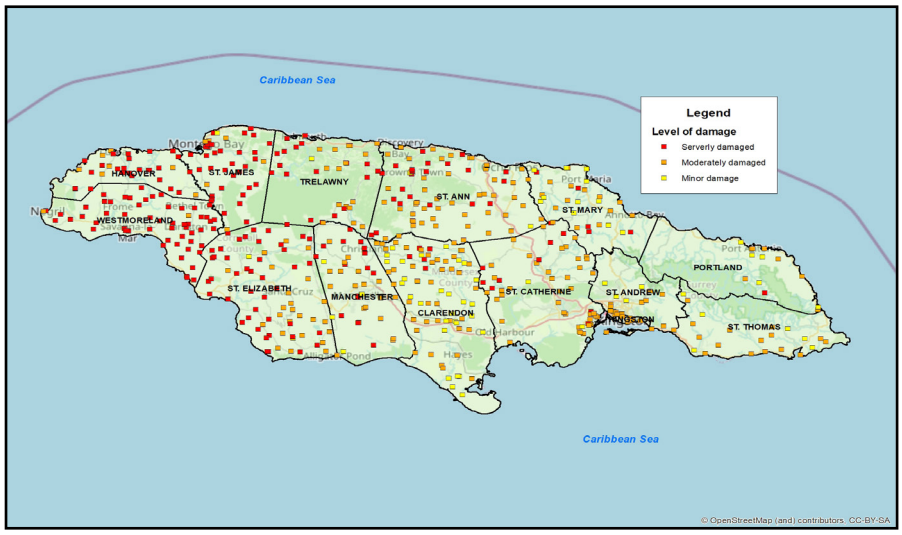
**Table III 2:** Categories of damage in the Education sector, public schools

| *Priority Level* | Number of Schools | Description |
|---|---|---|
| *1 – Severely damaged* | 291 | May affect school reopening. |
| *2 – Moderately damaged* | 325 | Significant repairs. School can operate while repairs are done. |
| *3 – Minor damaged* | 79 | School can operate while repairs are done. |
| ***Total*** | **695** | |

*Source: MOESYI, 2025.*

The primary source for damage estimation was therefore a consolidated school-level database combining pre-disaster baseline information with post-disaster reporting on Hurricane Melissa. Based on this registry, Map III 1 illustrates the spatial distribution of public schools by level of damage across the country. As shown in the map, impacts were reported nationwide, confirming the island-wide reach of the hurricane; however, the most severe damage is clearly concentrated in the western part of the country. Approximately 88 percent of the Priority Level 1 schools are located in three educational administrative regions: Montego Bay (Region 4, parishes of Hanover, St. James, and Westmoreland parishes); Mandeville (Region 5, parishes of Manchester and St Elizabeth), and Brown's Town (Region 3, parishes of Trelawny and St. Ann).

**Map III 1:** Distribution of damaged educational institutions, by level of damage




*Source: DaLA team using data of the MOESYI, 2025.*

Damage reports indicate that roofing repairs were by far the most widespread intervention needed, affecting at least 534 public schools, followed by electrical repairs in 308 schools, repairs to windows and doors in 236 schools, external sanitation and water facilities in 186 schools, kitchens and canteens in 155 schools, and sanitary facilities in 127 schools. In terms of exposure, the affected schools serve a combined capacity of 315,040 students, of which 143,396 correspond to schools classified under damage category 1, 144,172 under category 2, and 27,472 under category 3.

**Image III 1:** Roof destruction in Black River (St. Elizabeth Parish) and Petersfield (Westmoreland Parish)



*Source: DaLA team, 2025.*

While the registry provides broad and consistent geographic coverage, important reporting gaps were identified with respect to preliminary cost estimates, particularly in Mandeville, where only 18 percent of affected schools presented repair cost information, compared with 73 percent in Brown's Town and 97 percent in Montego Bay. Evidence from field visits and qualitative assessments suggests that this lack of cost reporting is indeed closely linked to the severity of impacts in parts of Mandeville, which constrained physical access to schools, reduced administrative capacity, and shifted priorities toward immediate response needs, thereby limiting the ability to produce timely and complete estimates.

While some schools reported the types of damage sustained (e.g., roofing, electrical systems, and sanitation facilities), this information was collected in a binary format (yes/no). As a result, reported roof damage could range from minor leakage affecting a single classroom to the near-total failure of the roof structure. Given this limitation, the assessment prioritized the use of preliminary repair cost estimates by level of damage.

Since it was necessary to input repair costs for a significant number of damaged schools that did not report preliminary monetary values, the assessment relied on a set of methodological assumptions. Repair costs were normalized using school capacity as a proxy for infrastructure size and complexity. Capacity was preferred, rather than enrolment, to reflect more accurately the scale of physical assets and built space.

Initial calculations were done at the regional level. However, while regional averages generally showed limited variation, results proved sensitive to outliers in regions with a small number of reporting schools, which risked distorting estimates. To mitigate this effect, the final estimation applied national average repair costs per unit of capacity for each damage category, ensuring greater stability and coherence across the dataset.

In addition, an adjustment factor of 30 percent was applied to schools included in the national heritage list, reflecting higher repair costs associated with conservation requirements, specialized materials, and regulatory constraints. Following the application of these assumptions, the entire dataset was recalculated, resulting in a significant upward revision of estimated damages to public schools. In parallel, a specific valuation for public Early Childhood Institutions (ECIs) was incorporated into the total sector impact, based on information compiled by the MOESYI, without the application of additional assumptions. The total damages in the public education sector were estimated at JMD 18.4 billion (see Table III 3). This approach strengthens the reliability of the estimates at aggregate and regional levels, while acknowledging that results are less precise at the individual school level, given the necessary use of imputed values.

**Table III 3:** Damages in the Education sector, in thousands of JMD

| *Categories* | Public | Private | Total |
|---|---|---|---|
| *1. Kingston* | 636,550 | 47,983 | 684,534 |
| *2. Port Antonio* | 1,073,340 | 10,155 | 1,083,495 |
| *3. Brown's Town* | 3,066,639 | 150,843 | 3,217,482 |
| *4. Montego Bay* | 5,872,820 | 608,348 | 6,481,168 |
| *5. Mandeville* | 3,110,408 | 203,839 | 3,314,247 |
| *6. Old Harbour* | 2,525,120 | 23,177 | 2,548,297 |
| *7. May Pen* | 2,113,913 | 85,727 | 2,199,640 |
| ***Total*** | **18,398,790** | **1,130,073** | **19,528,863** |

*Source: DaLA team using data of the MOESYI, 2025.*

Table III 3 also presents an estimate of damages for private (independent) schools, which required additional assumptions due to the limited coverage of available data. Private schools are not fully integrated into any national education management information system (IDB, 2021), and the primary source was a damage survey conducted by the Jamaica Independent Schools Association (JISA), with support from the Independent School Branch of the MOESYI. The survey was answered by 71 schools out of an estimated 474 independent schools nationwide. Among respondents, 56 schools reported sustained damage, and only 18 of these provided preliminary repair cost estimates. In the absence of

more comprehensive data, a methodological approach analogous to that used for public schools was applied. Repair costs were estimated per enrolled student, as school capacity data were not available for the independent sector. Given the small number of observations and the similarity of preliminary cost patterns, Priority 2 and Priority 3 damage categories were merged into a single category. This approach allowed for the estimation of repair costs for the 56 damaged schools. Enrolment figures from those 56 damaged schools were then extrapolated to the 15 participating schools that reported no damage, thereby estimating the share of total enrolment captured by the survey.

Finally, based on JISA's estimate of approximately 27,000 students enrolled in private schools nationally (which is consistent with the 2018-2019 school census), a scaling factor of 2.2 was applied to extrapolate the estimated damage from the survey sample to the total private education sector, in proportion to enrollment. That implies that survey respondents were, on average, substantially larger than non-responding institutions, a pattern consistent with the structure of the independent school sector, where larger schools tend to experience more extensive damage, have greater administrative capacity, and stronger incentives to report losses. The resulting total estimate for private schools was then allocated geographically by region, using the regional distribution of the schools reported in the survey.

Finally, estimated repair costs for private Early Childhood Institutions (ECIs), compiled by the MOESYI, were summed to the private sector total damage, resulting in approximately JMD 1.1 billion.

## B. Losses

In the education sector, the concept of losses accounts for the economic value of educational services that are not provided due to school closures or disruptions, as well as the impacts on learning and human development that result from those interruptions.

In practice, measuring the direct impact of a disaster on student learning outcomes in the immediate aftermath is highly constrained by data availability and the short assessment window following an event. As a result, the impact on learning is not directly measured, but rather approached through the financial consequences of school closures.

- For public schools, educational losses are estimated as the cost to the government of educational services that were not delivered during periods of closure or restricted operation.
- For private schools, educational losses are estimated as the cost to families of tuition fees paid for services that were not provided.

Prolonged school closures in Jamaica were driven not only by physical damage but also by the continued use of educational facilities for emergency response purposes. According to official statements, 59 schools still continued to operate as shelters for displaced populations by December 10, 2025, and 44 of them were still serving this function in January 2026. These schools were therefore unable to resume educational activities and were projected to reopen for education purposes only at the start of the next academic term, in January 2026, contributing significantly to the duration and magnitude of educational losses.

**Image III 2:** Petersfield High School (Westmoreland Parish) functioning as a shelter



*Source: DaLA Team, 2025.*

**"Prolonged school closures resulted in substantial educational losses across Jamaica: JMD 10.0 billion."**

As a first step in estimating educational losses, it was necessary to establish the duration and scope of school closures following Hurricane Melissa. School-level information on closures was limited and geographically partial, covering only a small number of institutions and regions, and was therefore insufficient to support a bottom-up estimation. As a methodological alternative, Table III 4 summarizes the key announcements issued by the Government of Jamaica and the MOESYI regarding system-wide school closures and phased reopenings, together with the assumptions adopted in this assessment for the proportion of schools affected at each stage (see Table III 4).

A linear recovery trend was applied between successive announcements with updated numbers on school reopenings. For this assessment, the assumed proportion of school closures was applied uniformly at the national level, affecting the total student population at the same proportion, without further differentiation by educational level, region, or parish. Based on the Government's announcement that all public education institutions are expected to reopen at the start of the new academic term in January 2026, all estimated education losses are allocated to the year 2025. While the full restoration of all school facilities may remain challenging in the short term, the announcement should be interpreted primarily as a policy signal emphasizing the return of all students to class in January, even if in some cases it may initially take place under suboptimal conditions, including the use of temporary installations or the relocation of classes to alternative premises.

**Table III 4:** Closure and reopening announcements of public education institutions and the corresponding impact on educational loss

| *Date* | Event | Estimated Impact |
|---|---|---|
| *Oct 22, 2025* | Schools advised to transition to remote learning from Oct 23. | |
| *Oct 23-24, 2025* | All schools transitioned to remote learning mode. | **50% loss** for all students. |

**Table III 4:** Closure and reopening announcements of public education institutions and the corresponding impact on educational loss *(continuation)*

| Date | Event | Estimated Impact |
|---|---|---|
| *Oct 27-31, 2025* | Melissa hits Jamaica, all schools closed. | **100%** loss for all students during the period. |
| *Nov 3, 2025* | Phased reopening began, 55% of public schools reopened. | Linear progression from **45% loss** in November 3 to 18% loss in November 26 |
| *Nov 26, 2025* | MOESYI announces 845 schools operational (82%) | Linear progression from **18% loss** in November 26 to **15% loss** in December 10. |
| *Dec 10, 2025* | 160 schools remained closed and are not expected to reopen before the next term | **15% loss** until end of school term December 16. |
| *Dec 16, 2025 (Projected)* | Planned end of term if Melissa had not hit the country | **0% loss** |
| *Jan 6, 2026 (Projected)* | Expected reopening of most remaining schools and beginning of new term. | **0% loss** (all students should be having classes, even if the infrastructure is not fully recovered) |

*Source: MOESYI and DaLA team, 2025.*

Educational losses for public schools were then valued by applying daily per-student costs, derived from per capita public expenditure on education by school level reported in the 2018–2019 Education Statistics, and updated to November 2025 prices using the official Consumer Price Index (CPI) for Education (see Table III 5). Estimates for public primary, special, secondary, and tertiary levels were calculated in aggregate. Considering an academic calendar with 190 school days, that annual value corresponds to JMD 1,549 per student, per school day. For public Early Childhood Institutions, the estimated daily per-student cost amounts to JMD 326.

**Table III 5:** Per capita expenditure by school level, in JMD

| School Level | Year 2018-2019 | October 2025 (CPI adjusted) |
|---|---|---|
| *Early Childhood* | 36,707 | 62,035 |
| *Primary Education* | 138,354 | 233,818 |
| *Special Education* | 327,947 | 554,230 |
| *Secondary Education* | 175,969 | 297,388 |
| *Tertiary Education* | 353,664 | 597,692 |

*Source: Statinja; MOESYI and DaLA team, 2025.*

A similar approach was adopted for independent (private) schools. In 2024, the Jamaica Independent Schools Association (JISA) reported that tuition fees ranged from JMD 70,000 to over JMD 300,000 per term, a range that was corroborated through online research conducted for this assessment. On this basis, this analysis adopted an average tuition of JMD 150,000 per term, equivalent to JMD 450,000 per student per year. Assuming a standard academic calendar, this corresponds to an estimated daily cost of JMD 2,368 per student per school day in the private education sector. Applying the same cost-

proportion observed in public schools between Early Childhood Institutions (ECIs) and other education levels, the daily per-student rate for private ECIs was estimated at JMD 499.

Finally, it was assumed that independent schools followed a similar timeline and proportion of reopening as public institutions. After adjusting for the respective enrolment of each sector, the resulting estimates of educational losses are presented in Table III 6. Total educational losses are estimated at JMD 10 billion, comprising JMD 9 billion in public schools and JMD 1 billion in independent schools.

**Table III 6:** Losses in the Education sector, in thousands of JMD

| *Losses* | Public | Private | Total |
|---|---|---|---|
| ***Total (Primary, Secondary)*** | **8,999,319** | **1,004,190** | **10,003,509** |

*Source: DaLA team, 2025.*

## C. Additional Costs

Additional costs refer to expenditures that would not have occurred in the absence of the disaster, and which are incurred to respond to, mitigate, or manage its impacts. In the education sector, these costs arise from emergency actions and temporary measures required to restore minimum operating conditions and support affected students and school communities. In this assessment, additional costs are estimated at JMD 734 million, primarily associated with three components: (i) cleaning and debris removal, (ii) psychological support program, and (iii) emergency assistance measures (see Table III 7).

**Table III 7:** Additional costs in the Education sector, in thousands of JMD

| *Additional costs* | Public | Private | Total |
|---|---|---|---|
| *Debris Removal* | 552,087 | 33,910 | 585,997 |
| *Psychological support program* | 99,144 | - | 99,144 |
| *Emergency Aid* | 55,981 | - | 55,981 |
| ***Total*** | **707,212** | **33,910** | **741,122** |

*Source: DaLA team using data of the MOESYI, 2025.*

Cleaning and debris removal represent the largest component: JMD 585 million, or 79 percent of the total additional costs. The estimation is based on demolition and rubble removal information reported by schools to the MOESYI. However, since only 80 schools provided cost information under this category, an approach analogous to that used for damage estimation was applied. Reported costs were normalized by school capacity, and, due to the limited number of observations, national average costs per unit of capacity were calculated for Priority Level 1 schools, and jointly for Priority Levels 2 and 3. These averages were then used to assign cleaning and debris removal costs to all schools that reported damage, resulting in an estimated total of JMD 552 million for this component. The public-sector cleaning-to-damage ratio was applied to independent schools, adding almost JMD 34 million more to the debris removal estimate.

Estimated values are broadly consistent with the average grants disbursed by MOESYI for cleaning and debris removal. At the aggregate level, however, the resulting total is approximately 70 percent higher than the total official disbursement by November 22 (JMD 350 million). This difference is considered reasonable, as it reflects the fact that schools were required to deal with immediate debris-removal needs in the aftermath of the hurricane, often relying on voluntary labor, community-led clean-up efforts and in-kind services provided at no direct financial cost, but also, in some cases, on informal or

inadequate management practices, such as the burning of residual materials, in the absence of timely resources and technical support.

**Image III 3:** Burning of debris in Black River Primary School, St Elizabeth Parish



*Source: DaLA Team, 2025.*

For psychological support, the MOESYI reported the deployment of 55 Parent Mentors across affected communities and 53 Guidance Counsellors providing tele-counselling services. For estimation purposes, it was assumed that these professionals would provide support over three months, with remuneration equivalent to the average salary of a public-school teacher. Under these assumptions, the cost of the psychological support program is estimated at close to JMD 99 million.

Finally, emergency aid costs reflect in-kind support provided primarily by UNICEF to ensure continuity of education in the immediate aftermath of Hurricane Melissa. This assistance included 420 School-in-a-Box kits, 420 Early Childhood Development kits, 14 tents already installed as temporary learning spaces, and 80 additional tents awaiting clearance at customs. Using UNICEF Supply Catalogue reference prices, the total value of this emergency educational support is estimated at approximately JMD 56 million.



# 4 HEALTH

# Chapter IV - Health

Hurricane Melissa caused significant damage to the health sector, amounting to JMD 13.1 billion in damages, JMD 3.1 billion in losses, and JMD 2.5 billion in additional costs (see Table IV 1). The most severe impacts concentrated on the western parishes of the country, primarily Hanover, St. Elizabeth, St. James, Trelawny, and Westmorland.

Table IV 1: Summary of the effects in the Health sector, in thousands of JMD

| *Effect* | Public |
|---|---|
| *Damages* | 13,091,726 |
| *Losses* | 3,144,358 |
| *Additional costs* | 2,505,640 |
| ***Total*** | **18,741,725** |

Source: DaLA team, 2025.

Hurricane Melissa caused the most significant damage to public health facilities since Hurricanes Gilbert, Dean, Ivan, and Beryl. There were eighteen hospitals (5 of them with sustained damage) and 120 health centers with widespread roof collapses, flooding, and electrical failures. Black River Hospital, located in St. Elizabeth, suffered the most extensive damage. Other health facilities, including five health departments and twelve pharmacies, reported damage to infrastructure and the loss of medicines and medical supplies. Additionally, sixteen vehicles were damaged (13% of the registered total), including ambulances, mobile health services, and vehicles for public health interventions. Hurricane Melissa has highlighted significant vulnerabilities within Jamaica´s health infrastructure, with implications for community resilience in the context of future climate – related emergencies.

The main sources of information used for the sector assessment include reports submitted by the Ministry of Health and Wellness (MOHW). In addition, data and information from the Situation Reports on Hurricane Melissa prepared by the Health Emergency Operations Center (HEOC) and the Pan American Health Organization (PAHO) were considered. Information collected during field visits to the parishes most affected, conducted between November 24 and 28, 2025, was also taken into account. Based on the information received and currently available, the assessed impacts are limited to the public health system.

The georeferenced data used for the estimates in this sector were based on a polygon layer of health infrastructure buildings obtained from the Global Building Atlas generated by the Technical University of Munich (TUM) and German Aerospace Center (DLR). This large-scale open dataset contains building footprints derived from high-resolution satellite imagery.

## A. Damages

To estimate the baseline for damages, two primary sources of information were used. First, a georeferenced layer of health centers and hospitals provided by the National Spatial Management Branch (NSMD), drawing on data from the Ministry of Health and Wellness (MOHW), the MONA Geomatics Institute (MGI), and the Planning Institute of Jamaica (PIOJ). Second, information was obtained directly from MOHW. In addition, to determine the built-up area of health facilities that sustained damage but were not reported by the MOHW, a georeferenced polygon layer from the Global Building Atlas (Technical University of Munich / German Aerospace Center, 2025) was employed.

For the estimation of damages in the health sector, the MOHW provided official reports identifying health facilities affected by the hurricane and describing the structural impacts—whether due to storm surge, flooding, or hurricane-force winds. Each facility was assigned a preliminary rehabilitation cost, and the level of damage was classified as major, medium, or minor (see Table IV 2).

**Table IV 2:** Type of damage health assessment MOHW

| *Type of Damage* | Definition |
|---|---|
| *Major* | More than 60% roof damage. No water storage facility. No electrical backup system. More than 60% of equipment and furniture damaged. More than 6 weeks to effect based repair. |
| *Medium* | Between 30% to 60% of roof damage. Water storage facility available but no water. Generator available but require electrical assessment. Between 30% to 60% of equipment and furniture damaged. 4 – 6 weeks to effect basic repair. |
| *Minor* | Less than 30% of roof damage. Water storage facility available with water source. Generator available and electrical assessment complete. Less than 30% of equipment and furniture damaged. 1 – 4 weeks to effect basic repair. |

*Source: Ministry of Health and Wellness (MOHW), 2025.*

With regard to equipment and furniture, the MOHW provided detailed information on damaged biomedical equipment and furniture along with corresponding replacement costs. This information also included various types of vehicles that were affected and their replacement costs. It should be noted that this level of detail was only available for the five most severely affected hospitals.

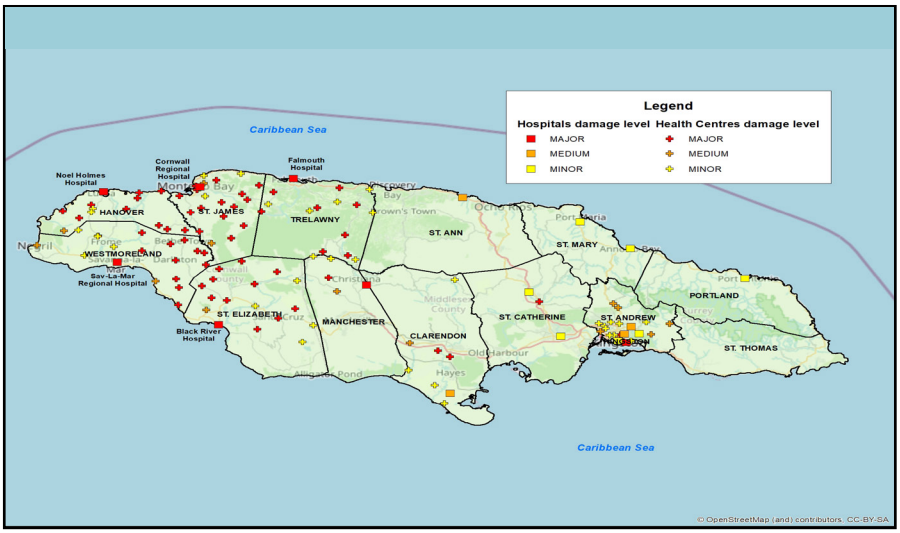
Based on the available information described above, for those health facilities affected by the hurricane for which no data were received, the following assumptions were established:

- Construction typologies: Construction typologies defined in the housing chapter were applied. Categorization was based on field mission observations, the reports received, and supplementary research conducted using open platforms such as Google Earth and Google Maps.
- Build-up area of infrastructure: build-up areas were estimated using the building polygon layer generated by the Global Building Atlas, based on the interpretation of high – resolution satellite imagery.
- Damage level of affected infrastructure: damage percentages were assigned according to the damage levels defined by the MOHW as follows: Major 70 percent; Medium 40 percent, and Minor 10 percent (See Table IV 2). These classifications were based on the damage descriptions provided in the MOHW damage assessment.
- Equipment: for health centres for which no detailed information was available, equipment damage was estimated at 16 percent of the infrastructure damage cost, based on the proportion applied to the affected hospitals.

It is important to note that damages to health facilities were primarily caused by three types of events: hurricane-force winds, flood-related impacts due to excessive rainfall, and storm surge impacts resulting from the proximity of health infrastructure to the coastline.

According to the reports received, a total of 143 health facilities were reported as affected. These include 18 hospitals, 120 health centres, and 5 department offices. Map IV 1 shows the geographical distribution of hospitals and health centres that experienced some level of damage. Additionally, the MOHW reported the destruction of three ambulances, thirteen vector control vehicles, and one staff transport of 29-seaters.

**Map IV 1:** Distribution of damaged educational Geographic distribution of affected Hospitals and Health Centres




*Source: DaLA team using data from the Ministry of Health and Wellness (MOHW), 2025.*

Regarding hospitals, five sustained major damage: one Type A, Cornwall Regional Hospital in St. James; one Type B, Sav-la-Mar Regional Hospital in Westmoreland; three Type C, Falmouth Hospital in Trelawny, Noel Holmes Hospital in Hanover, and Black River Hospital in St. Elizabeth.

The most critical case was Black River Hospital in St. Elizabeth, which sustained severe damage and is currently completely out of service. The hospital´s roof was extensively damaged, with almost the entire structure lost. In addition, doors and windows were damaged, and the wave protection wall collapsed. The laboratory area was destroyed, and the operating room was rendered unusable. Furthermore, due to its proximity to the coastline, the hospital was heavily impacted by storm surge, which destroyed nearly all equipment and furniture as well as the electrical systems and water supply (see Image IV 1).

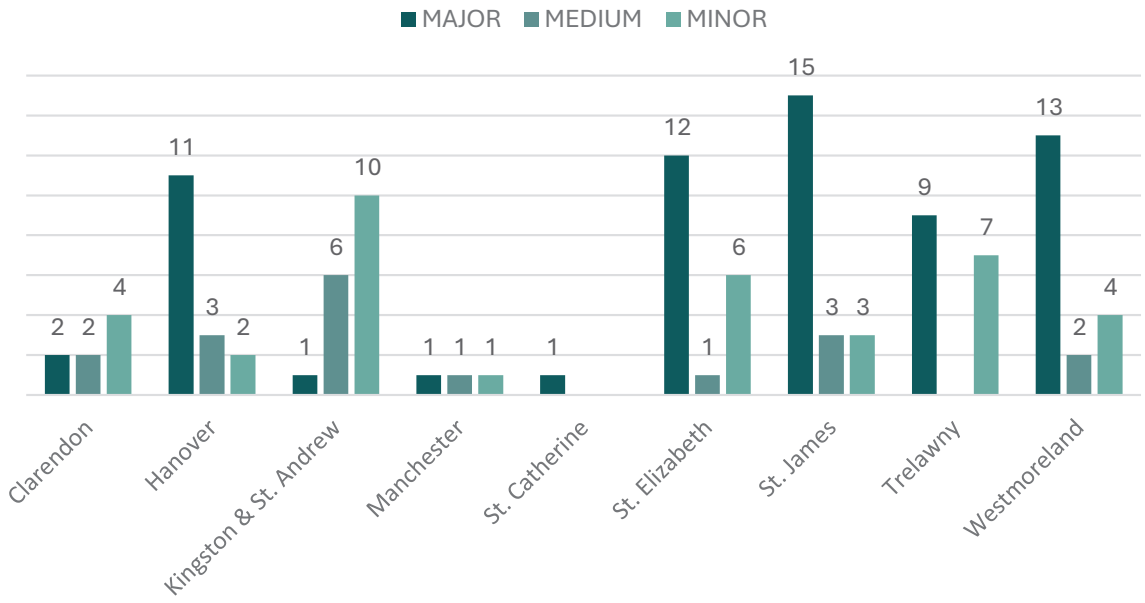
**Image IV 1:** Damages at Type b Hospital Black River, St. Elizabeth




*Source: DaLA Team, 2025.*

In the case of health centers, 120 were reported to have sustained some level of damage. Of these, 44 are Type I, 38 Type II, 31 Type III, 2 are Type IV, 4 are Type V, and 1 is Type VI. Figure IV 1 provides a breakdown of the number of health centers affected by parish and damage level. Based on those figures, 18 percent of the affected health centers are in St. James, 16 percent in Westmoreland, and 14 percent each in Hanover, Kingston & St. Andrews, St. Elizabeth, and Trelawny. The remaining 10 percent are in Clarendon (7%), Manchester (3%), and St. Catherine (1%). It is important to note that most health centers with major damage levels are located in the western part of the country, specifically in St. James, Westmoreland, St. Elizabeth, and Hanover.

**Figure IV 1:** Affected Health Centers by Parish and level of damage




*Source: DaLA Team, 2025.*

Based on the damages described above, total damages are estimated at JMD 13.1 billion of which JMD 11 billion corresponds to infrastructure damage, JMD 1.8 billion to biomedical equipment, JMD 0.1 billion to furniture and equipment, and JMD 0.1 billion to vehicles (see Table IV 3). This estimation does not include the cost of repositioning medicines and medical supplies in the damaged pharmacy services.

St. Elizabeth accounts for the largest share of the total damages at 30 percent, followed by St. James with 16 percent, Westmoreland and Hanover with 14 percent each, and Trelawny with 13 percent. The remaining 13 percent is distributed among Clarendon, Kingston & St. Andrews, Manchester, Portland, St. Ann, St. Catherine, St. Mary, and St. Thomas.

**Table IV 3:** Damages in the Health sector, in thousands of JMD

| Categories | Public | Percent (%) |
|---|---|---|
| *Hospitals infrastructure* | 5,215,387 | 40.0 |
| *Hospitals Biomedical equipment* | 932,178 | 7.0 |
| *Health Centres infrastructure* | 5,695,358 | 44.0 |
| *Health Centres Biomedical equipment* | 911,257 | 7.0 |
| *Hospitals / Health Centres furniture and equipment* | 87,226 | 1.0 |
| *Administrative buildings infrastructure* | 90,608 | 1.0 |
| *Administrative buildings equipment* | 18,112 | 0.1 |
| *Vehicles* | 141,600 | 1.0 |
| ***Total*** | **13,091,726** | **100.0** |

*Source: DaLA team, 2025.*

It is important to mention that 12 pharmacy service facilities located within health centres were damaged, and these were distributed across the most heavily impacted parishes[7] However, as of the closing of this report (01/16/2026), no information has been received detailing the quantities and types of medicines and supplies lost. Consequently, this component has not been included in the overall damage estimate.

## B. Losses

To construct the baseline related to losses, information on the number of medical and administrative staff was compiled through a review of documents available on the websites of the Ministry of Health and Wellness (MOHW) and the Southern Regional Health Authority. In addition, average salaries for medical and administrative personnel were obtained from the MOHW and from the website of the Ministry of Finance and Public Service of Jamaica.

Based on the available information, the following assumptions were made:

- Medical and administrative staff: for health institutions lacking detailed data on medical staff, available information from entities with similar characteristics was used.
- Salaries: Salary levels were estimated using the average of the minimum and maximum values indicated in the medical personnel pay scale published by MOHW, the Ministry of Finance, and the Public Service of Jamaica.
- Closure period of affected health institutions: the number of closure days was determined based on the damage scale reported by the MOHW, as follows: Minor damage, 15 days of closure; Medium damage, 30 days of closure; and Major damage, 45 days of closure.

Losses in the health sector are primarily associated with reduced service delivery to the population and related economic outputs, resulting from the temporary or permanent closure, as well as the reduced functionality of health facilities. This may be due to damage to infrastructure and equipment, inaccessibility caused by flooding or other events that prevented public access, or due to emergency

[7] The storage facilities are: 1) Aberdeen Health Centre; 2) Black River Health Centre; 3) Cambridge Health Centre; 4) Catherine Hall Health Center; 5) Darliston Health Centre; 6) Falmouth Health Centre; 7) Frankfield Health Centre; 8) Maroon Town Health Centre; 9) Mavis Bank Health Centre; 10) New Market Health Centre; 11) Spalding Health Centre; 12) Ulster Spring Health Centre.

preparedness and response. Given that all affected facilities belong to the public sector, losses were estimated based on the duration of closure and the salaries of healthcare workers employed at the facilities that were closed. It is important to mention that at the national level, primary care facilities (Health Centres) suspended service from October 27 to November 7 (12 days) as part of preparedness and response defined by the MOHW[8].

Based on the available information, losses in the health sector are estimated at JMD 3.1 billion, of which 60 percent correspond to losses in Hospitals and 40 percent to Health Centres (see Table IV 4). According to the estimates, the highest losses occurred in Kingston & St. Andrew (14%), followed by St. James (13%), Westmoreland and Manchester (11%), St. Elizabeth (10%), Clarendon (8%), Hanover (7%), and Trelawny (6%) among the most significant.

The closure of health institutions due to infrastructure damage directly affects both access to and the quality of health services provided to the population. In this regard, based on 2024 data from the MOHW, approximately 247,000 patients received care in clinical specialties and radiology services at the five severely affected hospitals, Cornwall Regional Hospital, Sav-la-Mar Regional Hospital, Falmouth Hospital, Noel Holmes Hospital, and Black River Hospital. Considering these figures and the estimated duration of closure of these facilities, it is projected that at least 31,000 patients will be unable to access these health services during the latter part of the year and the beginning of the next.

**Table IV 4:** Losses in the Health sector, in thousands of JMD

| *Parish* | Public | Percent (%) |
|---|---|---|
| *Clarendon* | 262,095 | 8 |
| *Hanover* | 211,307 | 7 |
| *Kingston & St. Andrew* | 445,564 | 14 |
| *Manchester* | 351,993 | 11 |
| *Portland* | 72,611 | 2 |
| *St. Ann* | 194,025 | 6 |
| *St. Catherine* | 164,284 | 5 |
| *St. Elizabeth* | 328,233 | 10 |
| *St. James* | 409,730 | 13 |
| *St. Mary* | 126,238 | 4 |
| *St. Thomas* | 40,340 | 1 |
| *Trelawny* | 190,544 | 6 |
| *Westmoreland* | 347,395 | 11 |
| ***Total*** | **3,144,358** | **100** |

*Source: DaLA team, 2025.*

## C. Additional Costs

Additional costs were estimated based on information received from the MOHW. These costs are associated with expenditures incurred as a result of the emergency and already disbursed by the

[8] This closure was a measure adopted by the MOHW to protect medical and administrative staff at health centers and to comply with the preventive measures established by the government authorities in charge of the emergency. The closure period was applied even to health facilities that did not sustain damage from the event.

MOHW that were necessary to maintain service continuity and manage the emergency. They mainly include attention to injured people, emergency coordination expenses, such as logistic and staff transportation, mental health and psychological support, enhanced disease surveillance, programs for monitoring health conditions, dissemination of key messages to the population primarily in affected areas, training of medical team members, and debris removal and clean-up activities, the temporary rental of infrastructure and equipment and environmental health response. The cost of a stronger referral medical system and operational support for essential services, as well as the cost of forcing patients to travel long distances looking for health care, is not included in this estimation.

According to information provided by the MOHW, 340 individuals were reported injured due to events associated with Hurricane Melissa, with the cost of medical care for these cases estimated at JMD 0.004 billion.

Ongoing expenditures related to health response coordination and logistical support were incurred by the MOHW to ensure effective management and continuity of health services in the affected areas. As of November 30, costs associated with health response coordination are estimated at JMD 0.01 billion, pending final invoicing. In parallel, logistical support costs, primarily related to transportation to personnel, supplies, and operational activities, are estimated at JMD 0.005 billion as of the same date.

Expenditures related to mental health and psychosocial support services amounted to JMD 0.02 billion, reflecting the provision of this service to populations in the Western and Southern Regions. This estimate includes costs associated with the engagement of additional psychologists and counsellors, the transportation of response teams between Kingston and the affected parishes, the organization of training sessions for the delivery of Psychological First Aid, and the printing of materials used for the administration of mental health screening tools.

Additional costs for epidemiological surveillance and risk and disease control programs amounted to JMD 0.07 billion and were used to strengthen surveillance systems and response operations following Hurricane Melissa. These expenditures included the engagement of an ICT/GIS Specialist to support digital surveillance tools and the operation of a situation room, the deployment of 10 Epidemiology/ Surveillance Officers in the affected parishes, and additional support for field activities and data management to ensure timely and accurate disease monitoring and reporting.

As part of the prevention and public health services, the MOHW spent JMD 0.04 billion with the aim of disseminating key information, education, and communication (ICE) messages to the population, particularly in the most affected parishes. This cost includes the placement of fogging notices in newspapers, the printing of health information flyers, and the engagement of town criers to spread health information messaging.

Training of local team members in the operation of the field hospital in Black River commenced on November 21, to facilitate a smooth transition in service delivery once the Emergency Medical Teams (EMT) depart the country. These training activities, fully implemented by the MOHW, aim to ensure operational continuity and strengthen local response capacity. The first two training sessions have been completed, with an associated cost of JMD 0.002 billion.

Furthermore, according to data reported by the MOHW, expenditures related to debris removal and the disposal of destroyed equipment and furniture amount to JMD 0.03 billion. In addition, costs associated with the rental of temporary facilities and equipment are estimated at JMD 0.1 billion.

Finally, the MOHW reported expenditures totalling JMD 2.2 billion under environmental health response. This figure which represents is disaggregated by program areas and reflects the estimated costs for the response to Hurricane Melissa: a) Environmental Health comprising three subcomponents: food

safety, vector control and water and sanitation (JMD 1.4 billion); b) Medical Solid Waste Management (JMD 0.05 billion): c) Non-communicable Diseases (NCDs) (JMD 0.03 billion; d) Veterinary Public Health (JMD 0.02 billion); e) Nutrition (JMD 0.6 billion); f) HIV/STI/TB (JMD 0.04 billion); g) Health Promotion and Education (JMD 0.07 billion).

Based on the information described above, additional costs are estimated at JMD 2.5 billion (see Table IV 5). The largest share corresponds to environmental health response, accounting for 87 percent, followed by epidemiological surveillance and risk and disease control programmes at 3 and health response coordination at 3 percent among the most significant cost items.

**Table IV 5:** Additional costs in the Health sector, in thousands of JMD

| *Category* | Public | % |
|---|---|---|
| *Attention of injured people (340)* | 4,187 | 0.2 |
| *Health response coordination* | 7,500 | 3.0 |
| *Logistic support* | 4,500 | 2.0 |
| *Emergency medical teams - EMT (training local health staff)* | 1,975 | 1.0 |
| *Travel expenses for health personnel* | 5,000 | 2.0 |
| *Prevention and public health services: Information and education* | 42,252 | 1.7 |
| *Cleaning up, debris removal and damage equipment disposal* | 30,000 | 1.2 |
| *Short-term leases/temporary relocation & equipping for continuity of operations* | 100,000 | 4.0 |
| *Mental health and psychosocial support* | 17,304 | 0.7 |
| *Epidemiological surveillance and risk and disease control programmes* | 74,500 | 3.0 |
| *Environmental Health response* | 2,218,422 | 88.5 |
| ***Total*** | **2,505,640** | **100.0** |

*Source: DaLA team, 2025.*



# 5 HOUSING

# Chapter V - Housing

The housing sector suffered extensive damage from Hurricane Melissa. The most affected parishes are Westmoreland, St. Elizabeth, and St. James, accounting for 91.6 percent of the total damage. This assessment has distinguished four levels of damage: minor (damage to windows and doors), moderate (damage to roofing sheets), severe (damage to roof structures and metal sheets), and destruction. In those parishes where stone, brick, or concrete walls with metal roofing predominate, most of the walls suffered minor damage, and the damage was mainly to the roofs.

In events of this magnitude, it is almost impossible to conduct a census of the affected dwellings; therefore, an estimation must be made. In this case, the analysis of the affected parishes is based on information from Copernicus building damage maps and on the selection of dwellings within the affected area using a polygon filter between 40 and 250 $m^2$. In addition, wind intensity was derived from the Hurricane Melissa Maximum Sustained Wind (MSW) dataset, based on the Holland wind field model.

The total cost of Hurricane Melissa for the housing sector was estimated at JMD 767.8 billion, attributed to damages amounting to JMD 688.2 billion, losses amounting to JMD 6.6 billion, and additional costs amounting to JMD 73 billion. The damage was caused by strong winds and, in specific areas, by storm surges and flooding. These estimates were made based on field visits, institutional interviews, and analysis of georeferenced data.

The greatest impact on the housing sector corresponds to the private sector, amounting to JMD 693.8 billion, primarily involving damage to residential properties and household goods. The public sector was affected by a total of JMD 74.1 billion, which corresponds to the removal and final disposal of debris, adaptation and operation of shelters, as well as institutional costs for field assessments, assistance, and monitoring of affected families.

**Table V 1:** Summary of the effects in the Housing sector, in thousands of JMD

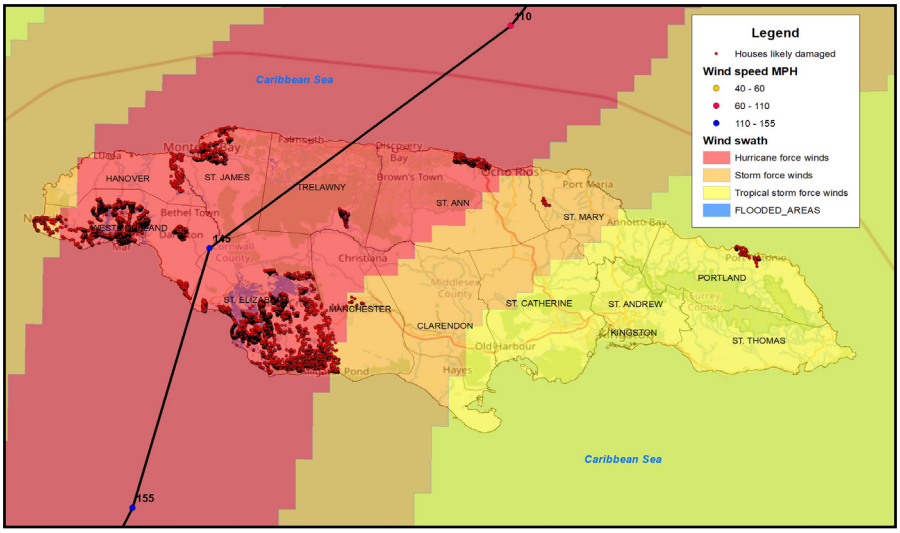
| *Effect* | Public | Private | Total |
|---|---|---|---|
| *Damages* | 1,010,146 | 687,159,476 | 688,169,622 |
| *Losses* | | 6,590,559 | 6,590,559 |
| *Additional costs* | 73,042,791 | | 73,042,791 |
| ***Total*** | **74,052,932** | **693,750,036** | **767,802,973** |

*Source: DaLA team, 2025.*

The methodology employed to estimate damage, losses and additional costs incorporated several inputs: a) data from the Ministry of Labour and Social Security; b) interviews with institutions such as the ODPEM, the National Housing Trust (NHF), the Housing Association of Jamaica (HAJ) and the PIOJ; c) field visits to settlements such as Black River, Savanna La Mar, Belmont, White House and Montego Bay; d) verification of housing construction costs by type of construction; e) geospatial analysis utilizing a range of international data sources.

The following maps illustrate the geographic concentration of housing impacts associated with Hurricane Melissa, combining hazard exposure mapping and before and after satellite imagery. These images indicate that surrounding coastal neighborhoods represent areas where housing structures potentially experienced more severe and concentrated damage, consistent with their location in storm-exposed coastal zones and proximity to flood-prone environments.

**Map V 1:** Houses likely damaged based on wind speed




*Source: Copernicus, National Hurricane Center (NHC), 2025.*

**Map V 2:** Affected Areas Before and After Hurricane Melissa

(a) Before Hurricane Melissa



(b) After Hurricane Melissa



*Source: (a) Vantor Imagery, 2024; (b) NOAA Hurricane Melissa Imagery, 2025.*

**Map V 3:** Image Zone, Black River




*Source: DaLA team, 2025.*

## A. Damages

The baseline establishes disaggregated information on dwellings by parish, according to construction material, in the affected areas. Information was organized according to the predominant construction material categories in the 2011 Population and Housing Census, as comparable data is not available from the 2022 census.

A general analysis of the predominant housing types in the most affected parishes indicates that 65.2 percent of dwellings are built with concrete and block walls with metal roofing, while 23.1 percent featured wooden walls with metal roofs. All other housing types account for a very small percentage of the affected parishes.[9]

An analysis of the three most affected parishes reveals that in Westmoreland, 56.7 percent of buildings consist of wooden walls with metal roofs. In St. Elizabeth, concrete and block walls with metal roofing buildings account for 81.7 percent. Similarly, this construction type is predominant in St. James, where it represents 66.1 percent of dwellings.

**Table V 2:** Baseline of Housing typology (construction materials of roof and outer walls)

| *Parish* | Dwellings | Stone and Brick-concrete roof | Concrete and Blocks - sheet metal | Wood-sheet metal | Wood-plasterboard+ sheet metal | Other |
|---|---|---|---|---|---|---|
| *Portland* | 27,447 | 21 | 16,069 | 7,011 | 4,067 | 300 |
| *St Mary* | 38,660 | 54 | 20,443 | 12,231 | 5,253 | 734 |
| *St Ann* | 62,512 | 5,235 | 49,695 | 4,928 | 2,251 | 403 |
| *Trelawny* | 30,194 | 4,132 | 18,345 | 6,915 | 679 | 123 |
| *St James* | 70,686 | 6,992 | 46,731 | 16,660 | 143 | 160 |
| *Hanover* | 25,942 | 3,743 | 9,796 | 12,229 | 113 | 61 |

[9] The 2010 and 2022 censuses do not record the type of roof in dwellings; therefore, a proxy was constructed using data from the 2001 census, which includes roofing materials in Table 6.8. This proxy is applied conservatively in combination with data from the 2022 census, since none of the censuses provide a joint classification of wall and roof materials.

**Table V 2:** Baseline of Housing typology (construction materials of roof and outer walls) *(continuation)*

| *Parish* | Dwellings | Stone and Brick-concrete roof | Concrete and Blocks - sheet metal | Wood-sheet metal | Wood-plasterboard+ sheet metal | Other |
|---|---|---|---|---|---|---|
| *Westmoreland* | 54,624 | 6,385 | 16,946 | 30,993 | 185 | 115 |
| *St Elizabeth* | 54,392 | 3,398 | 44,439 | 4,679 | 1,135 | 741 |
| *Manchester* | 61,996 | 2,193 | 55,434 | 2,764 | 1,000 | 605 |
| ***Total affected Parishes*** | **426,453** | **32,153** | **277,899** | **98,411** | **14,824** | **3,242** |

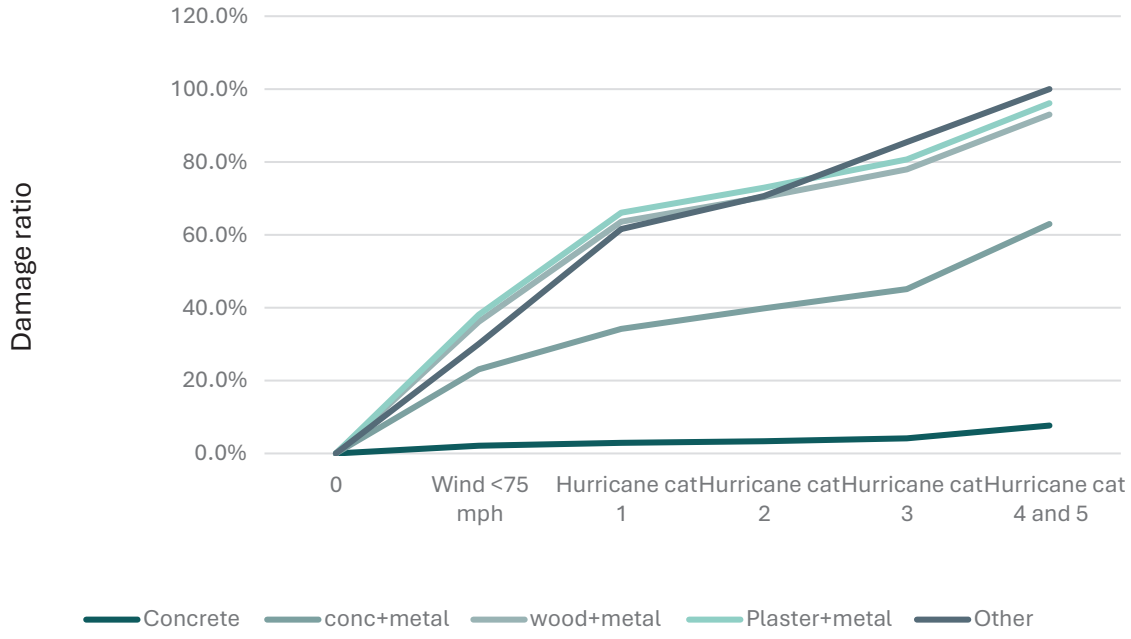
*Source: DaLA team using data from 2001, 2011, 2022 population and housing census.*

Figure V 1 presents the correlation between various construction types and the extent of damage caused by hurricane-force winds. Residences built with stone, brick, or concrete walls combined with concrete roofs demonstrate the highest resistance to damage, displaying minimal incidence rates according to baseline data. Structures featuring concrete and block walls accompanied by metal roofs represent an average standard of construction and are associated with moderate to severe damage levels.

Conversely, other construction types, particularly wooden walls with metal roofing buildings, exhibit significant vulnerability to hurricane-force winds, with complete destruction observed primarily among these less robust technologies. These correspond to dwellings mostly located in informal settlements and rural fishers and farmers' communities.

The vulnerability curves were developed by aggregating and calibrating costs for each type, based on comparable events within the Caribbean region.

**Figure V 1:** Vulnerability to wind speed according to building type




*Source: DaLA team, 2025.*

**Image V 1:** Damage Houses



*Source: DaLA team, 2025.*

This chapter uses data from the Jamaica Housing Damage Impact and Needs Assessment (JHDINA) conducted by the MLSS. That assessment classifies dwellings according to the damage suffered into five categories: no damage; no significant damage or Level 1; minor damage or Level 2; major damage or Level 3; and destroyed or Level 4. In total, 86,616 households were assessed (see Table V 3). As a result of the assessment, estimates indicate that 16 percent of homes were destroyed, 36 percent suffered major damage, 36 percent suffered minor damage, 9 percent suffered no significant damage, and 2 percent suffered no damage.

The affected households are heavily concentrated in Westmoreland and St. Elizabeth, both of which emerge as the most affected areas. Westmoreland accounts for the highest share of the national impact, representing 22.9 percent of all households assessed (19,807) and 22.3 percent of total affected persons (58,243). St. Elizabeth follows with 19.2 percent of households and 18.8 percent of the affected population. Together, these two parishes alone contain over 41 percent of the individuals impacted nationally. Rounding out the top five parishes for total affected persons are St. James (13.3%), St. Ann (10.6%), and Hanover (6.6%).

When focusing on high-severity structural damage—defined as Level 3 (Major Damage) and Level 4 (Totally Destroyed)—the concentration in the top parishes becomes even more pronounced. Westmoreland and St. Elizabeth collectively account for 53.6 percent of all Level 3 and Level 4 damage recorded in the country. Specifically, Westmoreland accounts for 32.3 percent (14,753 households) and St. Elizabeth for 21 percent (9,575 households) of the national total for these high-severity categories. The remaining top parishes for severe structural impact include St. James (14%), St. Ann (8.0%), and Hanover (7.7%), highlighting that those five parishes are responsible for nearly 83 percent of the most critical housing damage.

The total damage in the affected area amounts to JMD 687.1 billion. Analyzing the damage by parish, the most affected was Westmoreland, with a total of JMD 171.7 billion, representing 24.9 percent, while in St. Elizabeth it amounted to JMD 126.3 billion, representing 18.4 percent, and in third place is St.

James with an amount of JMD 91.8 billion, representing 13.4 percent. The damage includes damage to household goods in the affected homes, amounting to JMD 90.1 billion. The public buildings affected by the Hurricane are police stations in different parishes, amounting to JMD one billion.

**Table V 3:** Damages in the Housing sector, in thousands of JMD

| Parish | Quantity | Number of dwellings affected | | | | Total Affected Persons | Damages (Thousands JMD) |
|---|---|---|---|---|---|---|---|
| | | Level 1 | Level 2 | Level 3 | Level 4 | | |
| ***Dwellings*** | **85,127** | **8,146** | **31,294** | **31,557** | **14,130** | **261,527** | **687,069,406** |
| *Hanover* | 6,196 | 467 | 2,215 | 2,350 | 1,164 | 17,256 | 48,911,165 |
| *Clarendon* | 3,024 | 338 | 1,651 | 957 | 78 | 9,917 | 20,765,548 |
| *Kingston* | 140 | 26 | 100 | 11 | 3 | 463 | 782,555 |
| *Manchester* | 3,734 | 464 | 1,749 | 1,374 | 147 | 13,044 | 26,362,072 |
| *Portland* | 3,257 | 204 | 2,052 | 920 | 81 | 9,869 | 32,743,301 |
| *St. Andrew* | 591 | 105 | 340 | 124 | 22 | 1,744 | 5,251,580 |
| *St. Ann* | 8,383 | 804 | 3,908 | 3,236 | 435 | 27,686 | 61,365,330 |
| *St. Elizabeth* | 16,147 | 1,795 | 4,777 | 7,181 | 2,394 | 49,100 | 126,247,508 |
| *St. James* | 11,584 | 944 | 4,263 | 3,827 | 2,550 | 34,858 | 91,829,499 |
| *St. Mary* | 4,268 | 1,081 | 2,369 | 717 | 101 | 13,499 | 34,742,522 |
| *St. Catherine* | 3,080 | 551 | 1,996 | 478 | 55 | 10,594 | 26,699,760 |
| *St. Thomas* | 273 | 69 | 172 | 20 | 12 | 868 | 2,127,807 |
| *Trelawny* | 4,728 | 331 | 1,700 | 2,030 | 667 | 14,386 | 37,511,528 |
| *Westmoreland* | 19,722 | 967 | 4,002 | 8,332 | 6,421 | 58,243 | 171,729,227 |
| ***Household goods*** | **45,687** | | | | | | **61,869** |
| *Household goods damage* | | | | 40,392 | 21,477 | | 61,869 |
| ***Public buildings*** | | | | | | | **1,010,146** |
| *Police stations damaged* | 76 | 19 | 20 | 37 | 0 | | 1,010,146 |
| ***Total damage*** | | | | | | | **688,169,622** |

*Source: DaLA team, 2025, based on MLSS based on JHDINA Hurricane Melissa Relief Dashboard.*

**Table V 4:** Damages in the Housing sector by ownership, in thousands of JMD

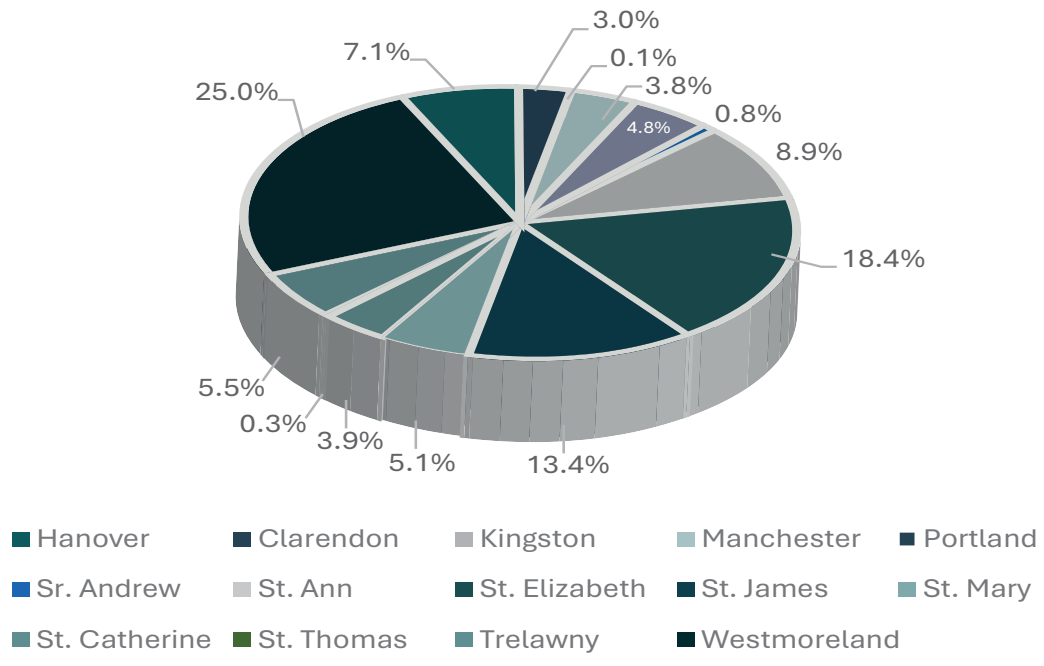
| | Public | Private |
|---|---|---|
| ***Dwellings*** | | |
| *Hanover* | | 48,911,165 |
| *Clarendon* | | 20,765,548 |
| *Kingston* | | 782,555 |
| *Manchester* | | 26,362,072 |
| *Portland* | | 32,743,301 |
| *Sr. Andrew* | | 5,251,580 |

**Table V 4:** Damages in the Housing sector by ownership, in thousands of JMD *(continuation)*

| | Public | Private |
|---|---|---|
| *St. Ann* | | 61,365,330 |
| *St. Elizabeth* | | 126,247,508 |
| *St. James* | | 91,829,499 |
| *St. Mary* | | 34,742,522 |
| *St. Catherine* | | 26,699,760 |
| *St. Thomas* | | 2,127,807 |
| *Trelawny* | | 37,511,528 |
| *Westmoreland* | | 171,729,227 |
| *Household goods* | | 90, 069,800 |
| *Household goods damage* | | 90,069,800 |
| *Public buildings* | 1,010,146 | |
| *Police stations damaged* | 1,010,146 | |
| ***Total damage*** | **1,010,146** | **688,169,622** |

*Source: DaLA team, 2025.*

**Figure V 2:** Damage per Parish




*Source: DaLA team, 2025.*

## B. Losses

The estimate of losses within the housing sector pertains to foregone rental income or uncollected revenue from residences that suffered moderate to severe damage or destruction. The baseline for this estimate was the percentage of rental properties based on data from the 2011 population and housing census for each parish.

Total losses from uncollected rent amount to JMD 6.5 billion, equivalent to the rent for the homes for an estimated period of three months for mild damage, nine months for severe damage, and 14 months for destroyed houses[10].

**Table V 5:** Losses in the Housing sector, in thousands of JMD

| *Parish* | Affected houses (level 2, level 3, level 4) | Percentage rented (%) | Rented houses affected | Losses of income |
|---|---|---|---|---|
| *Hanover* | 5,729 | 11.1 | 635 | 2,091 |
| *Clarendon* | 2,686 | 14.7 | 395 | 97,737,711 |
| *Kingston* | 114 | 31.9 | 36 | 80,986,063 |
| *Manchester* | 3,270 | 20.2 | 661 | 12,023,963 |
| *Portland* | 3,053 | 15.1 | 459 | 32,104,646 |
| *St. Andrew* | 486 | 30.3 | 147 | 97,382,426 |
| *St. Ann* | 7,579 | 18.5 | 1,401 | 62,236,220 |
| *St. Elizabeth* | 14,352 | 11.7 | 1,680 | 21,972,622 |
| *St. James* | 10,640 | 20.7 | 2,200 | 1,075,144,258 |
| *St. Mary* | 3,187 | 13.6 | 433 | 1,389,455,006 |
| *St. Catherine* | 2,529 | 19.5 | 493 | 72,092,924 |
| *St. Thomas* | 204 | 15.1 | 30 | 83,272,090 |
| *Trelawny* | 4,397 | 15.7 | 688 | 11,060,185 |
| *Westmoreland* | 18,755 | 10.1 | 1,899 | 418,934,715 |
| ***Total*** | **76,981** | | **11,157** | **6,590,559,288** |

*Source: DaLA team, 2025.*

## C. Additional Costs

The items incurring additional costs pertain to the removal and final disposal of debris, the adaptation and operation of shelters, as well as institutional expenditures related to damage assessment and assistance for affected families. The aggregate amount of these additional costs amounts to JMD 73 billion.

The cost of debris removal and final disposal amounts to JMD 66 billion, which includes all parishes. The adaptation of shelters, most of which are educational centers that were used for this purpose, was estimated at JMD 0.153 - 6.6 billion, based on institutional information. Similarly, the operation of shelters to care for affected families amounts to JMD 0.013 billion.

Finally, an institutional cost was estimated for the transfer of personnel to the field to assess the damage and assist families, which amounts to JMD 6.8 billion.

[10] The Jamaica Survey of Living Conditions provides data on a wide range of variables, including housing tenure, household expenditure on mortgages and rent, and ownership of durable goods. These data constitute a valuable baseline for strengthening and validating the estimates presented in this chapter. The most recent edition of the survey was published in 2021.



# 6 CULTURE

## Chapter VI - Culture

Hurricane Melissa caused an unprecedented level of disruption to Jamaica's cultural heritage. Cultural assets in Jamaica encompass a wide range of sites and institutions, including historic buildings, places of worship, museums, educational institutions, and community heritage spaces, many of which carry layered historical, social, and symbolic meanings and play an important role in social cohesion, cultural continuity, and livelihoods linked to cultural and tourism activities. Damage to these assets, therefore, entails not only material loss but also disruptions to collective memory, identity, and the transmission of cultural practices.

Some heritage buildings in Jamaica continue to serve active public functions, which has implications for how their damages and losses are accounted for in the DaLA assessment. For example, Manning's High School in Westmoreland and Munro College in St. Elizabeth, although formally recognized as heritage buildings, are operational educational facilities; therefore, the damages and associated economic losses for those structures are included within the Education sector assessment, given the priority and functional relevance of the education system. By contrast, many of the courthouses affected by the hurricane are also heritage buildings, but because their primary value is linked to their historical and cultural significance, their damages are included within the Culture sector assessment. In such cases, even when a building performs an additional public function, the evaluation considers the degree to which its heritage value has been compromised, particularly when the structure is essential for safeguarding Jamaica's cultural patrimony.

Unlike previous major events such as Hurricane Gilbert, no comprehensive measurement of cultural impacts had ever been undertaken, and the country did not have a baseline dataset detailing the structural characteristics of its cultural assets. This assessment, therefore, represents a significant step forward, both in terms of methodological development and institutional understanding of the sector's vulnerabilities.

The results reveal a geographically differentiated pattern of impacts, with the most severe damages concentrated in the parishes of St. Elizabeth, St. James, Westmoreland, and Trelawny, a finding consistent with the findings in other sectors. The unprecedented scope of the assessment, coupled with the absence of prior systematic documentation, underscores the importance of strengthening cultural asset inventories and integrating the Culture Sector more explicitly into national disaster risk management frameworks going forward.

The observed pattern of damage also reflects structural vulnerabilities that are common to many cultural assets in Jamaica. A significant share of historic buildings and heritage sites are characterized by advanced age, traditional construction materials, and limited structural adaptation to extreme weather events. Many are in areas exposed to flooding, landslides, or coastal hazards, reflecting historical settlement patterns rather than risk-informed planning. In addition, long-standing constraints related to maintenance, retrofitting, and access to risk-sensitive conservation measures, as identified through stakeholder consultations and site-level analysis, have increased the susceptibility of cultural assets to climate-related shocks.[11] These factors help explain the severity of impacts observed in several parishes and underscore the importance of incorporating disaster risk considerations more systematically into heritage management and cultural policy.

The effects of Hurricane Melissa on the culture sector are summarized in Table VI 1. Total damages amount to JMD 5 billion, while documented losses derived primarily from cancelled events and interrupted venue rentals reach JMD 14 million. Additional costs, total JMD 253 million. Together, these effects result in an overall impact of JMD 5.2 billion for those components that could be quantified

[11] UNESCO (2010). Managing Disaster Risks for World Heritage. UNESCO, ICCROM, ICOMOS, IUCN.

under the DaLA methodology. It is important to underscore that these monetary figures reflect only those cultural activities for which concrete financial data were available, meaning they represent only a partial view of the true impact experienced by the sector.

**Table VI 1:** Summary of effects in Culture and Cultural Assets, in thousands of JMD

| *Effect* | Public | Private | Total |
|---|---|---|---|
| *Damages* | 1,440,963 | 3,517,714 | 4,958,677 |
| *Losses* | 7,491 | 6,789 | 14,280 |
| *Additional costs* | 252,980 | | 252,980 |
| ***Total*** | **1,701,433** | **3,524,503** | **5,225,936** |

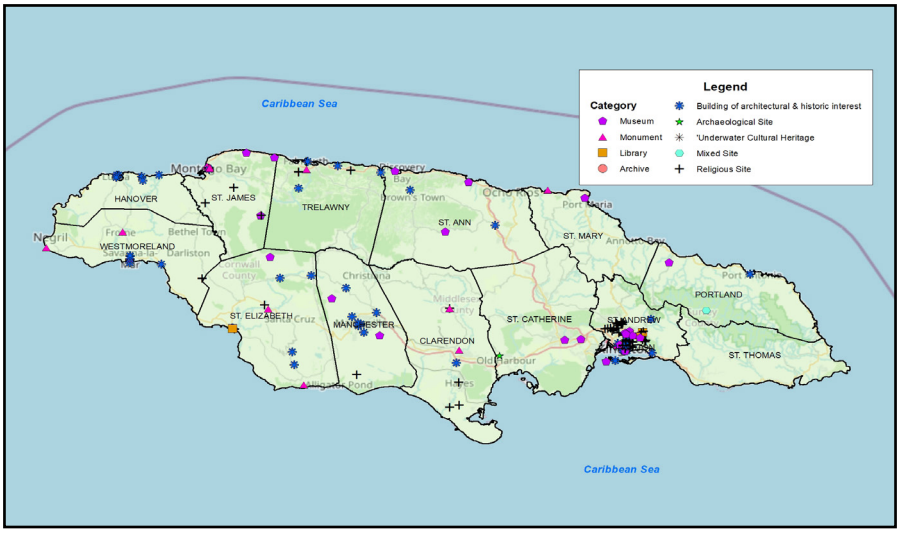
*Source: DaLA team, 2025.*

The information in this chapter is based on meetings organized by the Ministry of Culture, Gender, Entertainment and Sport (MCGES) of Jamaica, in which the main stakeholders of the sector participated. It is important to highlight that the data used were provided by the Jamaica Cultural Development Commission (JCDC), the Jamaica National Heritage Trust (JNHT), Jamaica Conservation and Development Trust (JCDT), along with preliminary processing carried out by UNESCO and public geospatial layers: GIS, OpenStreetMap, and building footprints. This processing included the use of satellite imagery to compare the conditions of sites before and after the hurricane, enabling the identification of those that were affected or damaged.

## A. Damages

The assessment of damages caused by Hurricane Melissa in Jamaica's Culture Sector is based on a technical approach that combines document review, satellite and field-image analysis, and available geospatial information. This methodology ensures consistent, comparable, and transparent estimates in line with the DaLA framework. As in any sector, the first step involves the analysis of the situation before the disaster. Based on data from the JNHT, Map VI 1 shows the cultural sites classified by category: archeological site, building of architectural and historic interest, library, monument, museum, and religious site. There is a highly uneven distribution of Jamaica's cultural sites across categories, with religious sites comprising the largest share at 40 percent, reflecting their historical and social prominence in the country's cultural landscape. Buildings of architectural and historical interest form the second-largest category at 33 percent, underscoring the significance of built heritage in national identity. Museums account for 16 percent, while monuments contribute 8 percent, together representing institutional and commemorative dimensions of cultural preservation. In contrast, libraries (2%) and archaeological sites (1%) constitute only a small fraction of the total.

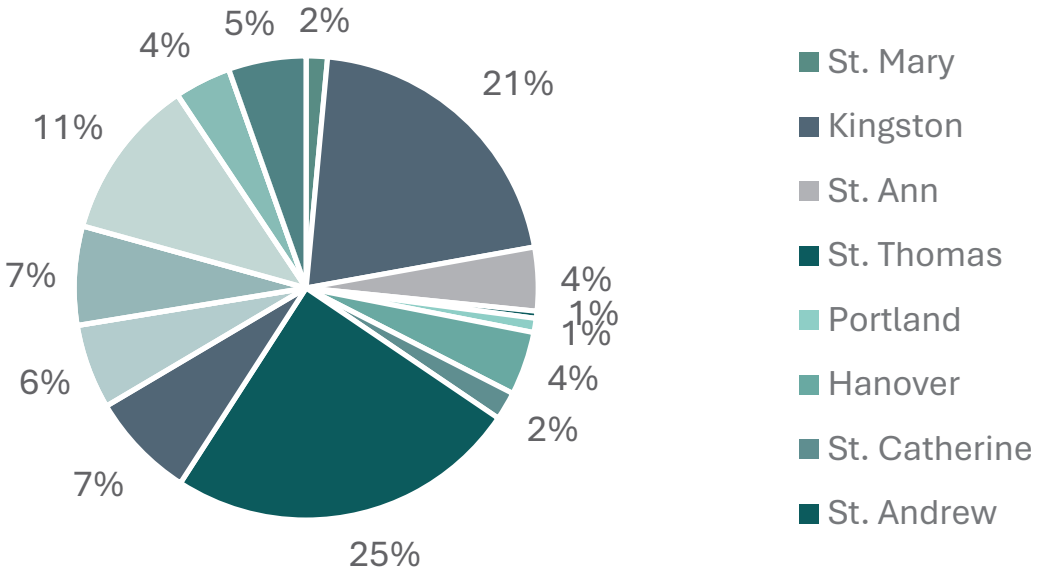
**Map VI 1:** Jamaica: Cultural sites by category




*Source: DaLA team using data from the JNHT, 2025.*

Figure VI 1 reveals a pronounced concentration of Jamaica's cultural sites and repositories within the parishes of St. Andrew and Kingston, which together account for nearly half of all documented locations. This distribution is consistent with the demographic reality that these parishes contain a substantial share of the national population and have long served as the country's principal centers of cultural, administrative, and institutional activity.

**Figure VI 1:** Jamaica: Cultural sites by parish




*Source: DaLA team using data from the JNHT, 2025.*

The damage assessment is based on an analysis of pre- and post-event satellite imagery conducted by UNESCO, through which 202 cultural sites were classified as destroyed, severely damaged, moderately damaged, possibly damaged, or showing no visible damage. This analysis was complemented and refined by field assessments carried out by the JNHT, which collected before-and-after photographic evidence for 45 sites. This latter component proved essential, as it enabled the exclusion of two sites from the satellite-based assessment (Balaclava Railway Station and Savanna-la-Mar Baptist Church) after confirming that they had been destroyed before the hurricane. Map VI 2 presents the cultural sites that, according to this assessment, exhibit some degree of damage. Notably, 73 percent of cultural sites

in St. Elizabeth sustained damage, compared to 64 percent in Westmoreland, while the corresponding proportions in Trelawny, Manchester, and Clarendon were 35 percent, 17 percent, and 13 percent, respectively. Furthermore, 75 percent of all destroyed sites in Jamaica are located in St. Elizabeth, and 40 percent of the sites with damage in this parish were classified as destroyed.

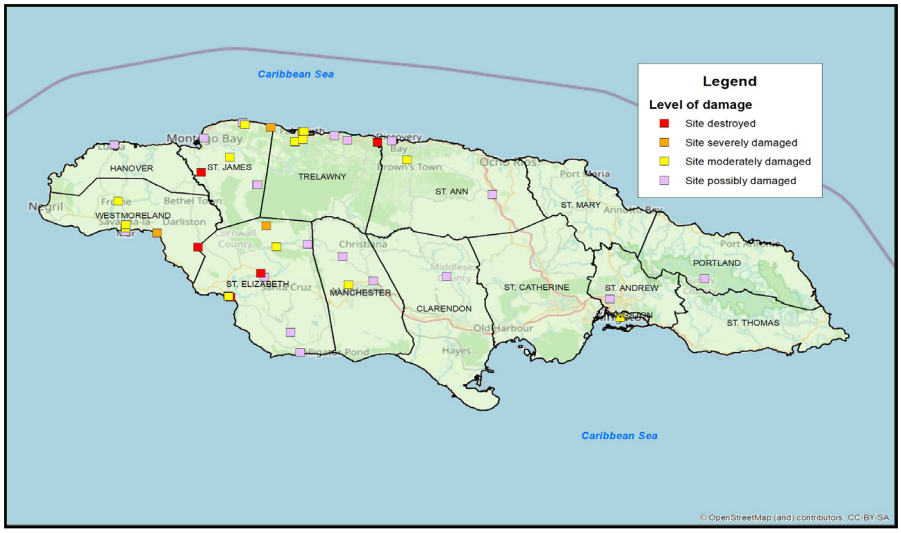
These results are particularly significant given the cultural value of many of the affected sites, which are characterized by substantial historical depth and strong local or national relevance. The parishes with the highest concentration of damage host a wide range of tangible cultural assets, including historic civic buildings, religious sites, monuments, and plantation-era structures that have played a central role in Jamaica's social, political, and economic history and continue to shape collective memory and identity.

In Trelawny, for example, damage affected the Falmouth Courthouse, a key component of one of the Caribbean's best-preserved Georgian towns. The building forms part of a coherent historic urban ensemble that reflects the economic and administrative importance of Falmouth during the height of the plantation economy, and it has long functioned as a symbol of colonial-era civic administration, governance, and public life. Damage to such a site therefore affects not only an individual structure, but also the integrity and legibility of a historic townscape of exceptional cultural significance (JNHT, 2025). In St. Elizabeth, impacts were recorded at landmark sites such as the Lovers' Leap Lighthouse, a nationally recognized monument that combines maritime heritage with a widely shared cultural narrative rooted in oral tradition and collective memory. Beyond its functional role as a navigational aid, the site is closely associated with one of Jamaica's best-known legends, giving it a symbolic value that extends well beyond its physical attributes and making it a prominent reference point in the cultural landscape of the parish (JNHT, 2025).

In St. James, impacts were recorded at internationally recognized heritage sites such as Rose Hall Great House and Greenwood Great House. These plantation-era structures are central to the interpretation of Jamaica's history of slavery and plantation society, offering complementary narratives through architectural form, material culture, and curated historical interpretation. They also constitute key assets within Jamaica's heritage tourism economy, linking historical memory with contemporary economic activity. Damage to these sites, therefore, has implications not only for physical heritage conservation but also for education, interpretation, and the cultural economy (JNHT, 2025).

The concentration of damage in these areas thus reflects not only the extent of physical impact, but also the exposure of highly significant cultural assets whose value derives from their historical associations, symbolic meanings, and ongoing social and economic roles. This underscores the importance of examining the affected zones in greater detail, taking into account both the cultural importance of the assets located within them and the implications for recovery, safeguarding, and long-term resilience.

**Map VI 2:** Jamaica: Cultural Sites Classified by Damage Severity




*Source: DaLA team using data from UNESCO, 2025.*

## 1. Estimations

For the purpose of explaining the procedure used for estimating the damages, the example of the St. Elizabeth Parish Church will be used. The St. Elizabeth Parish Church in Black River constitutes a cornerstone of the parish's historical, social, and cultural development. The original parish church on this site dates to around 1700, making it one of the oldest continuously used religious sites in Jamaica. Beyond its architectural value, the church embodies layered histories of colonial administration, slavery, emancipation, and post-emancipation society. The church has had a longstanding role not only as a place of worship, but also as a focal point for community life, education, and social organization over more than three centuries. As part of the Black River Protected National Heritage District, the church represents a symbol of continuity in Jamaica's historical trajectory, from the colonial period to the present (JNHT, 2025). This process allowed for geographically locating relevant assets and selecting those with visible structural damage or significant impacts.

### i. Visual Damage Analysis Using Before/After Imagery

Following post-disaster assessment best practices, a visual analysis was conducted using Before / After image pairs, see Image IV 1. They enabled the identification of destroyed, severe damage, moderate damage, or slight damage (see Box IV 1).

**Image VI 1:** St. Elizabeth Parish Church: Before and after Hurricane Melissa



*Source: Jamaica-Houses (web page Jamaica-Houses.com) and DaLA team, 2025.*

UNESCO's qualitative classification of this site as "destroyed", which required estimating the full replacement cost.

### ii. Estimating the construction area of the infrastructure

Regarding this variable, polygons were drawn using information provided by OpenStreetMap and building footprints. Based on the area of these polygons, the built-up area of the church was approximated; see Map VI 3.

**Map VI 3:** St. Elizabeth Parish Church: Building Footprint




*Source: Google Satellite, Global Building Atlas (© Technical University of Munich – TUM / German Aerospace Center – DLR, 2025).*

### iii. Estimating the damage

Economic valuation followed standardized DaLA procedures, applying the following components:

**a. Replacement Cost per Square Meter.**
A per-square-foot value was assigned to each building based on predominant construction materials, pre-event structural condition, and architectural typology.

**b. Valuation of Contents**
Given that cultural buildings typically contain heritage, bibliographic, or museographic materials, an additional 15 percent was applied to account for the value of essential contents and furnishings.

**c. Heritage Factor**
When the asset demonstrated historical or cultural significance, an additional 30 percent was applied to reflect the specialized reconstruction requirements, conservation standards, and traditional techniques involved.

**d. Component-Specific Valuation (e.g., Roofing)**
The methodology included a differentiated valuation of critical components. In the example assessed, the roof represented approximately 22 percent of the building's total value, and this proportion was incorporated into the final calculation.

**e. Estimation**
The combination of all elements resulted in a total damage estimate. For St. Elizabeth Parish Church, the calculated amount was JMD 37.1 million.

### iv. Replication of the Procedure for All Assessed Sites

This analytical procedure will be replicated for all buildings, ensuring methodological consistency across the sector's damage estimation. The total estimated damage for the cultural sector amounts to approximately JMD 5 billion (see Table VI 2).

**Table VI 2:** Culture sector: Damage, in thousands of JMD

| *Parish* | Damage |
|---|---|
| *Clarendon* | 64,646 |
| *Hanover* | 5,453 |
| *Manchester* | 156,611 |
| *St. Ann* | 68,622 |
| *St Elizabeth* | 1,607,097 |
| *St. James* | 1,214,591 |
| *Trelawny* | 761,197 |
| *Westmoreland* | 1,078,010 |
| ***Total*** | **4,956,228** |

*Source: DaLA team, 2025.*

**Box VI 1:** Damage Severity Levels

The damage assessment considered various damage states in this report. These states determine the overall damage category assigned to each facility and have been consistently applied across all sectors included in the assessment. However, sector-specific adaptations were incorporated where required to reflect the attributes of specific assets. For instance, the valuation of equipment varies significantly between sectors, as well as the fragility and exposure of each facility to the hazard.

It is important to emphasize that damage exhibits significant variability, even within the same damage category. Consequently, the damage states represent typical ranges of observed damage. As observed across the different sectors, roof structures played a critical role in the progression of damage, as roof failure was frequently observed in the field damage assessment. Literature in this field also demonstrates that the building envelope is the most fragile part of each construction in the context of hurricanes (Li and Ellingwood, 2006; Abdelhady et al., 2022). The description of each damage state is presented as follows and corresponds to an adaptation of the damage description presented in FEMA (2025).

The "total" or "destroyed" damage state corresponds to the complete collapse of the structure, involving failure of primary structural elements as well as total damage of non-structural components. This state also assumes complete damage to equipment and furnishings. In hurricane scenarios, this level of damage is typically associated with structures located in areas of highest wind exposure and storm intensity, particularly those with high pre-existing fragility. From a valuation perspective, this damage state assumes the full replacement cost of the facility, adjusted to reflect its pre-event condition.

The severe damage state is characterized by extensive damage to non-structural elements, such as failure of windows, doors, and internal partitions, combined with significant damage to structural components such as roof framing, walls, or beams. This may include partial structural collapse, substantial deformation of load-bearing elements, or major damage to the roof system, such as the collapse of roof framing. The most common structural failure observed in the fields corresponds to the complete collapse of the roof framing, which is explained by the exposure to high winds during the event.

Moderate damage includes substantial impacts to non-structural components and equipment, while structural damage remains limited and does not compromise the global stability of the facility. This state commonly involves partial loss of roof coverings, damage to roof membranes, localized failure of roof elements, or damage to secondary roof structures. While primary structural elements such as columns, beams, and slabs remain largely unaffected, roof-related damage may still allow significant water infiltration, causing damage to internal furniture, electrical systems, and equipment.

Minor or slight damage corresponds to limited impacts affecting non-structural elements, with no damage to major structural components. This state may include minor roof damage, such as localized loss of roofing materials, damage to gutters or other roof accessories, without compromising the overall roof framing structural system. Primary structural elements, including walls, beams, columns, and slabs, are unaffected. Minor damage to equipment may occur as a result of water filtration or exposure to high winds. Facilities in this damaged state generally remain operational or require only short-term corrective interventions.

*Sources: Abdelhady, A. U., Spence, S. M., & McCormick, J. (2022). Risk and fragility assessment of residential wooden buildings subject to hurricane winds. Structural Safety, 94, 102137.*
*Federal Emergency Management Agency [FEMA]. (2025). Hazus 7.0 Hurricane Model Technical Manual. U.S. Department of Homeland Security.*
*Access: https://www.fema.gov/sites/default/files/documents/fema_rsl_hazus-7-fltm_06272025_0.pdf*
*Li, Y., & Ellingwood, B. R. (2006). Hurricane damage to residential construction in the US: Importance of uncertainty modeling in risk assessment. Engineering structures, 28(7), 1009-1018.*

## 2. Cultural Value and Intangible Dimensions of Damage

Those results provide a robust and unprecedented empirical basis for understanding the magnitude and territorial distribution of damage to cultural sites in Jamaica. At the same time, interpreting their implications for the culture sector requires consideration of the non-use value of the affected assets, as cultural sites differ significantly in terms of their historical depth, symbolic meaning, and social function. In several of the most affected parishes, the damaged sites include places of worship, civic and educational institutions, and heritage landmarks that have long played a central role in local identity and historical continuity.

While the estimation of non-use values typically requires substantial resources, careful preparation, and detailed data collection, and is therefore difficult to implement within the timeframe of a post-disaster assessment, these dimensions should not be overlooked. This is particularly evident in cases such as the damage sustained by the Accompong Community Centre, where impacts extend beyond physical losses to affect the Maroon community's cultural identity, collective memory, and the transmission of historically significant cultural practices. There were also significant impacts among the Maroons located in the Eastern part of the island, associated with the World Heritage site of the Blue and John Crow Mountains.

The Accompong Community Centre and Museum represent Leeward Maroon heritage, and, by extension, the Windward Maroons, bearers of one of the distinctive and foundational cultural traditions in Jamaica. Accompong is one of the historic Maroon communities, and the center has functioned as a key space for safeguarding and transmitting cultural expressions that are central to Maroon identity. These include oral traditions, ritual practices, music and drumming, social customs, and collective knowledge systems that have been maintained through continuous intergenerational transmission. In this sense, the cultural significance of the site lies not only in the physical structure or the artifacts it houses, but in its role as a living space for the practice, reproduction, and transmission of intangible cultural heritage embedded in community life.

Damage to the Accompong Community Centre and Museum, therefore, has implications that extend beyond material loss, as it directly affects the community's capacity to safeguard and transmit living cultural heritage. This is particularly relevant in light of the indirect linkage between Accompong and the UNESCO inscription of Jamaica's Maroon heritage on the Representative List of the Intangible Cultural Heritage of Humanity, which recognizes the cultural practices, expressions, and knowledge systems of Maroon communities. While the inscription is directly tied to the heritage of the Moore Town Maroons, connection as part of the Maroon heritage, damage to cultural infrastructure in Accompong, even if not site specific, undermines the conditions that enable the continued practice and transmission of this globally recognized heritage. The impacts observed thus illustrate the importance of considering cultural damage beyond monuments and built heritage, encompassing effects on identity, collective memory, social cohesion, and the continuity of living traditions, and underscore the need to integrate intangible cultural heritage considerations into recovery and resilience strategies.[12]

Similar considerations apply, in different ways, to other affected sites of high symbolic and historical significance, such as the William Knibb Memorial Baptist Church, closely associated with Jamaica's emancipation and abolitionist history, and Rose Hall Great House, a landmark in the national narrative of plantation society and slavery, whose cultural value extends beyond patterns of visitation or economic use.

[12] See https://ich.unesco.org/en/RL/maroon-heritage-of-moore-town-00053

## B. Losses

In the case of the culture sector, losses refer primarily to reductions in monetary flows that cease to be generated as a consequence of the event. These losses arise because cultural activities and facilities such as museums, heritage houses, performing arts venues, and community cultural centers are unable to operate normally. Examples include the cancellation of cultural festivals and events, as well as the interruption of ticketed activities at museums or historic properties that were forced to close due to damage or inaccessibility. When these facilities suspend operations, the revenue they would have generated under normal circumstances is no longer realized and is therefore counted as a loss.

It is also important to note that losses may occur even when a cultural asset has not suffered physical damage. In the aftermath of a hurricane, widespread power outages, damage to access routes, and disruptions to basic services can force facilities to close temporarily, thereby interrupting their economic activity. As such, the interruption of services, whether caused directly by physical damage or indirectly by the functional repercussions of the disaster, results in the same type of economic loss.

Accurate measurement of these losses requires a baseline that reflects not only the inventory and characteristics of cultural assets, but also the typical revenue streams associated with each type of activity. This includes, for example, average ticket sales, visitor flows, event revenues, rental income, or other sources of recurring income under normal, non-disaster conditions.

**Table VI 3:** Ranny Williams Entertainment Center: Cancellations and revenue losses, in thousands of JMD

| *Date* | Event Name | Section of RWEC | Value |
|---|---|---|---|
| *October 24* | Frinally (Party) | Courtyard | 85 |
| *October 31* | Water Resources Authority Expo | Lawn | 250 |
| *November 1* | Rude Halloween Party | Lawn | 250 |
| *November 7* | Frinally (Party) | Courtyard | 85 |
| *November 29* | Voice Box Rehearsal | Louise Bennett Garden Theatre | 270 |
| *December 5* | Frinally (Party) | Courtyard | 85 |
| *December 13* | Armani Live | Lawn | 250 |
| *December 28* | Afrosoca Jam | Courtyard | 120 |
| ***Total*** | | | **1,395** |

*Source: JCDC, 2025.*

Across the various assessments submitted by institutions in the culture sector, it became evident that most reports were predominantly qualitative. This is understandable, as many entities lack baseline data on economic flows, which are essential for quantifying losses under the DaLA methodology. Qualitative assessments are valuable for understanding the nature of the damage and documenting institutional experiences; however, they are not suitable for estimating monetary losses. As a result, many of the assessments received, despite providing useful descriptive information, could not be incorporated into the loss quantification because they did not contain the minimum financial or operational data required to estimate disrupted economic flows.

Among the assessments received, the level of detail and precision provided by the JCDC stands out and should serve as a model for how the culture sector might prepare similar reports in the future,

particularly with regard to the documentation of scheduled activities, rental contracts, and baseline revenue information. The monetary losses reported by the JCDC reflect a clear and measurable disruption of cultural activities following Hurricane Melissa. Table VI 1 shows the lost revenue from cancelled events at the Ranny Williams Entertainment Centre (RWEC), while Table VI 4 captures losses across community and church halls in six parishes, amounting to a total of JMD 0.008 billion in confirmed revenue losses. These losses represent income that would have been generated through venue rentals, had the hurricane not interrupted operations. These figures represent only a portion of the true economic setback for the cultural sector, since they capture losses only where contractual or scheduled activities had identifiable monetary values.

**Table VI 4:** Cancellations and revenue losses, in thousands of JMD

| *Parish* | Venue | Number of Events/ Bookings | Rate | Cost |
|---|---|---|---|---|
| *St. James* | St John's Methodist Action Centre | 41 | 24 | 984 |
| *St. James* | Holy Trinity Church Hall | 24 | 50 | 1,200 |
| *Trelawny* | The St Peter's Anglican Church Hall | 27 | 35 | 945 |
| *Westmoreland* | Sean Lavery Faith Hall | 42 | 25 | 1,050 |
| *St. Ann* | Methodist Church Hall in Brown's Town | 27 | 20 | 540 |
| *St. Elizabeth* | St. Mathews Anglican | 48 | 40 | 1,920 |
| *St. Elizabeth* | Sharon Baptiste | 15 | 10 | 150 |
| ***Total*** | | | | **6,789** |

*Source: JCDC, 2025.*

National Museum West was closed to the public from October 26 to December 12, 2025. Although staff returned to work shortly after the hurricane, the Museum remained closed to visitors and officially reopened on Monday, December 15, 2025. Under normal circumstances, the Museum operates Monday through Saturday. The revenue loss associated with this period of closure is estimated at approximately JMD 1.7 million.

Other heritage institutions also reported significant financial impacts. The Montego Bay Cultural Centre recorded estimated losses of approximately JMD 0.2 million, the Jamaica Conservation and Development Trust (JCDT) reported losses of about JMD 4 million, and Seville Heritage Park in St. Ann similarly recorded losses of approximately JMD 0.2 million.

It is important to note that the losses estimated for the culture sector are based on the JCDC's report and the other venues, such as the JCDT, the National Museum West, the Montego Bay Cultural Centre, and the Seville Heritage Park, so they reflect only the information provided for the current year. These losses may continue into the following year if conditions do not return to normal, specifically, if public services are not fully restored and cultural facilities are unable to resume regular operations. As long as venues remain closed, events are suspended, and cultural programming is disrupted, the sector will continue to forgo the revenue it normally generates. Therefore, the figures presented here should be interpreted as a minimum estimate of losses, recognizing that additional losses could materialize in 2026 if the restoration of services and infrastructure is delayed.

In considering the Entertainment, Cultural, and Creative Industries (ECCI) sector, which, according to the 2025 Jamaica Creative and Cultural Industries Survey Report (launched in October 2025), contributed an estimated JMD 107 billion annually, representing 5.1 percent of Jamaica's GDP. Though

the sector was unable to provide quantitative data for inclusion in this report, based on a survey with a small subset of the sector, there were significant impacts on many freelancers, small enterprises, event organizers, and cultural organizations, resulting in loss of material, equipment, and revenue. Performers and content creators who depend on hotel contracts, events, and tourist audiences reported losing their primary sources of employment as hotels remained closed due to damage. The ripple effects of this decline extended across related industries, compounding the financial and operational challenges creatives faced.

As such, beyond these measurable losses, the cultural and social impacts are substantial yet remain unquantified. The interruption of auditions, rehearsals, training programs, and local cultural gatherings affected the creative and emotional well-being of thousands of participants. Many were unable to prepare or perform in optimal conditions, while others lost meaningful opportunities for artistic development and community engagement. In addition, damage to places of worship, which also function as key cultural and community spaces, temporarily limited the ability of communities to gather and exercise their faith, affecting religious practices that may be important to the social life and individual well-being of many. The temporary unavailability of cultural spaces, essential hubs for social cohesion, also contributed to heightened stress and reduced access to supportive community networks in the aftermath of the hurricane. These intangible losses, although central to the lived experience of Jamaica's cultural ecosystem, fall outside the scope of the DaLA methodology and therefore do not appear in the financial totals reported.

## C. Additional Costs

Due to the operational characteristics of the culture sector, it generally does not incur significant expenditures during the emergency response phase. Cultural facilities typically remain closed following a disaster and therefore do not require the operational expenses associated with maintaining functioning services through backup systems, generators, or similar equipment, as is the case in other sectors. As a result, the additional costs for the culture sector are primarily limited to the removal and disposal of debris at affected sites. Using the methodology described in the housing chapter, these additional costs are estimated at JMD 253 million.

# Productive
# **Sector**



# 7 AGRICULTURE AND LIVESTOCK

## Chapter VII - Agriculture and Livestock

Jamaica's agricultural and livestock production, along with its productive assets, economic flows, and overall productive diversity, was significantly affected by the passage of Hurricane Melissa. Productive areas and animal husbandry systems experienced substantial impacts due to hurricane-force winds, intense rainfall, flooding, landslides, excessive humidity, and other extreme conditions associated with the event. The economic impact on the sector amounts to JMD 22.6 billion in losses to productive flows, JMD 10.1 billion in damage to assets and productive infrastructure, and approximately JMD 3.5 million in additional costs required to restore the productive capacity of the island's most vulnerable farmers.

**Table VII 1:** Summary of the impacts in the Agriculture and Livestock sector, in thousands of JMD

| *Effect* | Public | Private | Total |
|---|---|---|---|
| *Damages* | 4,273,050 | 5,772,436 | 10,045,486 |
| *Losses* | - | 22,617,976 | 22,617,976 |
| *Additional costs* | 3,450,000 | - | 3,450,000 |
| ***Total*** | **7,723,050** | **28,390,412** | **36,113,462** |

*Source: DaLA team, 2025*

The passage of Hurricane Melissa caused extensive damage to Jamaica's agricultural and livestock assets. Plantation crops, including banana, plantain, sugarcane, fruits, coffee, ginger, turmeric, cocoa, and nutmeg, sustained losses valued at JMD 2.9 billion. Severe impacts were also recorded on irrigation systems, farm buildings, greenhouses, research facilities, government offices, and farm roads, amounting to JMD 4.9 billion in damage. More than 650 thousand laying hens, 462 dairy cows, and thousands of beehives were affected or lost, generating an estimated JMD 1.2 billion in livestock asset damage. Infrastructure related to livestock production, such as layer, broiler, pig, cattle, sheep, and rabbit houses, as well as fencing systems, was also destroyed or partially damaged, totaling JMD 1 billion.

Extreme weather conditions associated with the hurricane—high winds, intense rainfall, flooding, severe soil saturation, persistent humidity, landslides, and increased phytosanitary pressures—resulted in losses across more than 51 crops and 7 livestock species in most parishes of Jamaica. Overall, 48,016 hectares of crops and 1,487,712 animals were affected, with an estimated 66,986 farmers experiencing economic impacts. The parishes with the highest agricultural and livestock losses were St. Elizabeth (JMD 4.6 billion), Trelawny (JMD 4.5 billion), Westmoreland (JMD 3.4 billion), Manchester (JMD 3.2 billion), St. James (JMD 1.9 billion), Hanover (JMD 1.2 billion), and Clarendon (JMD 1.1 billion).

Additional costs, estimated at JMD 3.5 billion, are being considered through the distribution of agricultural and livestock recovery kits. The Ministry of Agriculture, Fisheries, and Mining (MoAFM) is preparing a response plan aimed at restoring crop and livestock production among the most affected and vulnerable farmers. These kits will include technical assistance and essential inputs to support rapid and resilient recovery while safeguarding national food security.

The information used to prepare this chapter was drawn from public institutional statistics, data from non-governmental organizations, and field interviews with affected farmers. The principal institutions contributing data include the MoAFM, the Rural Agricultural Development Authority (RADA), the STATIN, the PIOJ, and the Food and Agriculture Organization (FAO) of the United Nations.

## A. Damages

Over the past ten years, the agriculture sector[13] has contributed between 6.0 and 9.3 percent of Jamaica's GDP, making it the third-largest aggregate economic activity in the national economy. The latest agricultural GDP figure available at market prices indicates that the sector accounted for 9.3 percent of Jamaica's economic output. [14]

Its agricultural economy has grown at annual rates exceeding 10 percent over the past three years. Based on the Statistical Institute of Jamaica,[15] 42 percent of the agricultural economy is attributed to domestic crops' production.[16] Twenty-five percent is attributed to the production of root crops. The contribution of animal farming represents around 15 percent. The production of traditional exports, excluding sugar cane, contributes nine percent to its agricultural economy. Fishing activity is attributed with 6 percent, sugar cane production 1.3 percent, post-harvest crop activities - agricultural services 1.1 percent, and forestry and logging 0.7 percent. The MoAFM accounts for 18 percent of the jobs in the country and promoted the national strategy for growing agricultural production in a smart way and eating nutritious foods by using innovation, technology, and research.

Land is the main agricultural asset necessary for production, and where productive assets are located for the generation of economic flows in the agricultural sector. Among the assets necessaries for agricultural economic flows, distributed on agricultural land and exposed to external climatic risk factors, are: fences, farm roads, irrigation systems, tractors, seeders, harvesters, agricultural machinery, inputs inventory, warehouses, silos, packing houses, plantations – trees, greenhouses, balers, among other infrastructures – machinery – agricultural equipment necessary for the generation of agricultural economic flows. Some common livestock assets exposed to external climatic risk factors are: milking quarters, reproduction animals, stables, corrals, slaughterhouses, inventories of livestock products, and other livestock production infrastructure.

FAO, in its annual statistics,[17] records more than 45 crops produced between permanent and temporary inside the Jamaican territory. Eighty percent of the productive agricultural land (86,396 ha) is used in the production of eighteen agricultural activities (crops): coconuts (11%); yams (10%); coffee (9%); bananas (9%); oranges (7%); sugar cane (7%); pumpkins, squash and gourds (3%); plantains (3%); sweet potatoes (3%); chillies & peppers (3%); pineapples (3%); cabbages (2%); carrots & turnips (2%); corn (2%); pomelos & grapefruits (2%); edible roots & tubers (2%); groundnuts (1%) and lemons & limes (1%). The remaining 20 percent of the agricultural productive area (21,422 ha) is used to produce more than 27 additional crops: tomatoes (1,431 ha); lettuce and chicory (1,283 ha); cucumbers & gherkins (1,174 ha); potatoes (973 ha); cassava (972 ha); tangerines, mandarins and clementines (970 ha); spinach (951 ha); watermelons (860 ha); tobacco (780 ha); peas (730 ha); okra (653 ha); beans (629 ha); sisal (578 ha); cocoa (555 ha); onions & shallots (534 ha); mangoes, pegeon peas (502 ha), papayas (483 ha), avocados (359 ha), cow peas (291 ha), onions and shallots dry (290 ha), ginger (280 ha), cauliflowers and broccoli (269 ha), cantaloupes and melons (230 ha), broad beans and horse beans (191 ha), spice and aromatic crops (150 ha), beans dry (104 ha), fiber crops (83 ha), green maize (60 ha) and eggplants (32 ha).

The structure of agricultural assets in Jamaica depends on the technological level, type of crop, financial return and location conditions for their production. The assets land, farm roads, fences, tractors, implements, equipment and facilities - warehouses are mostly used in all agricultural production

[13] Agriculture, Forestry and Fishing.
[14] Market Prices – Statistical Institute of Jamaica, 2024 – Release dat: 7/17/2024.
[15] Statistical Institute of Jamaica, Annual report, release date: 2/3/2020.
[16] Excluding Root Crops.
[17] FAO 2023 / Official figures, estimated values and imputed values.

processes in Jamaica. The production of some local and export vegetables uses differentiated assets for the intensive production of these crops, such as greenhouses and post-harvest infrastructure.

The production of traditional exports and non-traditional exports uses assets with a higher level of technological infrastructure with the aim of greater control of productive and quality factors, such as irrigation, plantation and packing houses. The active plantations are visualized or distributed in permanent crops such as yams, coffee, cocoa, bananas, mangoes, ginger, turmeric and peppers.

Table VII 2 details the main crops affected by Hurricane Melissa and their distribution of agricultural assets normally used during their production process. This distribution of assets could vary depending on the type of producer and its level of technification. Banana cultivation, traditional export crop, is an example of a high level of technology within the agricultural sector of Honduras. Banana production uses some assets of a higher technological level than the rest of the agricultural sector, such as complete mechanization in soil preparation, certified plants, technified irrigation, fertigation, area spraying, post-harvest infrastructure, packing houses, research centers, among others. Vegetables production is another crop with a medium-high technological level in the use of high-value or differentiated assets. This crop mechanizes 100 percent of its soil preparation, uses irrigation systems, uses specialized infrastructure as greenhouses for control of diseases and plagues.

**Table VII 2:** Agricultural crops and their structure of use in agricultural assets for production in Jamaica

| *Crop* | Land | Plantation | Farm Roads | Fences | Irrigation | Tractors | Seeders | Harvesters | Implements | Equipment | Facilities Warehouses | Greenhouses | Silos | Post-Harvest Infrastructure | Packing Plants |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sweet Pepper | X | | X | X | X | X | | | X | X | X | X | | X | X |
| Tomato | X | | X | X | X | X | | | X | X | X | X | | X | |
| Lettuce | X | | X | X | X | | | | | X | X | X | | | |
| Cabbage | X | | X | X | X | | | | | X | X | X | | | |
| Carrot | X | | X | X | X | | | | | X | X | X | | | |
| Melon | X | | X | X | X | X | | | X | X | X | X | | | |
| Cantaloupe | X | | X | X | X | X | | | X | X | X | X | | | |
| Banana | X | X | X | X | X | X | | | X | X | X | | | X | X |
| Plantain | X | X | X | X | X | X | | | X | X | X | | | X | X |
| Yams | X | X | X | X | X | X | | | X | X | X | | | X | X |
| Cassava | X | X | X | X | X | X | | | X | X | X | | | X | X |
| Coffee | X | X | X | X | | X | | | X | X | X | | | X | X |
| Ginger | X | X | X | X | X | X | | | X | X | X | | | X | X |
| Turmeric | X | X | X | X | X | X | | | X | X | X | | | X | X |
| Fruit Trees | X | X | X | X | | X | | | X | X | X | | | X | X |

*Source: DaLA team based on interview information collected during field visits (2025).*

At the level of livestock production, the central asset is the existence of animals to produce meat, milk, or eggs. The main asset of livestock production is the stock of animals of each species. Based on the number of animals, the assets or livestock infrastructure needed for their breeding and production of livestock products are calculated or estimated. Livestock installations depend on the number of animals existing on each livestock species and the technological level used in its production. The type of technology used depends on the size of the initial investment made and the two economic flows for its maintenance and replacement.

**Table VII 3:** Livestock stocks in Jamaica, number of animals

| *Type of Animal* | Unit | Animals |
|---|---|---|
| *Chickens* | Animals | 14,126,000 |
| *Goats* | Animals | 594,116 |
| *Swine / pigs* | Animals | 218,431 |
| *Cattle* | Animals | 151,499 |
| *Bees* | Hives | 76,000 |
| *Asses* | Animals | 23,000 |
| *Mules and hinnies* | Animals | 10,000 |
| *Horses* | Animals | 4,008 |
| *Sheep* | Animals | 1,308 |

*Source: FAO, 2023.*

Based on the number of animals, the most common livestock species in Jamaica is poultry: chickens. A significant number of chickens are slaughtered every year in Jamaica, based on their stock (>14 million) and slaughter reports. Other species with a significant number of stocks are goats (>594 thousand), swine and pigs (>218 thousand). More than 151,000 heads of cattle are reported in Jamaica's stock reports[18] . Other livestock species with smaller stocks are assess (23,000 animals), mules – hinnies (10,000 animals), horses (4,000 animals), and sheep (1,300 animals). FAO also reports a stock of 76,000 bee hives on the island.

The geographic distribution of animals allows us to compare the different levels of risk and damage to the livestock assets during the climatic event. This comparison relates the distribution of extreme rainfall, hurricane-force winds, floods, and waterlogging in livestock production areas to the geographic distribution of the species. Poultry are the most widely distributed livestock species on the island. Based on Jamaica's livestock species distribution is expected that the production of livestock products, such as meat, milk, eggs, honey, and other primary products from animal origin.

The structure of livestock assets depends on the level of technology, livestock species, and site conditions for raising animals or producing animal products. Land, animals, internal farm roads, fences, equipment, and specific facilities are the main livestock assets used in all livestock production processes in Jamaica. Poultry production, whether for meat or eggs, utilizes specialized assets for intensive - extensive animal husbandry, such as poultry houses, automated feeding systems, automated primary product collection systems, tunnel-ventilated houses, integrated feed mills, hatcheries with temperature control – ventilation – air flow management, and other modern infrastructure. Livestock farming, whether for meat, milk, or dual-purpose production, utilizes specialized assets for extensive – intensive – agroforestry animal husbandry, such as pasture plantation, irrigation canals or systems,

[18] FAO / FAOSTAT - Stocks / 11 -18 - 2025

tractors, implements, pasture cultivation equipment, milking parlours, stables, corrals, and sheds for handling animals and their primary animal products.

**Table VII 4:** Livestock species and their assets usage structure for animal husbandry in Jamaica

| Assets | Poultry | Cattle | Swine - Pigs | Horses | Mules - Hinnies | Goats | Asses | Sheep | Bees |
|---|---|---|---|---|---|---|---|---|---|
| Land | X | X | X | X | X | X | X | X | X |
| Animals | X | X | X | X | X | X | X | X | X |
| Pastures | | X | | X | X | X | X | X | |
| Fences | X | X | X | X | X | X | X | X | X |
| Farm Roads | X | X | X | X | X | X | X | X | X |
| Canals | | X | | X | X | X | X | X | |
| Irrigation Systems | | X | | | | | | | |
| Tractors | | X | | | | | | | |
| Implements | | X | | X | X | X | X | X | |
| Equipment | | X | | X | X | X | X | X | X |
| Facilities | X | X | X | X | X | X | X | X | X |
| Milking quarters | | X | | | | | | | |
| Stables - Corrals | | X | | X | X | X | X | X | |
| Sheds | X | X | X | X | X | X | X | X | |

*Source: DaLA team based on interview information collected during field visits (2025).*

The impact of Hurricane Melissa on agricultural and livestock assets has been significant, affecting key agricultural and livestock productive economic activities and critical infrastructure. The MoAFM, has stated that Melissa truncated significant gains that had been achieved to date in the process of recovery from Hurricane Beryl. The assets of crops and livestock activities with the highest level of technification are the most affected by their higher exposure to the passage of the climatic event.

The damage to agricultural and livestock assets was mainly caused by hurricane-force winds, high rainfall, flooding, landslides, and excess moisture caused by the extreme conditions brought by Hurricane Melissa. Agricultural government authorities have classified the impact of the hurricane according to the trajectory, wind speed, vulnerability and severity in the parishes: (a) Level 5: Westmoreland, Trelawny, St. James, Hanover, St. Elizabeth - west and Manchester - north; (b) Level 4: St. Mary, St. Ann and Clarendon; (c) Level 3: St. Catherine; (d) Level 2: St. Andrew's; and (e) Level 1: St. Thomas, Portland and Kingston.

Field information collected by RADA, available sectoral information, and field interviews confirm the damage caused to agricultural and livestock assets by the impact of the Hurricane in the areas of greatest intensity. The weather event and its related factors impacted and caused damage in: (a) Plantations: bananas, plantains, sugar cane, fruits, coffee, ginger, turmeric, cocoa, nutmeg, among others; (b) Infrastructure: farm roads, irrigation systems, farm buildings, greenhouses, research facilities, and

governmental offices. At the level of livestock production, the assets that were severely affected and economically impacted are: (a) Animals: layers, dairy cattle, and beehives; (b) Infrastructure: laying houses, broiler houses, pig houses, cattle fences, goat fences, milking houses, sheep fences, and rabbit pens.

**Table VII 5:** Damages in the Agricultural and Livestock sector, in thousands of JMD

| *Agriculture Plantations* | Public | Private | Total |
|---|---|---|---|
| *Plantains* | - | 727,692 | 727,692 |
| *Banana* | - | 579,546 | 579,546 |
| *Sugar Cane* | - | 572,492 | 572,492 |
| *Fruits* | - | 403,242 | 403,242 |
| *Sorrel* | - | 312,051 | 312,051 |
| *Coffee* | - | 247,496 | 247,496 |
| *Ginger* | - | 18,817 | 18,817 |
| *Turmeric* | - | 16,154 | 16,154 |
| *Cocoa* | - | 8,395 | 8,395 |
| *Nutmeg* | - | 1,947 | 1,947 |
| ***Subtotal*** | **-** | **2,887,831** | **2,887,831** |

| *Agriculture Infrastructure* | Public | Private | Total |
|---|---|---|---|
| *Farm Roads* | 2,673,050 | - | 2,673,050 |
| *Rada Offices* | 350,000 | - | 350,000 |
| *Irrigations Systems* | - | 345,000 | 345,000 |
| *Farm Buildings* | - | 223,000 | 223,000 |
| *Greenhouses* | - | 131,700 | 131,700 |
| *Research & Public Facilities* | 1,250,000 | - | 1,250,000 |
| ***Subtotal*** | **4,273,050** | **699,700** | **4,972,750** |

| *Animals - Assets* | Public | Private | Total |
|---|---|---|---|
| *Layers* | - | 819,835 | 819,835 |
| *Dairy Cattle* | - | 50,860 | 50,860 |
| *Beehives* | - | 308,303 | 308,303 |
| ***Subtotal*** | **-** | **1,178,997** | **1,178,997** |

| *Livestock Infrastructure* | Public | Private | Total |
|---|---|---|---|
| *Laying Houses* | - | 394,111 | 394,111 |
| *Broiler Houses* | - | 312,000 | 312,000 |
| *Pig Houses* | - | 116,616 | 116,616 |
| *Cattle Fences* | - | 97,854 | 97,854 |

**Table VII 5:** Damages in the Agricultural and Livestock sector, in thousands of JMD *(continuation)*

| ***Livestock Infrastructure*** *(continuation)* | **Public** | **Private** | **Total** |
|---|---|---|---|
| *Goat Fences* | - | 59,811 | 59,811 |
| *Milking Houses* | - | 22,193 | 22,193 |
| *Sheep Fences* | - | 2,863 | 2,863 |
| *Rabbit Pens* | - | 460 | 460 |
| ***Subtotal*** | **-** | **1,005,907** | **1,005,907** |
| **Grand Total** | **4,273,050** | **5,772,436** | **10,045,486** |

*Source: DaLA team using data of the RADA, 2025.*

The DaLA team estimated total damage to Jamaica's agriculture and livestock sector at JMD 10.1 billion. Of this amount, the 49 percent corresponds to damage to agricultural infrastructure—greenhouses, farm roads, irrigation systems, agricultural buildings, research & public facilities, and offices. The remaining 58 percent reflects damage to permanent crop plantations (29%), livestock assets (12%), and livestock infrastructure such as animal houses, fences, and pens (10%). Among agricultural plantations, the most heavily affected crops were bananas (JMD 0.6 billion), plantains (JMD 0.7 billion), sugarcane (JMD 0.6 billion), fruits (JMD 0.4 billion), sorrel (JMD 0.3 billion), and coffee (JMD 0.3 billion). Damage to agricultural infrastructure was dominated by the destruction of farm roads (JMD 2.7 billion). According to RADA, approximately 302 roads—totaling 576 kilometers—were impacted. Additional infrastructure damage was recorded in irrigation systems (JMD 0.4 billion, including water storage, drip lines, and tanks), farm buildings (JMD 0.2 billion), and greenhouses (JMD 0.13 billion). The MoAFM also reported significant impacts on RADA offices, public infrastructure, and research centers.

Damage to livestock assets was concentrated primarily in the poultry subsector, affecting both egg (layer) production and broiler operations. Seventy percent of livestock-related damage arose from losses of layer birds (JMD 0.8 billion), the destruction of layer houses (JMD 0.4 billion), and broiler houses (JMD 0.3 billion). Damage to pig-breeding facilities (JMD 0.1 billion) and beekeeping assets (JMD 0.3 billion) was lower in value but still significant within their respective activities. At the parish level, 78 percent of livestock damage occurred in St. Elizabeth (JMD 0.8 billion), St. James (JMD 0.3 billion), St. Ann (JMD 0.3 billion), and Hanover (JMD 0.2 billion). Additional substantial losses were recorded in Manchester (JMD 0.1 billion), Westmoreland (JMD 0.1 billion), and Trelawny (JMD 59 million). Over 90 percent of dead layers were located in St. Elizabeth (JMD 0.4 billion), St. Ann (JMD 0.2 billion), St. James (JMD 68 million), Manchester (JMD 56 million), Hanover (JMD 39 million), and Trelawny (JMD 35 million), with infrastructure damage reflecting a similar geographic distribution. For broiler infrastructure losses (JMD 312 million), St. Catherine (JMD 104 million), St. Elizabeth (JMD 75 million), Hanover (JMD 47 million), and St. James (JMD 25 million) accounted for 81 percent of the total.

Damage to agricultural plantations was estimated at JMD 2.9 billion. Eighty-eight percent of plantation losses were concentrated in the parishes of Westmoreland (26%), St. Elizabeth (22%), St. James (17%), Clarendon (9%), Hanover (8%), and St. Mary (6%). The remaining 12 percent occurred in seven additional parishes, with Manchester and Trelawny showing the highest plantation losses among them. The value of damage to farm roads was estimated at JMD 2.7 billion, with St. Elizabeth (JMD 0.9 billion), Westmoreland (JMD 0.3 billion), Clarendon (JMD 0.3 billion), St. Catherine (JMD 0.2 billion), and St. Mary among the parishes reporting the largest impacts. St. Ann, Trelawny, and Manchester (each approximately JMD 0.1 billion) also reported moderate damage to farm roads.

Ninety-two percent of total banana plantation damage occurred in St. James (JMD 206 million), Westmoreland (JMD 123 million), St. Elizabeth (JMD 97 million), St. Mary (JMD 72 million), and Hanover (JMD 37 million). Ninety-seven percent of sugarcane plantation damage was concentrated in Clarendon

(JMD 171 million), Westmoreland (JMD 129 million), St. Elizabeth (JMD 129 million), and Hanover (JMD 129 million). For plantain plantations, 80 percent of losses were recorded in the western region (JMD 0.6 billion), 18 percent in the central region (JMD 134 million), and 2 percent in the rest of the country. The parishes accounting for 92 percent of plantain damage was Westmoreland (JMD 239 million), St. James (JMD 167 million), St. Elizabeth (JMD 105 million), St. Mary (JMD 87 million), Hanover (JMD 41 million), and Trelawny (JMD 31 million).

**Image VII 1:** Photographs of private and public damage to agricultural and livestock assets



*Source: DaLA team and RADA, 2025.*

## B. Losses

Jamaica's agricultural production is constantly exposed to natural hazards and disasters, and accurately estimating its economic impacts is essential for developing public policies that facilitate timely risk management decisions. Jamaica has been vulnerable to various natural threats with significant recurring repercussions, primarily associated with hydrometeorological and climatic risks, see Chapter I. For example, in 2024, Hurricane Beryl brought flooding, landslides, and infrastructure disruption. Climate change is expected to increase the hazards faced by the Caribbean, including Jamaica, in the following years.

The estimation for losses in the agricultural economic flows is related to the annual or cyclical production and is linked to agronomic – economic variables, such as: damaged agricultural area, agricultural area affected in production or yield, days of flooding, number of annual cycles, production or maintenance cost of the crops, productivity levels, level of yield impact, producer prices, level of impact on price due to a reduction in quality, quality of agricultural products and degree of impact on product quality.

The agricultural economic flows or gross value of the agricultural production have strongly boosted the Jamaican economy. The agricultural sector represents approximately 9% of Jamaica's economy, and the agricultural production accounts for over JMD 282 billion of Jamaica's Gross Domestic Product[19]. Its agricultural economy has grown at an average annual rate of 7.46% over the last 10 years[20] . But since 2022, its annual growth has skyrocketed to double-digit rates.

The structure of its agricultural GDP is composed as follows: Agriculture – Crops production (78%), Livestock – Animal farming (15%), Fishing (6%), and Forestry (1%)[21]. In terms of economic flows or agricultural production in tons, Jamaica produces more than 45 crops, generating approximately 1.6 million tons per year[22]. The crops with the highest annual tonnage are: sugarcane (515,000), yams (195,000), oranges (77,000), coconuts (76,000), bananas (72,000), plantains (61,000), pumpkins – squash – gourds (61,000), pineapples (49,000), sweet potatoes (49,000), cabbages (47,000), pomelos – grapefruits (46,000), carrots – turnips (33,000), edible roots – tubers (29,000), lemons – limes (26,000) and tomatoes (25,000). These 15 crops represent approximately 82 percent of the total tonnage produced annually by Jamaica. The following table details agricultural production in tonnage and their respective average yields for each crop. This baseline information is fundamental for calculating economic flows and necessary for estimating losses within the agricultural sector.

**Table VII 6:** Agricultural production by crop, in Tm and Tm/Ha

| *Crops* | Tm | Tm/Ha | Crops | Tm | Tm/Ha |
|---|---|---|---|---|---|
| *Sugar cane* | 414,769 | 53.4 | *Okra* | 6,289 | 9.6 |
| *Yams* | 194,959 | 17.7 | *Onions / Shallots (dry)* | 6,086 | 21.0 |
| *Oranges* | 76,762 | 9.7 | *String beans* | 5,724 | 9.1 |
| *Coconuts* | 75,981 | 6.2 | *Cantaloupes / Melons* | 3,844 | 16.7 |
| *Bananas* | 71,532 | 7.6 | *Tangerines / Others citrus* | 3,788 | 3.9 |
| *Plantains* | 61,082 | 19.3 | *Cauliflowers / Broccoli* | 2,998 | 11.1 |
| *Pumpkins / squash* | 60,877 | 18.1 | *Mangoes / Guavas / Others* | 2,790 | 5.4 |
| *Pineapples* | 49,149 | 18.2 | *Avocados* | 2,366 | 6.6 |
| *Sweet potatoes* | 48,804 | 15.9 | *Corn* | 2,291 | 1.1 |
| *Cabbages* | 46,935 | 17.6 | *Groundnuts* | 2,011 | 1.2 |
| *Pomelos / Grapefruits* | 45,753 | 27.2 | *Tobacco* | 1,600 | 2.0 |
| *Carrots / Turnips* | 33,292 | 15.5 | *Ginger* | 941 | 3.4 |
| *Edible roots / Tubers* | 28,513 | 17.1 | *Peas* | 833 | 1.1 |
| *Lemons / Limes* | 25,882 | 16.8 | *Pigeon peas* | 591 | 1.2 |
| *Tomatoes* | 25,442 | 17.8 | *Sisal* | 440 | 0.8 |
| *Chilies / Peppers (green)* | 22,234 | 15.0 | *Eggplants* | 405 | 12.7 |
| *Cassava* | 19,669 | 20.2 | *Cow peas* | 326 | 1.1 |
| *Chilies / peppers (dry)* | 19,563 | 14.1 | *Broad beans / Horse beans* | 207 | 1.1 |

[19] Statistical Institute of Jamaica, 2024 / Include Agriculture, Livestock, Forestry and Fisheries.
[20] Rates obtained from values at market prices.
[21] Statistical Institute of Jamaica, 2019.
[22] FAO Statistics 2023.

**Table VII 6:** Agricultural production by crop, in Tm and Tm/Ha *(continuation)*

| Crops | Tm | Tm/Ha | Crops | Tm | Tm/Ha |
|---|---|---|---|---|---|
| *Cucumbers / gherkins* | 19,140 | 16.3 | *Cocoa* | 151 | 0.3 |
| *Watermelons* | 18,873 | 21.9 | *Beans* | 110 | 1.1 |
| *Lettuce / Chicory* | 17,491 | 13.6 | *Maize* | 55 | 0.9 |
| *Spinach* | 15,308 | 16.1 | *Other tropical fruits* | 41,355 | 16.0 |
| *Potatoes* | 13,301 | 13.7 | *Other vegetables* | 23,310 | 12.1 |
| *Papayas* | 10,300 | 21.3 | *Other stimulants* | 963 | 6.4 |
| *Coffee* | 8,152 | 0.8 | *Other fiber crops* | 412 | 5.0 |
| *Onions / Shallots (green)* | 7,576 | 14.2 | | | |

*Source: DALA Assessment Team, with information from FAO (2023).*

Livestock production in the last ten years has accounted for between 13 and 17 percent of Jamaica's Agricultural GDP. Its market value has fluctuated upward from JMD 16 trillion to approximately JMD 40 trillion in recent years[23]. Year-on-year growth has fluctuated positively, with a marked slowdown and contraction in the year 2019 – 2020. The economic flows of the livestock sector are linked to its annual or cyclical production, specifically the raising of animals to produce meat, milk, eggs, and other primary animal products. The main variables related to livestock economic flows and necessary for quantifying losses are the following: species, types of production, animals killed, animals affected, age classification, days affected, number of annual cycles, productivity, degree of impact on productivity, prices of livestock products, degree of impact on product quality, and price penalty for quality. These variables, depending on their availability, were analysed, aggregated, and classified at different levels of political division, type of livestock production, and species.

RADA conducted a parish-level survey to assess the agricultural land and livestock affected by the hurricane. This information—combined with sectoral statistics and field interviews—served as the primary input for estimating losses in Jamaica's agriculture and livestock sectors. Based on these data, economic-flow losses were quantified for more than 51 crops and 7 livestock species. The assessment, carried out in coordination with RADA, determined that 48,016 hectares of agricultural land and 1,487,721 animals were affected. An estimated 66,986 farmers and livestock producers suffered impacts; 86 percent of these individuals were engaged in crop production, and the remaining 14 percent in animal husbandry. Losses stemmed directly from Hurricane Melissa and the extreme weather conditions associated with the event—including high winds, intense rainfall, flooding, severe soil saturation, persistent humidity, landslides, and increased phytosanitary pressures—leaving Jamaica's food sovereignty and security in a vulnerable state.

Eighty-seven percent of the affected agricultural area was located in the western (31,306 ha) and central (10,528 ha) regions of Jamaica. The parishes with the largest impacted agricultural areas were St. Elizabeth (12,338 ha), Westmoreland (10,388 ha), Manchester (5,226 ha), St. James (3,100 ha), and Trelawny (2,910 ha). The crops most affected were vegetables (14,966 ha), yams (4,670 ha), legumes (5,345 ha), condiments (5,508 ha), sugarcane (4,445 ha), bananas and plantains (4,250 ha), fruits (2,250 ha), potatoes (2,079 ha), and other domestic crops (5,573 ha).

A similar regional pattern was observed for livestock impacts: 98 percent of affected animals were reported in the western (863,817 animals) and central (593,590 animals) regions. The parishes with the highest numbers of affected animals were St. Elizabeth (505,051), St. Catherine (274,880), St. Ann

[23] Statistical Institute of Jamaica.

(204,721), Hanover (156,322), and St. James (133,756). By species, losses were estimated at 780,000 broilers, 656,851 layers, 20,554 beehives, 14,787 goats, 7,289 pigs, 6,841 head of cattle, 708 sheep, 462 dairy cows, and 230 rabbits.

The DaLA team estimated total losses in the agriculture and livestock sectors at JMD 22.6 billion. Of this amount, 87 percent corresponds to crop losses and 13 percent to livestock. Eighty percent of total losses were concentrated in the following activities: yams (34.6%), eggs (6.3%), pumpkin (4.6%), cabbage (3.0%), sweet pepper (2.9%), plantains (2.7%), carrots (2.5%), hot pepper (2.5%), coffee (2.4%), bananas (2.2%), tomatoes (2.2%), cucumbers (2.0%), cassava (2.0%), potatoes (1.9%), sugarcane (1.9%), and fruits (1.8%). The remaining 20 percent corresponded to 36 additional crops and six livestock activities: pork, goat meat, honey, sheep meat, rabbit meat, and milk.

Sixty-nine percent of total agricultural and livestock losses occurred in the western region (JMD 15.7 billion), 25 percent in the central region (JMD 5.8 billion), and 5 percent in the eastern parishes (JMD 1.1 billion). The parishes with the greatest recorded losses were St. Elizabeth (JMD 4.6 billion), Trelawny (JMD 4.5 billion), Westmoreland (JMD 3.4 billion), Manchester (JMD 3.2 billion), St. James (JMD 1.9 billion), Hanover (JMD 1.2 billion), and Clarendon (JMD 1.1 billion), together representing 88 percent of all losses in the sector.

All losses were borne by the private sector. The MoAFM anticipates a substantial reduction in agricultural output during the final quarter of the year. Recovery timelines will depend on crop type, growth cycle, access to seeds, planting material, agricultural inputs, and financing. Permanent crops typically experience prolonged recovery in events of this nature, whereas annual or short-cycle crops tend to recover more rapidly.

**Table VII 7:** Losses in the Agricultural and Livestock sector, in thousands of JMD

| *Agricultural Crops Losses* | Public | Private | Total |
|---|---|---|---|
| *Yams* | - | 7,829,981 | 7,829,981 |
| *Pumpkin* | - | 1,043,095 | 1,043,095 |
| *Cabbage* | - | 689,532 | 689,532 |
| *Sweet Pepper* | - | 653,536 | 653,536 |
| *Plantains* | - | 605,073 | 605,073 |
| *Carrots* | - | 571,736 | 571,736 |
| *Hot Pepper* | - | 559,867 | 559,867 |
| *Coffee* | - | 552,504 | 552,504 |
| *Banana* | - | 496,205 | 496,205 |
| *Tomato* | - | 492,130 | 492,130 |
| *Cucumber* | - | 462,564 | 462,564 |
| *Cassava* | - | 452,240 | 452,240 |
| *Potatoes* | - | 437,564 | 437,564 |
| *Sugar Cane* | - | 427,508 | 427,508 |
| *Fruits* | - | 405,366 | 405,366 |
| *Dasheen* | - | 400,971 | 400,971 |
| *Pak Choi* | - | 386,716 | 386,716 |

**Table VII 7:** Losses in the Agricultural and Livestock sector, in thousands of JMD *(continuation)*

| *Agricultural Crops Losses* | Public | Private | Total |
|---|---|---|---|
| *Callaloo* | - | 327,295 | 327,295 |
| *Corn* | - | 271,330 | 271,330 |
| *Okra* | - | 265,283 | 265,283 |
| *Legumes* | - | 253,874 | 253,874 |
| *Lettuce* | - | 235,591 | 235,591 |
| *String Bean* | - | 234,103 | 234,103 |
| *Scallion* | - | 233,352 | 233,352 |
| *Sorrel* | - | 228,775 | 228,775 |
| *Ginger* | - | 152,516 | 152,516 |
| *Cho-Cho* | - | 113,966 | 113,966 |
| *Other Tubers* | - | 475,371 | 475,371 |
| *Other Vegetables* | - | 247,734 | 247,734 |
| *Other Condiments* | - | 51,103 | 51,103 |
| *Others* | - | 65,544 | 65,544 |
| ***Subtotal*** | **-** | **19,622,426** | **19,622,426** |
| ***Livestock Losses*** | **Public** | **Private** | **Total** |
| *Chicken meat* | - | 369,071 | 369,071 |
| *Sheep meat* | - | 16,987 | 16,987 |
| *Goat meat* | - | 295,741 | 295,741 |
| *Pork* | - | 261,137 | 261,137 |
| *Rabbit meat* | - | 1,104 | 1,104 |
| *Beef meat* | - | 547,280 | 547,280 |
| *Eggs* | - | 1,418,798 | 1,418,798 |
| *Milk* | - | 6,505 | 6,505 |
| *Honey* | - | 78,925 | 78,925 |
| ***Subtotal*** | **-** | **2,995,550** | **2,995,550** |
| ***Grand Total*** | **-** | **22,617,976** | **22,617,976** |

*Source: DaLA team using data of the RADA, 2025.*

**Image VII 2:** Photographs of private losses to agricultural and livestock production



*Source: DaLA team, RADA and others, 2025.*

## C. Additional Costs

The MoAFM of Jamaica is developing a response plan to address the impacts of Hurricane Melissa, to restore crop production and livestock activities in the most affected areas and among the most vulnerable farmers. The Ministry's Hurricane Response Committee has identified a series of priority actions, including support for land preparation, rehabilitation of irrigation systems, access to certified seed, fertilizers, greenhouse inputs, phytosanitary products, livestock feed, veterinary medicines and vaccines, certified planting material, land clearing, expanded access to agricultural insurance, and technical assistance.

In coordination with RADA, the Ministry has estimated a requirement of JMD 3.5 billion to provide technical assistance and supply the inputs necessary for the rapid and resilient reactivation of the agricultural sector, thereby safeguarding the country's food security.

**Table VII 8:** Additional cost in the agriculture and livestock Sector, in thousands of JMD

| | Public | Private | Total |
|---|---|---|---|
| *Re-establish Kits - Crops* | 2,951,456 | - | 2,951,456 |
| *Re-establish Kits - Livestock* | 498,544 | - | 498,544 |
| ***Subtotal*** | **3,450,000** | **-** | **3,450,000** |
| ***Grand Total*** | **3,450,000** | **-** | **3,450,000** |

*Source: DaLA team using data of the RADA, 2025.*

# 8

# FISHERIES AND AQUACULTURE



## Chapter VIII - Fisheries and Aquaculture

The fishing and aquaculture economic activity, with its productive assets, economic flows, social relevance, cultural heritage, and food security in Jamaica, was significantly exposed to the risk of Hurricane Melissa. The most powerful hurricane to ever hit Jamaica devastated fisheries and the aquaculture sector with unprecedented storm surges, huge waves, and winds of 185 mph that impacted key fisheries, aquaculture productive assets, and infrastructure. The estimated economic impact of this climatic event on Jamaica's fisheries – aquaculture sector was around JMD 5.9 billion in assets' damages, JMD 1.8 billion in economic flows' losses, and approximately JMD 96 million in additional costs to reestablish the landing and fishing capacity of the island.

**Table VIII 1:** Summary of the impacts in the fisheries and aquaculture sector, in thousands of JMD

| *Effect* | Public | Private | Total |
|---|---|---|---|
| *Damages* | 2,816,177 | 3,067,791 | 5,883,968 |
| *Losses* | - | 1,758,699 | 1,758,699 |
| *Additional costs* | 96,000 | - | 96,000 |
| ***Total*** | **2,912,177** | **4,826,490** | **7,738,667** |

*Source: DALA team, 2025.*

Total estimated damages in Jamaica's fishing and aquaculture sector amount to JMD 5.9 billion. Of this total, 52 percent corresponds to damage to fishing vessels, 48 percent to landing-site infrastructure, and less than 0.4 percent to aquaculture farm infrastructure. The National Fisheries Authority (NFA) reported that 3,301 vessels were damaged, 52 landing sites or beaches and their associated infrastructure were affected, and 39.3 hectares of aquaculture sustained damage. Significant damage was recorded across storage sheds, jetties, storage houses, NFA offices, beach areas affected by erosion, cold-storage facilities, fences, pumps, farm light posts, piping lines, feed inventories, bulldozers, farmhouses, containers, and other minor infrastructure.

Estimated losses in the fisheries and aquaculture sectors total JMD 1.8 billion. Marine fisheries account for 97 percent of total losses, while aquaculture—specifically tilapia production—accounts for 3 percent. Within marine fisheries, 93 percent of losses were concentrated in artisanal finfish fisheries, 5 percent in industrial lobster fisheries, 2 percent in industrial conch fisheries, and less than 1 percent in sea cucumber activities. These losses reflect a 35 percent reduction in landing capacity and a 22 percent reduction in the fleet's fishing capacity.

Additional costs required to restore fishing and landing capacity are estimated at JMD 96 million. The NFA has assessed debris clearance needs in 11 of Jamaica's 13 parishes, with estimated amounts ranging from JMD 5 million to JMD 17 million per parish. Parishes with the highest estimated clearance costs include St. Ann (JMD 17 million), St. Catherine (JMD 15 million), St. Elizabeth (JMD 10 million), Trelawny (JMD 10 million), and St. Mary (JMD 9 million).

The information used to prepare this chapter is based on public-sector statistics and field interviews conducted in the affected areas. The principal institutions providing data include the MoAFM the National Fisheries Authority (NFA), the STATIN, and the PIOJ.

## A. Damages

The fishing sector in Jamaica accounts for around 1 percent of the Island's total gross domestic product.[24] The fishing economy has shown a positive trend in the last seven years (2018 – 2024) with notable variations in its year-on-year growth.[25] The fishing years with significant growth have occurred in 2019, 2022, and mainly 2023. These growths in the fishing economy have been substantially higher than small contractions with its production levels in the years 2020, 2024, and mainly 2021. The NFA emphasizes that sustainable management and market adaptation will be the key to maintaining this positive trend in the coming years. The fisheries sector is an important foreign exchange earner and a primary contributor to income, employment, food security, social and economic stability, especially in coastal communities. Additionally, the sector is a crucial component of Jamaica's heritage and national progress. Jamaica's fisheries sector is primarily structured into two subsectors: Capture fisheries and Aquaculture. Capture fisheries harvest directly from the ocean, and aquaculture is fish farming.

This key segment of Jamaica's economy is highly dynamic. According to the NFA Statistics and its Data Management Units, a total of 8,781 fisher licences were issued in 2024, along with 11,846 fisheries licences, authorizations, and permits during the same year. The major categories of Jamaica's fishing are: offshore fisheries, coastal fisheries, coastal artisanal fisheries, and aquaculture. Offshore fishing involves the use of longline gear targeting tuna. Coastal fisheries involve more modest vessels in size (on average, 9 meters or less). Coastal artisanal fisheries primarily use open canoes.

The fishing vessels are the most important assets of this economic activity. The fleet is a cornerstone of this fishing industry, impacting economic stability, cultural identity, and food security. The NFA issued 1,969 vessel licences in 2024 out of more than 4,890 vessels counted in the 2023 census. The main categories of boat licenses in Jamaica extend to the following: a) artisanal, b) industrial, c) recreational, d) CAY, e) sport charter, f) temp vessel certificate, and g) conch. The artisanal category represents the majority of licenses issued each month.[26] In 2025, on average, more than eighty-seven percent of the total licenses issued belonged to artisanal fishers. [27]

Sixty-four percent of vessel licenses are registered or issued in the following parishes: St. Catherine (14.4%), KSA (14.1%), Westmoreland (12.8%), Clarendon (8.1%), St. Thomas (7.4%), and Portland (6.9%). The remaining thirty-six percent of the vessels are registered in the parishes: St. James (6.3%), St. Mary (6%), St. Elizabeth (5.8%), St. Ann (5.6%), Hanover (4.7%), Trelawny (4.2%), and Manchester (3.8%). All these vessels arrive at specific land sites around the coastal perimeter of the island.

The licensed fleet is comprised of 86 percent small boats between 2.4 and 9 meters in length, powered by one or two outboard motors (25 to 75 HP / primarily 40 HP). Some boats are propelled by oars. These small boats are mainly made of fiberglass. Another 11 percent of the fleet consists of boats between 9.1 and 20 meters in length, primarily made of fiberglass (95%) with a small fraction of the fleet made of steel (5%). The remaining 2 percent of the boats are between 20.4 and 29.5 meters in length and are mainly made of steel (80%) and fiberglass (20%).

The latest census conducted by the National Fisheries Authority (2023) identified a total of 4,892 vessels, categorized as registered, unregistered, active, and inactive. Sixty percent of the vessels surveyed were registered, and 66 percent were engaged in fishing activities. The census classified the fleet into artisanal boats, sport charter vessels, carriers, and industrial vessels. Fifty-seven percent of the surveyed vessels were located in the parishes of Westmoreland, Kingston, St. Andrew, Clarendon,

[24] National Fisheries Authorities, 2025 / Quarterly Statistics Report / Contribution excludes taxes and subsides.
[25] Growth Analysis is related to GDP figures on Basic Prices.
[26] National Fisheries Authority, First Quarter, 2024
[27] First Quarter, 2025.

St. Catherine, and St. Elizabeth. Overall, vessels are distributed across all coastal beaches and landing sites on the mainland, as well as the offshore Morant and Pedro Cays, see Table VIII 2.

**Table VIII 2:** Number of vessels by parish, units

| *Parish* | No. Vessels |
|---|---|
| *Westmoreland* | 788 |
| *Kingston & St. Andrew* | 611 |
| *Clarendon* | 576 |
| *St. Catherine* | 481 |
| *St. Elizabeth* | 358 |
| *Portland* | 312 |
| *St. Thomas* | 303 |
| *St. James* | 276 |
| *Hanover* | 265 |
| *St. Mary* | 262 |
| *St. Ann* | 257 |
| *Manchester* | 204 |
| *Trelawny* | 199 |
| ***Total*** | **4,892** |

*Source: National Fisheries Authority (NFA), 2023.*

The distribution of vessels by length is as follows: less than 1 percent under 5.9 ft; 3 percent between 6 and 11.9 ft; 16 percent between 12 and 17.9 ft; 18 percent between 18 and 23.9 ft; 44 percent between 24 and 29.9 ft; 11 percent between 30 and 35.9 ft; 3 percent over 36 ft; and 2 percent not specified. Ninety-five percent of the vessels surveyed were constructed of fiberglass, while the remaining 5 percent were made of wood (2.4%), metal (2%), and other materials (0.6%). The crew composition of Jamaica's fleet is distributed as follows: 1–2 members per vessel (56%), 3–4 members (39%), 5–6 members (4%), and more than 7 members (1%). Notably, 95 percent of artisanal vessels operate with fewer than four crew members. Sixty percent of the Jamaican fleet primarily targets reef finfish species, while 19 percent focuses on deep-slope species, 13 percent on offshore pelagic species, and 5 percent on coastal pelagics. Less than 3 percent target species, such as spiny lobster, shrimp, crabs, baitfish, sea urchins, and others.

The main fishery areas of Jamaica are concentrated on the south side of the island, with around eighty percent of the total fishery areas in the country. The main south fishery areas are: New Bank, Blossom Bank, Walton Bank, Sunbury Bank, Kingston Bank, Pedro Bank, Mackerrel Bank, Morant Bank, California Bank, Albatross Bank, Lamottes Bank, Dingle Bank, and Norseman's Bank. North Shelf, Grappler Bank, and Henry Holmes Bank are the northern fishery areas on the island. There are more than 180 landing sites in the whole country, including the ones in Pedro Cayes and Morant Caye. The fisheries landing sites in Jamaica range from beaches with a small number of boats to a large number of vessels, including steel-hulled industrial ships. Key fishing beaches are located in Old Harbor Bay, Port Royal, Rocky Point, and the modern fishing port complex in Kingston, where carrier boats land the catch from offshore fisheries and acquire ice, water, fuel, and provisions for the offshore fishing vessels.

**Map VIII 1:** Fish Landing Sites and Beaches in Jamaica




*Source: NFA, 2025*.

At the fishing level, the core assets of this economic activity are the vessel fleet and the landing sites. Surrounding these primary assets, a range of additional fisheries-related infrastructure is required to support the generation of economic flows. These ancillary assets include offices, jetties, storage sheds, restrooms, beaches, storage houses, cold-storage facilities, fences, and other minor structures.

**Table VIII 3:** Number of farms by parish, units

| *Parish* | No. Farms |
|---|---|
| *St. Catherine* | 78 |
| *Clarendon* | 14 |
| *St. Elizabeth* | 4 |
| *Westmoreland* | 5 |
| *Hanover* | 5 |
| *St. Ann* | 2 |
| *Portland / St. Mary* | 2 |
| *St. Thomas* | 1 |
| ***Total*** | **111** |

*Source: NFA, 2025.*

In the aquaculture subsector, the principal asset is land. Jamaica has slightly more than 110 aquaculture farms distributed across nine parishes. Production is heavily concentrated in St. Catherine (479.8 acres) and Clarendon (87.5 acres), which together account for 95 percent of the country's aquaculture area. The remaining 5 percent is distributed across St. Elizabeth (11 acres), Westmoreland (3.4 acres), Hanover (9 acres), Portland/St. Mary (4.5 acres), St. Thomas (2.5 acres), and St. Ann (2 acres). The national aquaculture area totals approximately 600 acres, or 243 hectares. Other assets associated with aquaculture activities referenced in this report include bulldozers, farmhouses, containers, storage houses, cold-storage units, fences, pumps, light poles, piping systems, and other minor infrastructure. Hurricane Melissa made landfall along Jamaica's western coastline, placing fisheries and aquaculture assets and infrastructure at significant risk. Extreme waves and winds reaching 185 mph severely impacted key productive assets. The National Fisheries Authority (NFA) conducted a rapid macro-assessment of 148 beaches or landing sites and 110 aquaculture farms across the island. According

to national authorities, 3,301 vessels sustained damage—446 severely, 740 moderately, and 2,115 with minor damage. In addition, 52 beaches or landing sites were affected (8 severely, 13 moderately, 31 with minor damage), and 39.26 hectares of aquaculture production were damaged. The NFA also reported considerable losses involving storage sheds, jetties, bulldozers, farmhouses, containers, storage facilities, cold-storage units, fences, pumps, farm light poles, pipelines, feed inventories, NFA offices, beach erosion, and other minor infrastructure.

All vessels classified as having major or total damage were located in St. Elizabeth (238 vessels) and Westmoreland (208 vessels). Furthermore, 96 percent of vessels with moderate damage were identified in Westmoreland (345), Trelawny (210), St. Elizabeth (84), and St. Ann (70). The remaining 4 percent (70 vessels) with moderate damage were also recorded in St. Ann. Minor damage was reported for 2,115 vessels across ten localities, including St. James, St. Catherine, Hanover, St. Ann, St. Mary, Westmoreland, St. Elizabeth, Portland, St. Thomas, and the cays.

Regarding landing sites, all beaches with major damage were located in St. Elizabeth (4 sites), Westmoreland (3 sites), and Trelawny (1 site). Ninety-two percent of moderately damaged beaches were found in Trelawny (4 sites), St. Elizabeth (3), Westmoreland (3), and St. Ann (2), while the remaining 8 percent (1 beach) was located in St. James. A total of 29 beaches were classified with minor damage in St. Mary (7), Hanover (6), St. James (5), St. Ann (5), St. Elizabeth (2), and in Trelawny, Westmoreland, St. Catherine, and St. Andrew (1 each).

Most of the aquaculture areas and associated productive infrastructure affected by the hurricane were located in the parishes of St. Catherine (20.64 ha), St. Elizabeth (9.41 ha), Clarendon (5.26 ha), Hanover (3.24 ha), St. James (0.40 ha), and Westmoreland (0.31 ha). The bulk of the fisheries and aquaculture infrastructure damaged by the event corresponds to landing sites, aquaculture farms, and facilities of the NFA. These assets include both public and private infrastructure. Among the 52 landing sites affected, 27 experienced damage to their storage sheds: 19 were completely destroyed, one suffered partial structural and roof damage, and seven lost their roofs. The parishes reporting damage to storage sheds were St. Catherine (9), St. Elizabeth (6), Trelawny (4), St. Ann (4), Westmoreland (3), and Clarendon (1).

At the level of fisheries shops, most damage was recorded in Westmoreland (20 shops) and St. Elizabeth (4 shops). Twenty-four shops experienced total destruction, leaving no structural remnants. The NFA classifies this level of destruction as Type 3 damage. Some landing sites also reported damage to restroom facilities, including Calabash (1 unit) and Parottee (2 units) in St. Elizabeth, and Salem (1 unit) in St. Ann.

Fifteen jetties were identified as totally destroyed across 5 fishing beaches: Old Harbour Bay (8 jetties), Long Acre–Galleon (2), Whitehouse–Gilling's Gully (3), Cave (1), and Rock (1), located across the parishes of St. Catherine, St. Elizabeth, Westmoreland, and Trelawny. Several landing sites also registered moderate beach erosion, including Great Bay and Black River in St. Elizabeth, and Farquhar–Alligator Hole in Clarendon. Additionally, fencing was damaged at the Black River and Great Bay landing sites. Other types of fishing infrastructure in St. Elizabeth and Westmoreland—such as cultural facilities (Great Bay), fish processing structures (Long Acre), wind-powered systems (Whitehouse–Gilling's Gully), craft sheds/gazebos (Belmont), and the waterwheel at Cave—also suffered significant damage, affecting local economic activity.

**Image VIII 1:** Photographs of private and public damage to assets - vessels in the fishing sector



*Source: DALA team and the NFA, 2025.*

Nineteen NFA government offices were reported damaged to varying degrees across eleven parishes. The most severely affected offices were located in St. Elizabeth (Black River and Great Bay) and Westmoreland (Negril and Whitehouse), with structural damage, compromised fuel pumps, and loss of furnishings. Moderate damage was reported in St. Thomas (Bowden and Port Morant), Hanover (Lances Bay), and Manchester (Alligator Pond). Minor structural and roof damage, as well as broken windows and guardhouse deterioration, were recorded at NFA offices in St. Catherine (Twickenham Park and Old Harbour), St. Mary (Annotto Bay and Pagee), St. Andrew (Head Office and Old Fisheries), Portland (Manchioneal and Port Antonio), and Clarendon (Rocky Point).

Damages to aquaculture assets were primarily concentrated in Westmoreland, St. Elizabeth, St. Catherine, and Clarendon, while Hanover and St. James reported comparatively minor impacts. Westmoreland farms experienced significant losses in bulldozers, farmhouses, containers, and storage facilities. Aquaculture operations in St. Elizabeth reported damage to farmhouses, storage houses, cold-storage facilities, and farm fencing. Farms in St. Catherine sustained damage to light poles, piping systems, and farmhouses, while pump failures, storage losses, and structural impacts were documented in Clarendon. Damage to storage houses was also reported in Hanover and St. James. Additionally, farms in St. Catherine, Clarendon, and Westmoreland reported losses in feed inventory.

The total estimated damages in the fishing and aquaculture sector in Jamaica were JMD 5.86 billion. The damage to the sector was concentrated in the effects on the fishing fleet and the infrastructure of the landing ports or fishing beaches. Fifty-two percent of these total damages are related to the effects of fishing vessels. Another 48 percent of the estimated damage was recorded at the landing port infrastructure around the island. Minor damage (<0.4%) was observed in aquaculture farms and their assets. A little more than 48 percent of the damage caused by Hurricane Melissa is related to the public sector, and the rest is related to the private sector.

Seventy-nine percent of the estimated damage to fishing vessels was recorded in Westmoreland (JMD 1.46 billion), St. Elizabeth (JMD 0.59 billion), and Trelawny (JMD 0.34 billion). Eighty-one percent of the fishing fleet (1046 vessels) of these three parishes was moderately and severely damaged by the passage of Hurricane Melissa. The parishes of St. Ann (JMD 0.16 billion) and St. James (JMD 0.12 billion)

are other localities that suffered considerable damage to their fishing fleet. Nineteen percent of its total vessels (100 vessels) suffered moderate damage, and the rest of its fleet suffered minor damage. The rest of the affected parishes in their boats suffered minor damage: St. Catherine, Hanover, St. Mary, Portland, and St. Thomas, accounting for around JMD 0.35 billion of estimated damage to vessels.

The most affected or impacted fish landing sites in their infrastructure were located in the parishes of Westmoreland (JMD 2.3 billion), St. Elizabeth (JMD 0.2 billion), and St. Catherine (JMD 0.16 billion), based on information generated by the National Fisheries Authority. The damage in the landing sites' infrastructure of the three parishes represents about 93 percent of the total estimated damage amount in this category. Other parishes with significant damage to the infrastructure of their fishing landing sites were Trelawny (JMD 58 million), St. Ann (JMD 55.2 million), St. James (JMD 30 million), and Hanover (JMD 26 million). The registered damages of these four parishes represented around 6 percent of the total damage amount in this category. The affected infrastructure of the landing sites in Clarendon, St. Mary, St. Thomas, Portland, Manchester, and St. Andrew registered damages of around JMD 31.8 million (1 %).

**Table VIII 4:** Damages in the Fisheries and Aquaculture Sector, in thousands of JMD

| ***Fisheries Vessels*** | **Public** | **Private** | **Total** |
|---|---|---|---|
| *Vessels - major damage* | - | 1,306,900 | 1,306,900 |
| *Vessels - moderate damage* | - | 1,184,000 | 1,184,000 |
| *Vessels- minor damage* | - | 528,750 | 528,750 |
| *Subtotal* | - | 3,019,650 | 3,019,650 |
| | | | |
| ***Fisheries Landing Sites*** | **Public** | **Private** | **Total** |
| *Storage Sheds* | 351,500 | - | 351,500 |
| *Shops* | 750,000 | - | 750,000 |
| *Bath Rooms* | 9,040 | - | 9,040 |
| *Other Sheds* | 1,402,701 | - | 1,402,701 |
| *Jetties* | 200,080 | - | 200,080 |
| *Fences* | 1,056 | - | 1,056 |
| *Beach Erosion* | 25,000 | - | 25,000 |
| *NFA Offices* | 76,800 | - | 76,800 |
| ***Subtotal*** | **2,816,177** | **-** | **2,816,177** |
| | | | |
| ***Aquaculture Infrastructure*** | **Public** | **Private** | **Total** |
| *Bulldozer* | - | 5,091 | 5,091 |
| *Farm Houses* | - | 11,900 | 11,900 |
| *Containers* | - | 509 | 509 |
| *Storage Houses* | - | 4,035 | 4,035 |
| *Cold Storage* | - | 1,875 | 1,875 |
| *Fences* | - | 400 | 400 |
| *Pumps* | - | 160 | 160 |

**Table VIII 4:** Damages in the Fisheries and Aquaculture Sector, in thousands of JMD *(continuation)*

| *Aquaculture Infrastructure* | Public | Private | Total |
|---|---|---|---|
| *Light Posts* | - | 60 | 60 |
| *Piping* | - | 80 | 80 |
| *Feed Inventory* | - | 1,524 | 1,524 |
| *Subtotal* | - | 25,635 | 25,635 |
| ***Grand Total*** | **2,816,177** | **3,043,761** | **5,859,938** |

*Source: DaLA team and National Fisheries Authority, 2025.*

Damage to aquaculture assets was significantly lower compared to the damage to the assets of the fishing sector, but it is important to mention that the economic scale of the two activities is very different. Damage to aquaculture assets is representative of this economic activity. The parishes of Westmoreland (JMD 12.8 million), St. Elizabeth (JMD 6.4 million), St. Catherine (JMD 3.3 million), and Clarendon (JMD 2.7 million) accounted for 98 percent of the total damage to aquaculture infrastructure or assets. The remaining 1 percent (JMD 0.4 million) was registered in the parishes of Hanover and St. James.

## B. Losses

Jamaica's fishing sector structures its activity into two major components: marine fish (artisanal and industrial) and aquaculture production[28]. Aquaculture production is mainly concentrated in tilapia. The diversity of fisheries on the island varies from reef, coastal pelagic, offshore, deep slope, and no boat and shrimp. The most common fish varieties traditionally fished are snapper, parrot, doctor jack, grunt, barracuda, tuna, wrenchman, and kingfish. The productive flow of Jamaica's fisheries-aquaculture sector has maintained a positive trend through the last few years (2020 – 2024). The island's marine fish production has increased from 11,962.9 to 14,291.3 tons in the catch of fish, shells, lobsters, and shrimp[29]. In contrast, aquaculture production has contracted from 911.8 to 663.7 tons in tilapia and basa species. This contraction is associated with the reduction of farms and productive aquaculture areas. The growth and contraction of the fishery-aquaculture sector is greatly influenced by the vulnerability of climatic events in the region. Jamaica's aquaculture and fisheries production value amounts to around JMD 17.7 billion[30]. Ninety-six percent of this value is registered within fishing activity, and 4 percent is associated with aquaculture activity. Artisanal fishing accounts for 89 percent of the value of production in this sector. Industrial conch fishing (4%), shrimp (3%), and aquaculture-tilapia production (4%) represent the remaining 11 percent of the gross value of the sector's production.

The STATIN of Jamaica reports exports of fishery products in two categories: Animal & Fish, as part of agricultural production, and Fish & Fish products, as part of manufactured production. Exports from these two categories are around JMD 3.1 billion[31]. Eighty-three percent of the value exported corresponds to Fish & Fish Product, and sixteen percent to animals & fish. Jamaica has a dynamic fisheries sector supported by rich marine resources. Marine production is structured with the capture of hundreds of marine species. The NFA has reported the capture of between 300 and 405 species in the last five quarters (2024 -2025).[32] Sardines (Sardinella), Black Jacks (Caranx lugubris), and Herring (Opisthonema oglinum) represent the highest-volume species in the catch. Within the snapper group, approximately eleven species were identified across the fishing areas, making it one of the most diverse

[28] NFA, 2025.
[29] Planning Institute of Jamaica, 2024.
[30] National Fisheries Authority, 2024.
[31] Statistical Institute of Jamaica, 2024.
[32] Quarterly Statistics Reports, 2024 – 2025.

categories, including Dog, Glasseye, Grey, Lane, Mutton, Red, Silk, Vermillion, and Yellowtail snapper. Snapper and parrotfish are caught in all parishes of the island. The species recorded in more than ten parishes include Snapper (13), Parrot (13), Jack (11), Mackerel (10), Grouper (10), and Butterfish (10). Doctorfish (9), Grunt (9), Kingfish (9), Dolphin fish (8), and Tarpon (8) were reported in 8–9 parishes. In contrast, species with the most limited geographic distribution—captured in the fewest landing sites and parishes—were Marlin (7), Wrenchman (7), Barracuda (6), and Tuna (4).

Jamaica's marine fish production has fluctuated between 600 and 2,650 metric tons monthly in the last three years. On average, the island catches 1,100 – 1,200 tons of marine species per month. The months of February, March, July, and September have reported production numbers much lower than the monthly average. The finfish production is open and registers production for twelve months a year, while Sea Cucumber, Industrial Conch, and Industrial Spiny Lobster record production only in certain months of the year. Jamaica's lobster fishing season closes from April to June, and the conch fishery closes from August through February to protect the population for regeneration.

**Table VIII 5:** The most common fish varieties caught per parish

| *Parish* | Snapper | Parrot | Doctor | Dolphin Fish | Jack | Grunt | Barracuda | Tuna | Mackerel | Grouper | Wrenchman | Tarpon | Butter Fish | King Fish | Marlin |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *St. Ann* | x | x | x | | x | | x | | | x | x | | x | | x |
| *St. Mary* | x | x | | x | x | | | x | x | x | | | | | x |
| *St. James* | x | x | x | x | x | x | x | x | x | x | x | x | x | x | x |
| *Trelawny* | x | x | x | x | x | x | | | | | | | | x | x |
| *Westmoreland* | x | x | x | x | x | x | x | | x | x | x | x | x | x | x |
| *St. Elizabeth* | x | x | x | x | | | | | | | | x | x | x | |
| *Clarendon* | x | x | x | x | x | x | x | | x | x | x | x | x | x | |
| *Manchester* | x | x | | | x | x | | | x | x | x | x | | x | |
| *St. Catherine* | x | x | x | | x | x | x | | x | | | x | x | | |
| *Portland* | x | x | | x | x | | | x | x | x | x | | x | x | x |
| *KSA* | x | x | x | | x | x | x | | x | x | | x | x | x | |
| *Hanover* | x | x | | x | | x | | x | x | x | x | | x | | x |
| *St. Thomas* | x | x | x | | x | x | | | x | x | | x | x | x | |

*Source: NFA, 2025.*

Jamaica's fishing capacity is structured by the geographic distribution of the vessels and the landing sites or beaches in the parishes. The NFA records a count of 4,892 vessels nationwide[33] distributed in thirteen parishes and mentions the existence of more than 180 beaches or landing sites around the island. In this document, we considered 148 landing sites that were part of the information gathering process by the national authorities. Considering the distribution of vessels by parish and the type of vessels (material/size), the vessel's fishing capacity of the thirteen parishes of Jamaica can be distributed from the total. The parishes with the highest fishing capacity based on their fishing fleet are Westmoreland (17), St. Andrew (13), Clarendon (11), St. Catherine (10) and St. Elizabeth (7). Parishes

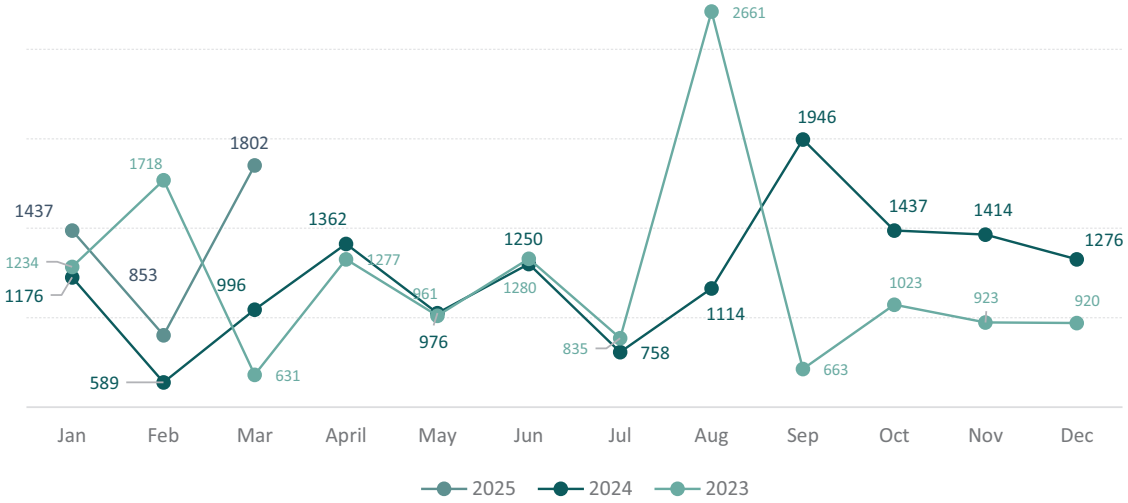
[33] National Fisheries Census, 2023

with moderate fishing capacity are Portland (7), St. Thomas (6), St. James (6), St. Ann (5), St. Mary (5) and Hanover (5). Finally, the parishes with the lower fishing capacity based on their fishing fleet are Trelawny (4) and Manchester (4).

In relation to landing capacity, the parishes with the largest number of landing sites or beaches for the reception or landing of fish from the fleet of vessels are: Portland (20), Westmoreland (18), St. Thomas (17), Hanover (17), St. Elizabeth (12). Parishes with a moderate number of landing sites or beaches are: Clarendon (10), St. Ann (10), St. Mary (10), St. Andrew (9), St. James (8), Trelawny (8) and St. Catherine (5).

Aquaculture production is mainly concentrated in the parishes of St. Catherine and Clarendon. Ninety-five percent of the aquaculture area is distributed in these two areas. The remaining 5 percent of the aquaculture farms are distributed in the parishes of St. Elizabeth, Westmoreland, Hanover, St. Thomas, St. Ann, Portland|, and St Mary. On average, Jamaica has produced about 54 metric tons of aquaculture species each month[34]. In the first six months of the year, monthly aquaculture production (59 MT/ month) appears to be higher than in the second half of the year (49 MT/month). The months of October, November and December were the months with the lowest production in this subsector.

**Figure VIII 1:** Marine Fish Production by month and year, in metric tons (MT)




*Source: National Fisheries Authority (NFA), 2025.*

*Note: Reported weight for whole, tail and head meat*

The island's fisheries authorities have preliminarily recorded effects on fishing capacity through satellite images by quantifying affected vessels at the different landing sites: St. Catherine (Old Harbour Bay: 273 vessels with minor damage); St. Elizabeth (VMAD:[35] Slipe: 83; Parotte: 70; Long Acre: 42 / VMOD[36]: Great Bay: 33; Frenchman's Bay: 30; Calabash Bay: 22 - / VMID:[37] Billy's Bay: 25; Vernon: 5); Westmoreland (VMAD: Whitehouse: 170; Scotts Cove: 26; Cave: 12 / VMOD: Market Beach: 177; Belmont: 88; Little Bay: 80; / VMID: Negril: 196); Hanover (VMID: Elgin Town: 94; Great River: 80; Lances Bay: 33; Orange Bay: 30; Green Island: 21; Cousins Cove: 8); St. James (VMOD: Grange Pen: 30 / VMID: River Bay: 92; Salt Spring: 79; Whitehouse: 70; Navy: 21); Trelawny (VMOD: Rio Bueno: 70; Falmouth: 66; Rock: 45: Salt Marsh: 29); St. Ann (VMOD: Salem: 48; Runaway Bay: 22 / VMIND: White River: 57; St. Ann's Bay: 39; Discovery Bay: 37; Ocho Ríos: 31; Priory:17); St. Mary's (VMID: Page: 91; Oracabessa: 54; Río Nuevo: 41; Annotto Bay: 23; Boscobel: 16; Robins Bay: 12; Dover: 12); Portland (VMID in several beaches); St. Thomas (VMID in several beaches).

[34] National Fisheries Authority, 2024.
[35] VMAD: Vessels with Major Damage.
[36] VMOD: Vessels with Moderate Damage.
[37] VMID: Vessels with Minor Damage.

Based on this information, it has been estimated that the landing capacity in fishing ports or beaches has been reduced to 83 percent due to damage to their infrastructure. In addition, the fishing capacity of the fleet of vessels has been reduced to 78 percent due to the damage caused by the passage of Hurricane Melissa. The most affected parishes with a considerable reduction in their landing capacity are: St. Elizabeth (44%) and Trelawny (50%). Other parishes with a moderate reduction in landing capacity are: Westmoreland (70%), St. Ann (70%), St. James (71%), St. Mary (77%), and Hanover (88%). St. Catherine and St. Andrew recorded a minimal reduction in their landing capacity at their landing sites or beaches.

Jamaica's fishing capacity was moderately reduced (78%) based on damage to its fishing fleet. At the parish level, the reduction in fishing capacity was a bit more dramatic. St. Elizabeth (19%), Trelawny (42%), and Westmoreland (45%) reduced their fishing capacity by less than half and in some cases by less than a fifth due to massive damage to their vessels. Other parishes with moderate reductions were St. Ann (79%) and St. James (86%). Hanover (91%), St. Thomas (91%), St. Mary (92%), Portland (92%), and St. Catherine (95%) minimally reduced their fishing capacity due to the effects of the climate disaster.

From the interaction of the reduction in fishing capacity and the reduction in landing capacity in Jamaican ports or beaches, an initial reduction in marine fishing of 35%is estimated in the month of November. The parishes with an initial effect of more than half of their production or monthly fishing economic flows are: St. Elizabeth (91% reduction), Trelawny (79% reduction) and Westmoreland (69% reduction). In addition, an initial moderate contraction in monthly marine fisheries is estimated for the parishes of St. Ann (minus 45%), St. James (minus 39%), St. Mary (minus 30%) and Hanover (minus 20%). Minor initial contractions are estimated for St. Catherine (minus 11%), St. Thomas (minus 9%), Portland (minus 8%) and St. Andrew (4%). The estimated ideal recovery of marine fisheries is to be restored in 6 to 7 months with a gradual increase in fishing capacity and landings (65 to 94 percent in six months). This estimate may vary depending on access to capital and financing for the restoration of productive fishing assets.

Jamaica's aquaculture production capacity is directly related to its aquaculture pool area. Prior to the event, the area of aquaculture farms was approximately 242 hectares. St. Catherine (194 ha) and Clarendon (35 ha) were the parishes with the highest productive capacity - area (84%) in Jamaica before Hurricane Melissa. The other thirteen hectares of aquaculture area were distributed in 7 parishes: St. Elizabeth (4.5 ha), Hanover (3.6 ha), Portland – St. Mary (1.8 ha), Westmoreland (1.4 ha), St. Thomas (1 ha) and St. Ann (0.8 ha). In proportion to the productive aquaculture area of the parishes, St. Elizabeth reported total damage to its aquaculture area and Hanover registered 89 percent damage. Other parishes with minor effects were Westmoreland (23 percent), Clarendon (15 percent) and St. Catherine (11 percent). At the level of absolute hectares affected, St. Catherine reported damages in 20.6 ha and Clarendon in 5.3 ha, representing about 70 percent of the total affected area.

The estimated losses in the fisheries and aquaculture sector amount to JMD 1.8 billion due to the passage of Hurricane Melissa. Ninety-seven percent of the losses in marine-aquaculture economic flows correspond to the fisheries sector (JMD 1.7 billion). Losses in the aquaculture sector account for just 3 percent of total losses (JMD 57 million). In the fisheries sector, the estimated losses are mainly due to the presumption of reduced fishing and landing capacity during the following 6 months after the event. The processes of replenishment, repair, and reconstruction of fishing assets, mainly vessels and landing ports, can take some time depending on the accessibility of capital and financing of the owners of the assets. At the aquaculture level, the losses are mainly due to damage to the aquaculture surface in the affected parishes. In this case, there is a direct loss of tilapia production that was being farmed in aquaculture pools at the time of the hurricane.

Eighty-six percent of Jamaica's marine fish production losses have been estimated in the parishes of Westmoreland (JMD 0.65 billion), St. Elizabeth (JMD 0.44 billion), Trelawny (JMD 0.18 billion), St. Ann

(JMD 106 million), and St. James (JMD 90 million). Losses in the parishes of St. Mary (JMD 57.7 million), St. Catherine (JMD 49.3 million), Hanover (JMD 44.5 million), St. Thomas (JMD 35.5 million), Portland (JMD 34 million), and St. Andrew (JMD 13.7 million) accounted for the remaining 14 percent of the total amount.

**Table VIII 6:** Losses in the Fisheries and Aquaculture Sector, in thousands of JMD

| *Marine Fish Production* | Public | Private | Total |
|---|---|---|---|
| *Artisanal - Finfish* | - | 1,577,899 | 1,577,899 |
| *Conch - Industrial* | - | 38,640 | 38,640 |
| *Lobster - Industrial* | - | 83,055 | 83,055 |
| *Sea Cucumber* | - | 1,760 | 1,760 |
| *Subtotal* | - | 1,701,354 | 1,701,354 |
| | | | |
| ***Aquaculture*** | **Public** | **Private** | **Total** |
| *Tilapia production* | - | 57,345 | 57,345 |
| *Subtotal* | - | 57,345 | 57,345 |
| ***Total*** | **-** | **1,758,699** | **1,758,699** |

*Source: DaLA Assessment team and National Fisheries Authority, 2025.*

In terms of aquaculture losses, the most affected parishes were St. Catherine (JMD 28.4 million), St. Elizabeth (JMD 12.9 million), and Clarendon (JMD 9.1 million), representing 88 percent of total aquaculture losses. The remaining 12 percent of total aquaculture losses were recorded in the parishes of Hanover (JMD 4.45 million), Westmoreland (JMD 1.95 million), and St. James (JMD 0.56 million).

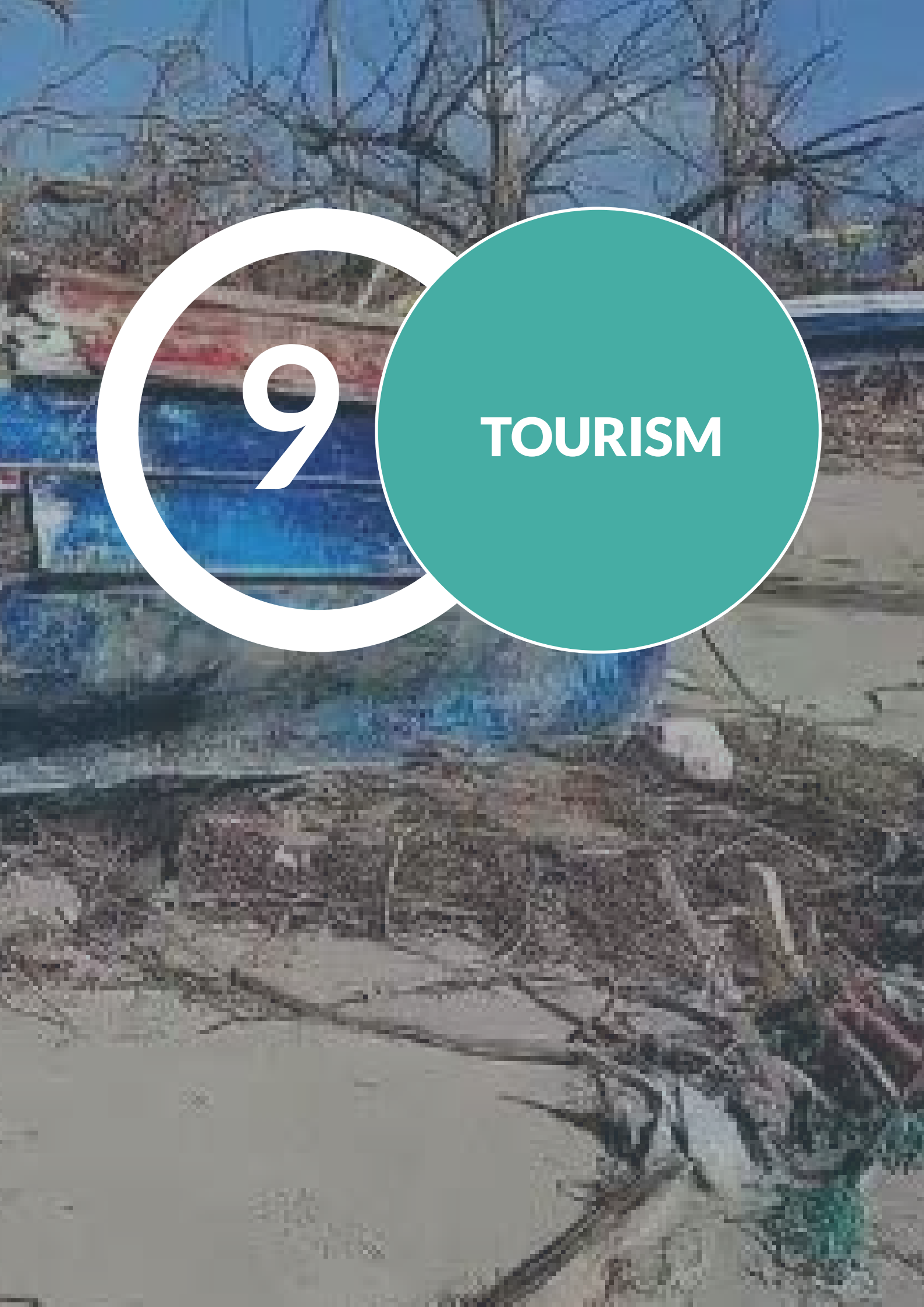
## C. Additional Costs

The process of restoring or recovering fishing and landing capacity must start by cleaning up and removing debris after the hurricane. A little more than 30 percent of Jamaica's landing sites were directly affected by Hurricane Melissa. All of the moderately and hardly affected fishing beaches were located in the western and central part of the island within the parishes of Westmoreland, St. Elizabeth, Trelawny, St. James, and St. Ann. The eastern region and some parishes in the central part of the island suffered lower damage to their infrastructure and boats of the landing sites (St. Mary, St. Andrey and St. Catherine) based on the information reported by the fishing authorities. The majority of the parishes with their landing sites or beaches have been affected at different levels depending on the path of the hurricane. Therefore, the National Fisheries Authority has estimated additional costs for debris removal in most parishes as reported by each of them. This debris removal process involves the movement of vessel debris, jetties, sheds, fences, and other infrastructure related to the landing sites.

**Table VIII 7:** Additional Costs in the Fisheries and Aquaculture Sector, in thousands of JMD

| *Marine Fish Production* | Public | Private | Total |
|---|---|---|---|
| *Debris removal* | 96,000 | - | 96,000 |
| ***Total*** | **96,000** | **-** | **96,000** |

*Source: DaLA Assessment team and National Fisheries Authority, 2025.*



# 9 TOURISM

# Chapter IX - Tourism

Hurricane Melissa made landfall in Jamaica, severely affecting a large share of the country's tourism destinations. The storm caused significant physical damage in the parishes of St. Elizabeth, St. James, St. Ann, Trelawny, Hanover, and Westmoreland, and generated substantial disruption to tourism activity across the rest of the country, even prior to landfall.

This chapter presents the results of the assessment for the tourism sector. Hurricane Melissa is estimated to have caused damages of JMD 315 billion, losses of JMD 265 billion, and additional costs of JMD 20.5 billion. While the impacts were concentrated in a subset of parishes, these areas account for a substantial share of Jamaica's tourism activity, amplifying the overall economic effect of the event.

**Table IX 1:** Summary of the effects in the tourism sector, in thousands of JMD

| *Effect* | Public | Private | Total |
|---|---|---|---|
| *Damages* | | 315,419,390 | 315,419,390 |
| *Losses* | | 265,232,104 | 265,232,104 |
| *Additional costs* | 11,039,678 | 9,462,582 | 20,502,260 |
| ***Total*** | **11,039,678** | **590,114,076** | **601,153,754** |

*Source: DaLA team, 2025.*

The information presented in this section is based on field observations and interviews conducted during the assessment. The team received official data and valuable support from the Ministry of Tourism of Jamaica (MTJ), as well as inputs from the Tourism Recovery Task Force.

## A. Damages

Damages were estimated using two main sources of information. The first was the tourism baseline described in the Appendix of this chapter, which consists of a georeferenced inventory of tourism assets, including their estimated replacement costs. This baseline was combined with a damage classification model that assigns a level of damage to each individual establishment.

The damage classification model was developed using a supervised classification approach. A stratified random sample of buildings exposed to hurricane-force winds was manually interpreted using very high–resolution imagery (15–30 cm spatial resolution) to identify damage categories, including no damage, partial roof damage, severe roof damage, and complete destruction. Wind intensity data were derived from the Hurricane Melissa Maximum Sustained Wind (MSW) dataset, based on the Holland wind field model.

Building-level damage was then generalized by extrapolating the damage proportions observed in the stratified random sample to all buildings within the corresponding wind intensity classes. This approach assumes a homogeneous damage response within each wind class and was guided by the visual interpretation of high-resolution imagery. The generalized results were subsequently evaluated at the parish level, and further adjustments were applied in cases where the extrapolated damage levels appeared implausibly high relative to observed conditions.

Table IX 2 presents the resulting distribution of damage levels by parish. These totals emerge directly from the methodology described above and were not imposed ex ante. The results are consistent with expectations given the characteristics of the event, showing a high concentration of affected assets in the western parishes, with particularly severe impacts in St. Elizabeth, St. James, and Trelawny.

**Table IX 2:** Percentage of damage per parish

| *Parish* | No damage | Minor roof damage | Partial roof damage | Total roof damage | Destroyed |
|---|---|---|---|---|---|
| *Clarendon* | 88.9 | 0.0 | 11.1 | 0.0 | 0.0 |
| *Hanover* | 87.3 | 0.6 | 3.8 | 7.0 | 1.3 |
| *Kingston* | 85.7 | 0.0 | 14.3 | 0.0 | 0.0 |
| *Manchester* | 93.9 | 4.6 | 1.5 | 0.0 | 0.0 |
| *Portland* | 100.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *St. Andrew* | 100.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *St. Ann* | 71.4 | 5.9 | 12.9 | 4.1 | 5.9 |
| *St. Catherine* | 100.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *St. Elizabeth* | 68.7 | 3.8 | 11.9 | 8.7 | 7.0 |
| *St. James* | 70.0 | 6.1 | 11.2 | 7.9 | 4.8 |
| *St. Mary* | 75.9 | 7.4 | 11.1 | 1.9 | 3.7 |
| *St. Thomas* | 100.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *Trelawny* | 52.8 | 18.6 | 15.5 | 9.9 | 3.1 |
| *Westmoreland* | 78.5 | 3.4 | 10.2 | 5.2 | 2.8 |

*Source: DaLA team, 2025.*

At this stage, a baseline of tourism establishments was available, including their replacement costs by asset class and an assigned level of physical damage. To translate this information into monetary damage estimates, it was necessary to apply damage ratios that represent the fraction of asset value affected, conditional on both the type of asset and the degree of damage. Table IX 3 presents the damage matrix used to assign these fractions by asset category and damage level.

It is important to clarify that the "no damage" category does not imply the absence of impacts. Rather, it indicates that no visible damage was detected through aerial imagery. Minor or cosmetic damages may still be present, but cannot be identified remotely. Accordingly, a small damage fraction was applied to buildings classified as having no damage, with slightly higher fractions applied to other asset categories to account for less visible impacts.

**Table IX 3:** Damage factor matrix (%)

| *Degree* | Building | Furniture & Equipment | Other assets | Landscape & Common areas |
|---|---|---|---|---|
| *No damage* | 0.5 | 2 | 2 | 2 |
| *Minor roof damage* | 10 | 30 | 40 | 10 |
| *Partial roof damage* | 25 | 60 | 70 | 30 |
| *Total roof damage* | 50 | 100 | 100 | 50 |
| *Destroyed* | 100 | 100 | 100 | 100 |

*Source: DaLA team, 2025.*

One additional step was required to complete the damage estimation. For a small number of establishments, the model was unable to assign a damage level, primarily due to the lack of

georeferencing. In these cases, average damage factors by parish and asset type were applied. At this stage, each record included four elements: asset class, baseline replacement value, assigned damage factor, and resulting damage value. Damages were calculated through the simple multiplication of the baseline value by the corresponding damage fraction.

Table IX 4 presents total damages by parish, expressed in thousands JMD, along with the percentage of damages relative to the total baseline value. Total estimated damages amount to JMD 315 billion, with nearly 44 percent occurring in St. James. This reflects the high concentration of tourism facilities in and around Montego Bay. Approximately 18.8 percent of total damages occurred in St. Ann, again largely driven by the size of its tourism asset base. Together, St. James, St. Ann, Trelawny, Hanover, and Westmoreland account for 92.2 percent of total tourism-sector damages.

Special consideration should be given to St. Elizabeth. Although the absolute value of damages in this parish is relatively modest, the share of damage relative to its baseline asset value is the highest among all parishes. St. Elizabeth lost approximately 17.7 percent of its tourism infrastructure, much of which consists of small-scale establishments that typically lack the financial resilience and insurance coverage of larger facilities. As a result, this parish is likely to face the greatest challenges during the reconstruction phase.

**Table IX 4:** Damage per parish, in thousands of JMD

| *Parish* | Value | Percentage (%) |
|---|---|---|
| *Clarendon* | 439,618 | 4.3 |
| *Hanover* | 20,955,943 | 4.7 |
| *Kingston* | 100,836 | 1.0 |
| *Manchester* | 556,877 | 1.4 |
| *Portland* | 484,884 | 0.9 |
| *St. Andrew* | 1,238,054 | 0.8 |
| *St. Ann* | 59,381,280 | 10.9 |
| *St. Catherine* | 155,485 | 0.9 |
| *St. Elizabeth* | 12,924,700 | 17.7 |
| *St. James* | 138,706,387 | 12.6 |
| *St. Mary* | 8,531,754 | 8.4 |
| *St. Thomas* | 72,496 | 0.9 |
| *Trelawny* | 38,337,548 | 12.4 |
| *Westmoreland* | 33,533,462 | 8.1 |
| *Unable to locate* | 68 | 0.6 |
| ***Total*** | **315,419,390** | **9.6** |

*Source: DaLA team, 2025.*

Table IX 5 presents total damages by asset type, together with their respective shares relative to the baseline values. The largest share of damages is associated with buildings and facilities, which account for 59.4 percent of total damages. This share is significantly lower than the relative weight of these assets in the overall baseline, reflecting the limited number of facilities that were either destroyed or structurally compromised. This assessment was corroborated during fieldwork inspections. In the

Montego Bay area, most observed damages were non-structural in nature, in contrast to conditions along the South Coast, where structural impacts were more prevalent.

The second-largest category of damages relates to furniture and equipment. Although no widespread structural damage was observed in the Montego Bay area, fieldwork revealed extensive damage caused by water intrusion. In several accommodation establishments, furniture and equipment were severely affected, and in some cases, complete replacement will be required. This same mechanism explains the relatively high level of damages recorded under "other assets," which include electrical and communications systems, elevators, air-conditioning units, pumps, and related infrastructure, all of which were reported as damaged due to water exposure.

Finally, significant damage was observed in landscaping and common areas. Strong winds led to the uprooting of trees and widespread damage to shared spaces, while storm surge caused additional impacts on properties located near the coastline and beachfronts. Damages to landscaping and common areas were particularly significant for resort-type establishments, where these elements represent an important component of the overall asset base.

**Table IX 5:** Damage per type, in thousands of JMD

| *Type of asset* | Value | Percentage (%) |
|---|---|---|
| *Buildings and facilities* | 187,351,446 | 7.9 |
| *Furniture and equipment* | 63,296,871 | 16.8 |
| *Other assets* | 34,973,233 | 22.0 |
| *Landscaping and common areas* | 29,797,839 | 7.9 |
| ***Total*** | **315,419,390** | **9.6** |

*Source: DaLA team, 2025.*

## B. Losses

Tourism-sector losses were estimated using the baseline described in the Appendix of this chapter and by modeling recovery flows through Gompertz functions. Given that the impacts of Hurricane Melissa varied significantly across parishes, separate estimations were conducted at both the parish and resort-area levels. It is important to note that destination areas do not necessarily align with parish boundaries. Estimating differentiated recovery paths and applying tailored assumptions for each destination area allowed for a more robust and realistic assessment of losses.

Several key variables were considered in defining the recovery parameters for each destination area. The first was the degree of physical damage relative to the baseline. Higher levels of damage were assumed to result in longer recovery periods, which explains why losses along the South Coast are estimated to extend into 2027. A second critical factor was the restoration of electrical power. Across all fieldwork interviews, lack of electricity was consistently identified as one of the primary impediments to recovery[38]. As of early December, more than 80 percent of users in Westmoreland and over 40 percent in Hanover remained without power. Under such conditions, a meaningful recovery of tourism activity is unlikely. However, once electricity is restored, recovery in these areas is expected to accelerate, particularly in Negril, where overall physical damage was less severe than in other affected regions.

[34] In a survey conducted by the MOT, 35.4 percent of respondents stated that utility outages were the primary constraint to recovery.

In contrast, tourism activity in most eastern parishes was already showing signs of recovery. These parishes experienced limited physical damage, and critical supporting infrastructure—such as airports and power supply—was restored relatively quickly. Accordingly, a rapid recovery trajectory was assumed for these areas.

Using these differentiated recovery models, a monthly series of stopover tourism receipts was constructed for each destination area and compared against the corresponding baselines to estimate losses. Table IX 6 summarizes total losses across three periods. The first period, the last quarter of 2025, accounts for nearly 43 percent of total losses. This reflects the initial recovery and assessment phase, which coincided with the onset of the high tourism season. Losses continue throughout 2026, particularly concentrated in the early months due to ongoing recovery efforts and higher baseline activity levels. Total losses for 2026 are estimated at JMD 146.7 billion, representing approximately 57 percent of total losses. Losses in 2027 are expected to be relatively limited and confined to the South Coast. A full recovery is assumed for all other parishes by the end of 2026[39].

**Table IX 6:** Stopover losses by destination area, in thousands of JMD

| *Destination Area* | Oct - Dec 2025 | 2026 | Jan - Mar 2027 | Total |
|---|---|---|---|---|
| *Montego Bay* | 48,457,592 | 71,491,364 | 0 | 119,948,957 |
| *Ocho Rios* | 23,550,145 | 27,232,778 | 0 | 50,782,924 |
| *Negril* | 23,217,237 | 32,800,847 | 0 | 56,018,084 |
| *Kingston* | 2,738,846 | 798,233 | 0 | 3,537,079 |
| *South Coast* | 9,181,233 | 13,659,249 | 170,548 | 23,011,030 |
| *Port Antonio* | 327,966 | 82,002 | 0 | 409,968 |
| *Other* | 2,493,988 | 618,575 | 0 | 3,112,563 |
| ***Total*** | **109,967,008** | **146,683,049** | **170,548** | **256,820,605** |

*Source: DaLA team, 2025.*

Table IX 7 presents losses associated with cruise visitors, in addition to stopover tourism losses. The contrast between the two is striking: losses related to cruise visitors account for only 3.2 percent of total tourism losses. These losses are largely concentrated in late 2025 and the early months of 2026 and primarily affect areas in the immediate vicinity of cruise ports[40].

Although cruise-related losses are small when compared with stopover tourism losses, two important caveats should be noted. First, cruise operations play a signaling role for the broader tourism sector. The resumption of cruise calls serves as an endorsement of destination recovery, which explains why private-sector stakeholders in Montego Bay expressed strong interest in the early return of cruise activity. Second, cruise visitors generate significant spending in businesses located near ports, such as the Harbour Street Craft Market and the Montego Bay Old Fort Craft Market. These markets, along with numerous nearby establishments, depend heavily on cruise tourism.

[39] Losses were calculated using the baseline described in the Appendix. The Ministry of Tourism (MOT) also provided 2025 "target" estimates. From January to September 2025, these targets overstated stopover visitor arrivals by 7.6 percent. If the MOT target figures were used instead of the Appendix baseline, estimated stopover losses for the fourth quarter of 2025 would be 14.3 percent higher.

[40] Losses were calculated using the baseline described in the Appendix. The Ministry of Tourism (MOT) also provided 2025 "target" estimates. From January to September 2025, these targets overstated cruise visitor arrivals by 9.4 percent. If the MOT target figures were used instead of the Appendix baseline, estimated cruise losses for the fourth quarter of 2025 would be 28.8 percent higher.

As a result, even relatively modest losses in cruise visitation can have a disproportionately large impact on a significant number of households whose livelihoods rely on cruise-related economic activity.

**Table IX 7:** Losses by type of visitor, in thousands of JMD

| *Type of visitor* | Oct - Dec 2025 | 2026 | Jan - Mar 2027 | Total |
|---|---|---|---|---|
| *Stopover* | 109,967,008 | 146,683,049 | 170,548 | 256,820,605 |
| *Cruise* | 4,460,810 | 3,950,689 | 0 | 8,411,499 |
| ***Total*** | **114,427,817** | **150,633,739** | **170,548** | **265,232,104** |

*Source: DaLA team, 2025.*

Tourism losses can be further disaggregated by type of expenditure using the information provided by the MTJ. Table IX 8 presents this breakdown. As expected, the largest share of losses accrues to the accommodation sector, which accounts for nearly 60 percent of total losses. This relatively high proportion reflects the prevalence of all-inclusive tourism products across several destinations, where a large share of visitor spending is captured within accommodation establishments.

A substantial portion of losses is also borne by tour operators and related services. Losses in transportation services are estimated at JMD 12 billion, while tour operators and entertainment-related businesses are expected to experience losses amounting to JMD 36 billion.

**Table IX 8:** Losses by type of expenditure sector, in thousands of JMD

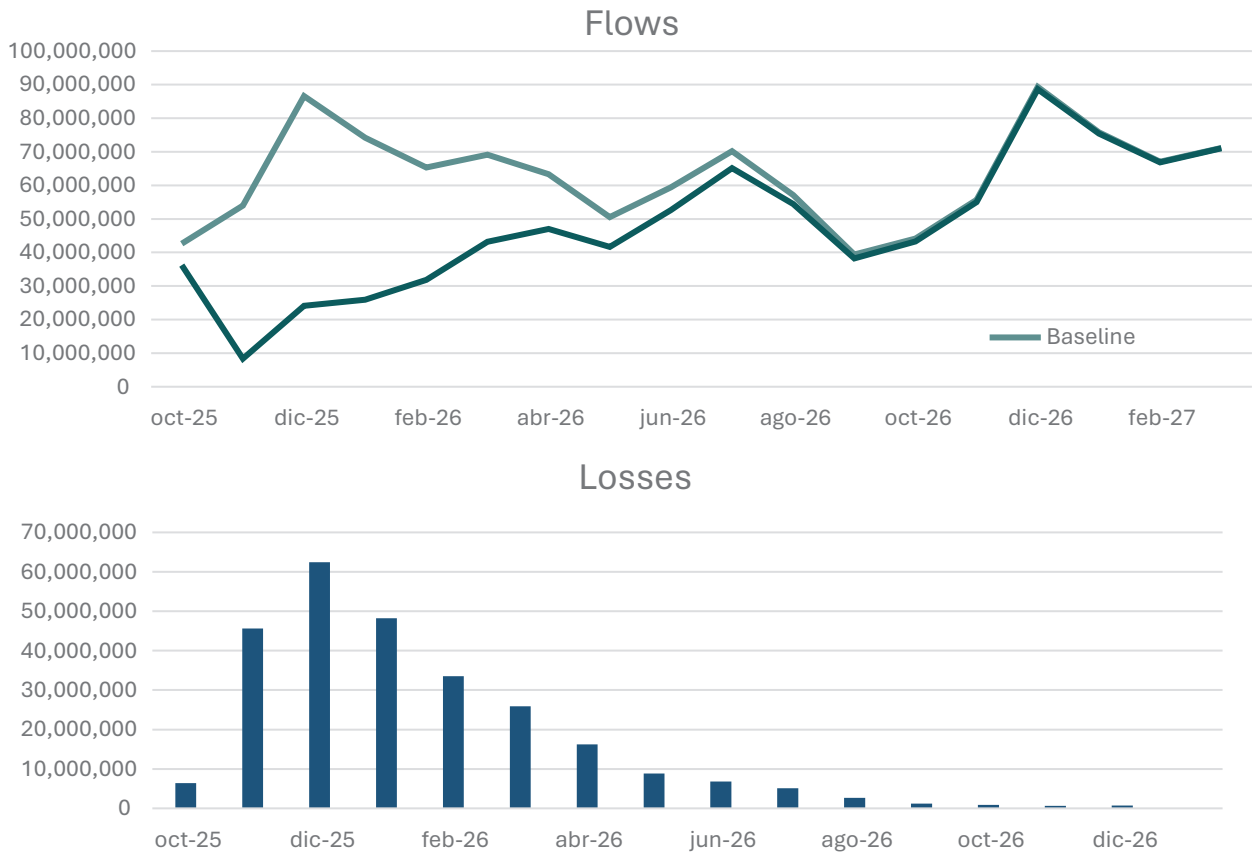
| *Type of expenditure* | Stopover | Cruise | Total |
|---|---|---|---|
| *Accommodation* | 156,917,389 | | 156,917,389 |
| *Shopping* | 8,731,901 | 3,516,007 | 12,247,907 |
| *Transportation* | 12,584,210 | 243,933 | 12,828,143 |
| *Food & beverage* | 7,447,798 | | 7,447,798 |
| *Attractions & entertainment* | 32,616,217 | 2,910,379 | 35,526,595 |
| *Miscellaneous* | 38,523,091 | 1,741,180 | 40,264,271 |

*Source: DaLA team, 2025.*

For illustrative purposes, Figure IX 1 presents, in the top panel, the baseline and the projected flows of total international tourism receipts. This comparison highlights a key characteristic of tourism activity: its strong seasonality. On average, receipts in December are more than twice those recorded in September. These seasonal patterns are fully incorporated into the baseline, the recovery trajectories, and consequently the loss estimates.

This seasonality explains why losses are expected to peak in December rather than in November. Although tourism activity in December is typically higher than in November, losses are calculated as a fraction of the baseline. As a result, absolute losses are greater in months with higher baseline activity, even if the level of operational disruption is similar or declining.

**Figure IX 1:** Flows and losses, in thousands of JMD




*Source: DaLA team, 2025.*

## C. Additional Costs

During the field visits, the assessment team collected information to estimate additional costs incurred by the tourism sector. Beyond traditional post-disaster expenses—such as debris removal, cleaning, and the reconditioning of facilities—establishments reported significant costs related to the self-generation of electricity, water supply, and other essential services. In addition, several resorts provided support to surrounding communities and their workforce by offering shelter, food, and, in some cases, laundry services.

Table IX 9 presents the estimated additional costs by parish. In total, additional costs in the tourism sector are estimated at JMD 21 billion.

**Table IX 9:** Additional costs in the, in thousands of JMD

| *Parish* | Value |
|---|---|
| *Clarendon* | 28,575 |
| *Hanover* | 1,362,136 |
| *Kingston* | 6,554 |
| *Manchester* | 36,197 |
| *Portland* | 31,517 |
| *St. Andrew* | 80,473 |
| *St. Ann* | 3,859,783 |

**Table IX 9:** Additional costs in the, in thousands of JMD *(continuation)*

| *Parish* | Value |
|---|---|
| *St. Catherine* | 10,106 |
| *St. Elizabeth* | 840,105 |
| *St. James* | 9,015,915 |
| *St. Mary* | 554,564 |
| *St. Thomas* | 4,712 |
| *Trelawny* | 2,491,941 |
| *Westmoreland* | 2,179,675 |
| *Unable to locate* | 4 |
| ***Total*** | **20,502,260** |

*Source: DaLA team, 2025.*

## D. Appendix Tourism

**Tourism baseline construction**

In order to assess damages to the tourism sector, it was necessary to construct a baseline of tourism assets present in Jamaica prior to the landfall of Hurricane Melissa. To the best of our knowledge, a detailed and comprehensive baseline for the tourism sector either does not exist or was not available at the time of this assessment. This appendix, therefore, outlines the methodology used to construct a functional baseline of tourism assets, which serves as the foundation for estimating damages, losses, and additional costs.

The objective was to develop a clean and georeferenced inventory of tourism assets suitable for GIS-based analysis. The primary data source was the MTJ, which provided official lists of accommodation facilities, tour operators, and points of interest. For accommodation facilities, the MTJ data also included property-level attributes for a subset of establishments, which were instrumental in identifying accommodation types and refining valuation parameters. In total, the MTJ dataset comprised 898 accommodation facilities, 181 tour operators, and 112 tourist attractions.

A second source of information was OpenStreetMap (OSM). Tourism-related features were extracted using point-of-interest (POI) tags, focusing on features explicitly associated with tourism and accommodation activities. To enhance spatial coverage, these records were complemented with data from Google Maps using the legacy Google Places Nearby Search API. A grid-based spatial search strategy was implemented across the study area, whereby each grid centroid served as a search point and a fixed search radius ensured full spatial coverage. Multiple tourism-related place types were queried. The resulting Google-derived points were then merged with the OSM and MTJ datasets, contributing additional establishments not present in other sources while preserving a transparent and systematic process. In addition, Google Maps API services were used to georeference a substantial number of MTJ records that initially lacked geographic coordinates.

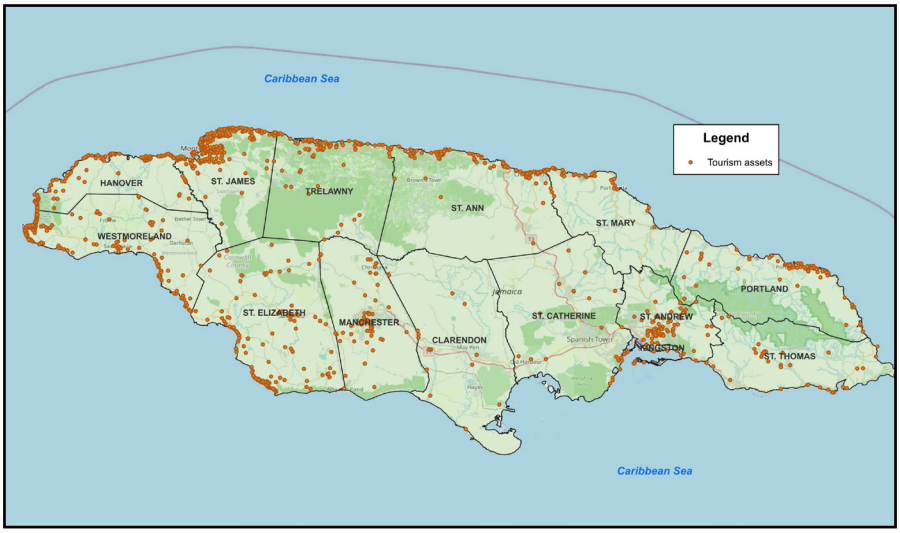
The final output of this process was a consolidated inventory of 2,276 tourism asset points, of which 1,930 were successfully georeferenced. The distribution of these assets is presented in Table IX 10.

**Table IX 10:** Number of tourism points per type

| *Type* | Number of points |
|---|---|
| *Accommodation* | 1,740 |
| *Hotel* | 607 |
| *Villa* | 550 |
| *Guesthouse* | 481 |
| *Apartment rental* | 102 |
| *Tour Operator / Services* | 214 |
| *Tourism Attraction* | 306 |
| *Golf Course* | 10 |
| *Marina* | 7 |
| ***Total*** | **2,277** |

*Source: DaLA team, 2025.*

**Map IX 1:** Georeferenced tourism assets




*Source: DaLA team, 2025.*

To construct the baseline, a replacement cost was estimated for each tourism asset. For accommodation facilities, this estimation was based on the number of rooms and the range of available amenities for a substantial share of properties. Where property-specific information was unavailable, average values were imputed. A single representative replacement value was assigned to tour operators, while specific estimates were developed for convention centers, golf courses, and marinas based on their respective characteristics.

Table IX 11 presents the tourism-sector baseline by parish, as well as the national total. The estimated replacement value of Jamaica's tourism sector amounts to JMD 3.3 trillion. Approximately one-third of this value is concentrated in St. James, reflecting the parish's extensive tourism ecosystem, which includes high-end resorts, large hotels, smaller guesthouses, and luxury villas. Together, the two western parishes of Hanover and Westmoreland account for 26 percent of the total value of tourism assets. This area is characterized by the presence of large resort complexes alongside a significant number of bed-and-breakfast establishments, boutique hotels, and villas.

St. Ann ranks second in terms of total replacement value, with tourism assets valued at JMD 549 billion, followed by Trelawny with JMD 342 billion. Collectively, these five parishes represent approximately 85 percent of the total replacement value of Jamaica's tourism sector.

**Table IX 11:** Tourism baseline by parish, in millions of JMD

| *Parish* | Value |
|---|---|
| *Clarendon* | 10,758 |
| *Hanover* | 442,737 |
| *Kingston* | 9,848 |
| *Manchester* | 41,972 |
| *Portland* | 54,804 |
| *St. Andrew* | 154,218 |
| *St. Ann* | 548,575 |
| *St. Catherine* | 18,198 |
| *St. Elizabeth* | 87,185 |
| *St. James* | 1,098,647 |
| *St. Mary* | 101,758 |
| *St. Thomas* | 8,503 |
| *Trelawny* | 342,094 |
| *Westmoreland* | 420,681 |
| *Unable to locate* | 11 |
| ***Total*** | **3,339,990** |

*Source: DaLA team, 2025.*

Table IX 12 presents the baseline by asset type. Approximately 72 percent of the total replacement value corresponds to buildings and facilities. Landscaping and common areas account for 11.5 percent of the total value, slightly exceeding the share attributed to furniture and equipment. The remaining assets are grouped under "other assets" and represent 4.9 percent of the total replacement cost.

**Table IX 12:** Tourism baseline by type of asset, in millions of JMD

| *Type of asset* | Value |
|---|---|
| *Buildings and facilities* | 2,408,044 |
| *Furniture and Equipment* | 383,345 |
| *Other assets* | 162,943 |
| *Landscaping and common areas* | 385,669 |
| ***Total*** | **3,340,001** |

*Source: DaLA team, 2025.*

To construct the losses baseline, it is necessary to estimate the flows generated by tourism activity. For the purposes of this assessment, only foreign tourism is considered. The Ministry of Tourism of Jamaica (MTJ) provided the information required to develop a detailed baseline for the main destination areas.

Specifically, the MTJ supplied historical monthly data on stopover and cruise visitors, including average expenditure levels and a disaggregation of spending categories.

Using this information, baseline projections were developed for each Destination Area by forecasting the number of visitors and their associated spending levels.

Table IX 13 presents the total number of visitors projected in the absence of Hurricane Melissa. The monthly forecasting horizon covers 24 months and does not necessarily imply that the recovery period is expected to last that long. For the last quarter of 2025, the number of stopover visitors was projected to decline by 3.9 percent relative to the same period in 2024, reflecting observed reductions in August and September 2025 compared with the corresponding months of the previous year. In contrast, cruise visitor arrivals were expected to increase by 0.4 percent over the same period. Overall, total visitor numbers were projected to remain relatively stable compared with 2024, prior to the impact of Hurricane Melissa.

**Table IX 13:** Tourism baseline, number of forecasted visitors

| *Period* | Stopover visitors | Cruise visitors |
|---|---|---|
| *Oct-Dec 2025* | 691,178 | 326,325 |
| *2026* | 2,841,908 | 1,270,103 |
| *Jan - Sep 2027* | 2,158,643 | 1,000,237 |

*Source: DaLA team, 2025.*

Based on the projected number of visitors, a monthly baseline of tourism flows was constructed in current U.S. dollars (USD) and subsequently converted to Jamaican dollars (JMD). The total baseline value of tourism flows amounts to JMD 182 billion for the last quarter of the year, JMD 728 billion for the full year 2026, and JMD 582 billion for the first three quarters of 2027. Nearly 98 percent of international tourism receipts are attributable to stopover visitors, reflecting both their substantially higher average spending and their larger share of total arrivals.

**Table IX 14:** Tourism baseline for losses by type of visitor, in millions of JMD

| *Period* | Stopover | Cruise |
|---|---|---|
| *Oct-Dec 2025* | 176,817 | 6,335 |
| *2026* | 712,423 | 8,738 |
| *Jan - Sep 2027* | 546,279 | 20,941 |

*Source: DaLA team, 2025.*

Finally, Table IX 15 presents the total baseline of tourism flows over the 24-month assessment window, disaggregated by destination area. More than 38 percent of total international tourism receipts are generated in the Montego Bay destination Area, reflecting, to a large extent, the high concentration of tourism infrastructure and points of interest located in St. James. It is important to emphasize that destination areas do not necessarily correspond directly to parish boundaries; for example, the Montego Bay destination area includes portions of both Hanover and Trelawny.

Ocho Rios ranks as the second most significant destination area, accounting for 18.1 percent of total receipts, followed by Negril with 16.8 percent. Collectively, the destination areas most affected by Hurricane Melissa account for 79.7 percent of total international tourism receipts over the period considered.

**Table IX 15:** Tourism baseline for losses by Destination Area, in millions of JMD

| *Destination Area* | Value |
|---|---|
| Montego Bay | 554,509 |
| Ocho Rios | 260,383 |
| Negril | 240,916 |
| Kingston | 149,564 |
| South Coast | 87,928 |
| Port Antonio | 16,860 |
| Other | 125,359 |
| ***Total*** | **1,435,519** |

*Source: DaLA team, 2025.*


10
COMMERCE

# Chapter X - Commerce

This chapter presents the assessment of the commerce sector following the impact of Hurricane Melissa. The storm is estimated to have generated total effects of JMD 147,483 million in the sector. Of this amount, damages are estimated at JMD 55,834 million, additional costs at JMD 2,512 million, and losses at JMD 89,136 million, excluding losses associated with international tourism.

**Table X 1:** Summary of the effects in the commerce sector, in thousands of JMD

| *Effect* | Public | Private | Total |
|---|---|---|---|
| *Damages* | | 55,834,197 | 55,834,197 |
| *Losses* | | 89,136,353 | 89,136,353 |
| *Additional costs* | 1,352,906 | 1,159,633 | 2,512,539 |
| ***Total*** | **1,352,906** | **146,130,183** | **147,483,089** |

*Source: DaLA team, 2025.*

The information used to construct this section was drawn primarily from public records published by the Statistical Institute of Jamaica (STATIN). The commercial baseline was further developed using geospatial data from OpenStreetMap (OSM) and Google Maps. The assessment team also held productive meetings with officials from STATIN, whose technical input and guidance were instrumental in strengthening the analytical framework.

The team wishes to place particular emphasis on the extensive collaboration provided by the Tax Administration Jamaica (TAJ). TAJ not only supplied timely and highly insightful data that significantly enhanced the quality of the analysis but also dedicated valuable time to meet with the team and discuss methodological and sector-specific considerations. This collaboration was critical to improving the robustness and credibility of the commerce-sector assessment.

The team also gratefully acknowledges colleagues from the Inter-American Development Bank (IDB) for their support in processing and interpreting the information used in this chapter. Finally, the team expresses its appreciation to the Planning Institute of Jamaica (PIOJ) for its coordination efforts and overall support throughout the assessment process.

## A. Damages

Damages were estimated using two primary sources of information. The first was the commerce-sector baseline described in the Appendix of this chapter, which consists of a georeferenced inventory of commercial establishments, including their estimated replacement costs and International Standard Industrial Classification (ISIC) codes. This baseline was combined with a damage classification model that assigns a level of physical damage to each individual establishment.

The damage classification model was developed using a supervised classification approach. A stratified random sample of buildings exposed to hurricane-force winds was manually interpreted using very high–resolution imagery (15–30 cm spatial resolution) to identify damage categories, including no damage, partial roof damage, severe roof damage, and complete destruction. Wind intensity information was derived from the Hurricane Melissa Maximum Sustained Wind (MSW) dataset, based on the Holland wind field model.

Building-level damage was subsequently generalized by extrapolating the damage proportions observed in the stratified random sample to all buildings within the corresponding wind intensity classes. This

approach assumes a homogeneous damage response within each wind class and was guided by visual interpretation of high-resolution imagery. The generalized results were then evaluated at the parish level. As no implausibly high damage values were identified, no further corrections were required.

Table X 2 presents the resulting distribution of damage levels by parish. These percentages emerge directly from the methodology described above and were not imposed ex ante. It is important to note that the distribution of damage differs from that observed in other sectors, reflecting specific characteristics related to the construction, typology, and spatial distribution of commercial establishments. The parishes experiencing the highest levels of impact on commercial assets were Trelawny, Westmoreland, and St. Elizabeth, while significant impacts were also observed in St. James and St. Ann.

**Table X 2:** Percentage of damage per parish

| *Parish* | No damage | Minor roof damage | Partial roof damage | Total roof damage | Destroyed |
|---|---|---|---|---|---|
| *Clarendon* | 80.0 | 9.4 | 7.5 | 3.1 | 0.0 |
| *Hanover* | 69.2 | 3.9 | 3.9 | 14.1 | 9.0 |
| *Kingston* | 100.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *Manchester* | 63.7 | 16.6 | 18.9 | 0.0 | 0.7 |
| *Portland* | 81.3 | 3.7 | 2.8 | 6.5 | 5.6 |
| *St. Andrew* | 91.4 | 3.8 | 4.5 | 0.2 | 0.2 |
| *St. Ann* | 74.8 | 7.2 | 3.6 | 12.6 | 1.8 |
| *St. Catherine* | 86.4 | 8.6 | 1.9 | 2.1 | 1.1 |
| *St. Elizabeth* | 45.3 | 31.3 | 3.2 | 15.2 | 5.0 |
| *St. James* | 75.4 | 7.1 | 4.3 | 11.0 | 2.1 |
| *St. Mary* | 71.7 | 9.4 | 7.6 | 5.7 | 5.7 |
| *St. Thomas* | 100.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| *Trelawny* | 40.5 | 5.1 | 3.2 | 20.3 | 31.0 |
| *Westmoreland* | 42.9 | 14.3 | 16.8 | 14.0 | 12.1 |

*Source: DaLA team, 2025.*

At this stage, a baseline of commercial establishments was available, including replacement costs by asset class, International Standard Industrial Classification (ISIC) codes, and an assigned level of physical damage. To translate this information into monetary damage estimates, damage ratios were applied to represent the fraction of asset value affected, conditional on both asset type and degree of damage. Table X 3 presents the damage matrix used to assign these fractions by asset category and damage level.

It is important to clarify that the “no damage” classification does not imply the absence of impacts. Rather, it indicates that no visible damage was detected through aerial imagery. Minor, internal, or cosmetic damages may still be present but cannot be identified remotely. Accordingly, a small damage fraction was applied to buildings classified as having no visible damage, with slightly higher fractions applied to other asset categories to account for impacts that are less readily observable through remote sensing.

**Table X 3:** Damage factor matrix (%)

| Degree | Building | Furniture & Equipment | Inventories | Other |
|---|---|---|---|---|
| *No damage* | 0.5 | 2 | 2 | 2 |
| *Minor roof damage* | 10 | 30 | 40 | 10 |
| *Partial roof damage* | 25 | 60 | 70 | 30 |
| *Total roof damage* | 50 | 100 | 100 | 50 |
| *Destroyed* | 100 | 100 | 100 | 100 |

*Source: DaLA team, 2025.*

One additional step was required to complete the damage estimation. For a small number of establishments, the model was unable to assign a damage level, primarily due to the absence of georeferencing. In these cases, average damage factors by parish and asset type were applied. At this stage, each record included four key elements: asset class, baseline replacement value, assigned damage factor, and resulting damage value. Damages were calculated by multiplying the baseline value by the corresponding damage fraction.

Table X 4 presents total damages by parish, expressed in thousands of JMD, along with the percentage of damages relative to the total baseline value. Total damages in the commerce sector are estimated at JMD 55,134 million, equivalent to 15.4 percent of the baseline value considered. This percentage should be interpreted with caution. As discussed in Appendix X, the baseline constructed for this assessment is likely to underestimate the true scale of commercial activity, particularly due to the absence of a comprehensive official registry of commercial establishments and the limited coverage of small and informal businesses.

Westmoreland is estimated to have incurred approximately JMD 12,917 million in damages to the commerce sector, making it the most affected parish in absolute terms. St. Elizabeth follows with an estimated JMD 9,263 million in damages. The high level of damage in these parishes is likely attributable to the direct impact of Hurricane Melissa on specific commercial infrastructure, as well as to construction characteristics commonly observed in commercial buildings, which may be more vulnerable to wind and water damage. Together, these two parishes account for nearly 40 percent of total commerce-sector damages.

Commercial activity in Jamaica is highly decentralized, with a large number of small establishments dispersed across urban and rural areas. Unlike larger firms, these small businesses typically have limited or no insurance coverage, increasing their vulnerability to disaster-related shocks. This situation is likely exacerbated in low-density parishes such as St. Elizabeth, where informal and micro-enterprises play a central role in local economies. As a result, many of these establishments are expected to face significant challenges during the recovery phase, particularly if recovery in connected sectors—most notably tourism—is prolonged.

**Table X 4:** Damage per parish, in thousands of JMD

| Parish | Value | Percentage (%) |
|---|---|---|
| *Clarendon* | 1,481,644 | 8.8 |
| *Hanover* | 1,644,616 | 24.6 |
| *Kingston* | 297,106 | 1.4 |
| *Manchester* | 5,965,203 | 14.2 |

**Table X 4:** Damage per parish, in thousands of JMD *(continuation)*

| *Parish* | Value | Percentage(%) |
|---|---|---|
| *Portland* | 1,326,154 | 13.7 |
| *St. Andrew* | 2,776,086 | 4.1 |
| *St. Ann* | 1,857,139 | 17.5 |
| *St. Catherine* | 2,608,170 | 7.4 |
| *St. Elizabeth* | 9,262,582 | 28.1 |
| *St. James* | 7,661,823 | 14.9 |
| *St. Mary* | 799,271 | 15.6 |
| *St. Thomas* | 147,262 | 1.2 |
| *Trelawny* | 7,088,130 | 50.6 |
| *Westmoreland* | 12,917,490 | 35.2 |
| *Unable to locate* | 1,522 | 1.6 |
| ***Total*** | **55,834,197** | **15.4** |

*Source: DaLA team, 2025.*

Total damages by asset type are presented in Table X 5. Approximately 50 percent of total damages are concentrated in inventories. This reflects both the nature of commercial activity and the predominant type of impact observed. For establishments that sustained damage but were not destroyed, water intrusion caused extensive losses to inventories, a particularly critical issue for small supermarkets and retail stores. Estimated damages to inventories amount to JMD 28 billion. A similar pattern is observed for furniture and equipment, which were also significantly affected by water exposure. Damages to this asset category are estimated at JMD 9 billion.

Damages to buildings and facilities are estimated at JMD 17,750 million, ranking second after inventories in absolute terms but representing only about 10 percent of the total baseline value. This lower relative share reflects the type of damage most commonly observed in commercial establishments—primarily roof damage and water intrusion rather than widespread structural failure. Damages to other assets were minimal, reflecting the limited presence of such assets within the commerce sector.

**Table X 5:** Damage per type, in thousands of JMD

| *Type of asset* | Value | Percentage (%) |
|---|---|---|
| *Inventories* | 28,175,866 | 20.3 |
| *Buildings and facilities* | 17,749,865 | 10.0 |
| *Furniture & equipment* | 9,451,223 | 19.5 |
| *Other assets* | 457,243 | 12.0 |
| ***Total*** | **55,834,197** | **15.2** |

*Source: DaLA team, 2025.*

Table X 6 presents damages by type of commercial establishment. As expected, the five largest categories account for more than 75 percent of total damages in the commerce sector. The largest share of damages corresponds to retail trade in non-specialized stores where food, beverages, or tobacco predominate—primarily supermarkets and convenience stores. These establishments are by

far the most prevalent form of retail activity and therefore concentrate a substantial share of the assets exposed to risk. Damages in this category are estimated at JMD 14 billion.

Hardware stores account for a significant 17 percent of total damages. In this case, both the relatively large number of such establishments and the high value of their inventories help explain the magnitude of the losses. The next three most affected categories—fuel service stations, clothing and footwear retailers, and pharmacies—together account for approximately JMD 19 billion in damages.

**Table X 6:** Damage per type of establishment, in thousands of JMD

| *Type of establishment* | Value |
|---|---|
| *Retail sales in non-specialized stores with food, beverages or tobacco predominating* | 14,156,713 |
| *Retail sale of hardware, paints and glass in specialized stores* | 9,712,391 |
| *Retail sale of automotive fuel in specialized stores* | 7,849,274 |
| *Retail sale of clothing, footwear and leather articles in specialized stores* | 7,799,281 |
| *Retail sale of pharmaceutical and medical goods, cosmetic and toilet articles in specialized stores* | 3,657,581 |
| *Maintenance and repair of motor vehicles* | 3,654,732 |
| *Retail sale of computers, peripheral units, software and telecommunications equipment in specialized stores* | 2,031,337 |
| *Sale of motor vehicles* | 1,802,667 |
| *Other retail saless in non-specialized stores* | 1,397,927 |
| *Retail sale of electrical household appliances, furniture, lighting equipment and other household articles in specialized stores* | 936,469 |
| *Sale of motor vehicle parts and accessories* | 650,046 |
| *Other retail sales of new goods in specialized stores* | 533,619 |
| *Retail sale of food in specialized stores* | 500,609 |
| *Non-specialized wholesale trade* | 318,180 |
| *Retail sale of books, newspapers and stationery in specialized stores* | 261,607 |
| *Retail sale of cultural and recreational goods n.e.c.* | 230,163 |
| *Retail sale of beverages in specialized stores* | 223,388 |
| *Retail sale of textiles in specialized stores* | 75,994 |
| *Retail sale of sporting equipment in specialized stores* | 25,534 |
| *Retail sale of second-hand goods* | 7,876 |
| *Sale, maintenance and repair of motorcycles and related parts and accessories* | 7,869 |
| *Retail sale of tobacco products in specialized stores* | 742 |
| *Retail sale of audio and video equipment in specialized stores* | 199 |
| ***Total*** | **55,834,197** |

*Source: DaLA team, 2025.*

## B. Losses

Before presenting the loss estimates for the commerce sector, it is important to clarify the scope of this section. Only losses attributable to consumption by Jamaican residents are included. The share of commercial activity associated with tourism has been excluded to avoid double-counting, as those losses are already captured in the tourism chapter.

Losses in the commerce sector were estimated using a baseline of total retail sales for Jamaica, constructed as described in the Appendix of this chapter. Recovery paths were modeled using Gompertz functions, with baselines and recovery trajectories developed at the parish level to reflect spatial heterogeneity in impacts and recovery conditions. Several factors were considered in defining the recovery profiles, most notably the degree of physical damage relative to the baseline and the restoration of electricity. Parishes with a higher share of users without power were assumed to experience delayed recovery, while higher levels of physical damage were associated with longer recovery periods. Based on these assumptions, commercial sales flows were projected as a fraction of the baseline, generating parish-level estimates of sales during the recovery period. A full recovery of the commerce sector is assumed by the end of 2026.

Table X 7 presents aggregated commercial losses by parish for two periods: the last quarter of 2025 and the year 2026. Total losses in the commerce sector are estimated at JMD 89 billion, with approximately 65 percent occurring in 2026. This pattern reflects several dynamics. Commercial activity was most severely disrupted during November and part of December 2025, driven not only by physical damage but also by prolonged power outages. During this period, humanitarian assistance helped alleviate pressure on household consumption in some areas. As recovery progressed, impacts on commercial sales became more uneven. While many establishments experienced prolonged losses, others—particularly those supplying construction materials, hardware, paint, and gardening products—benefited from increased demand related to reconstruction. This uneven recovery is expected to persist throughout 2026.

The parish with the highest estimated commercial losses is St. Elizabeth, accounting for approximately 34 percent of total sector losses. This reflects the severity of impacts in the area, including the destruction of multiple commercial establishments. St. James follows, with estimated losses of JMD 16 billion, most of which occurred in the last quarter of 2025. St. Andrew ranks third, with losses of approximately JMD 12 billion. In this case, losses are driven primarily by the size of the commercial base rather than the degree of physical damage; St. Andrew accounts for roughly 46 percent of national monthly retail sales under normal conditions. Overall, commerce-sector losses are more geographically widespread than those observed in other sectors. Even parishes that experienced minimal physical damage recorded losses, largely due to the temporary shutdown of economic activity following Hurricane Melissa.

**Table X 7:** Losses in domestic commercial sales by parish, in thousands of JMD

| *Parish* | Oct - Dec 2025 | 2026 | Total |
|---|---|---|---|
| *Portland* | 170,485 | 84,165 | 254,649 |
| *St. Andrew* | 7,818,092 | 3,759,317 | 11,577,409 |
| *St. Ann* | 2,827,407 | 264,923 | 3,092,330 |
| *St. Catherine* | 6,422,083 | 1,276,246 | 7,698,329 |
| *St. Elizabeth* | 10,753,056 | 19,748,478 | 30,501,535 |
| *St. James* | 14,217,660 | 2,063,478 | 16,281,139 |
| St. Mary | 917,574 | 182,347 | 1,099,921 |

**Table X 7:** Losses in domestic commercial sales by parish, in thousands of JMD *(continuation)*

| Parish | Oct - Dec 2025 | 2026 | Total |
|---|---|---|---|
| *St. Thomas* | 911,177 | 181,076 | 1,092,253 |
| *Trelawny* | 1,206,378 | 1,606,830 | 2,813,208 |
| *Westmoreland* | 4,814,614 | 762,815 | 5,577,428 |
| *Total* | 57,665,322 | 31,471,030 | 89,136,353 |
| *Clarendon* | 2,012,936 | 400,026 | 2,412,962 |
| *Hanover* | 1,888,870 | 299,268 | 2,188,138 |
| *Kingston* | 374,935 | 180,287 | 555,222 |
| *Manchester* | 3,330,056 | 661,775 | 3,991,830 |

*Source: DaLA team, 2025.*

## C. Additional Costs

Table X 8 presents the estimated additional costs by parish. Total additional costs in the commerce sector are estimated at JMD 2,512 million. These costs are primarily associated with post-disaster clean-up and recovery activities, including debris removal, cleaning and remediation of facilities, and the self-generation of electricity, water supply, and other essential services during periods of infrastructure disruption.

**Table X 8:** Additional costs by parish, in thousands of JMD

| Parish | Value |
|---|---|
| *Clarendon* | 66,674 |
| *Hanover* | 74,008 |
| *Kingston* | 13,370 |
| *Manchester* | 268,434 |
| *Portland* | 59,677 |
| *St. Andrew* | 124,924 |
| *St. Ann* | 83,571 |
| *St. Catherine* | 117,368 |
| *St. Elizabeth* | 416,816 |
| *St. James* | 344,782 |
| *St. Mary* | 35,967 |
| *St. Thomas* | 6,627 |
| *Trelawny* | 318,966 |
| *Westmoreland* | 581,287 |
| *Unable to locate* | 69 |
| ***Total*** | **2,512,539** |

*Source: DaLA team, 2025.*

## D. Appendix Commerce

In order to assess damages to the commerce sector, it was necessary to construct a baseline of commercial assets present in Jamaica prior to the landfall of Hurricane Melissa. To the best of our knowledge, a detailed and comprehensive baseline for the commerce sector either does not exist or was not available at the time of this assessment. This appendix, therefore, outlines the methodology used to construct a functional baseline of commercial assets, which serves as the foundation for estimating damages, losses, and additional costs.

The objective was to develop a clean and georeferenced inventory of commercial establishments suitable for GIS-based analysis. As no official or comprehensive list of establishments was provided, two primary data sources were used. The first was OpenStreetMap (OSM), from which commerce-related features were extracted using point-of-interest (POI) tags. This extraction covered the entire national territory.

The initial dataset was complemented with information from Google Maps using the legacy Google Places Nearby Search API. A grid-based spatial search strategy was implemented, whereby each grid centroid served as a search point, and a fixed search radius was applied to ensure spatial coverage. To manage data acquisition costs, this grid-based search was applied only to the western half of the country, where impacts were most severe and commercial density is relatively high. Multiple commerce-related place types were queried. The resulting Google-derived points were then merged with the OSM dataset to enhance coverage and reduce omissions.

The final output of this process was a consolidated inventory of 3,804 commercial asset points. The parish-level distribution of these establishments is presented in Table X 9.

**Table X 9:** Number of commerce points per parish

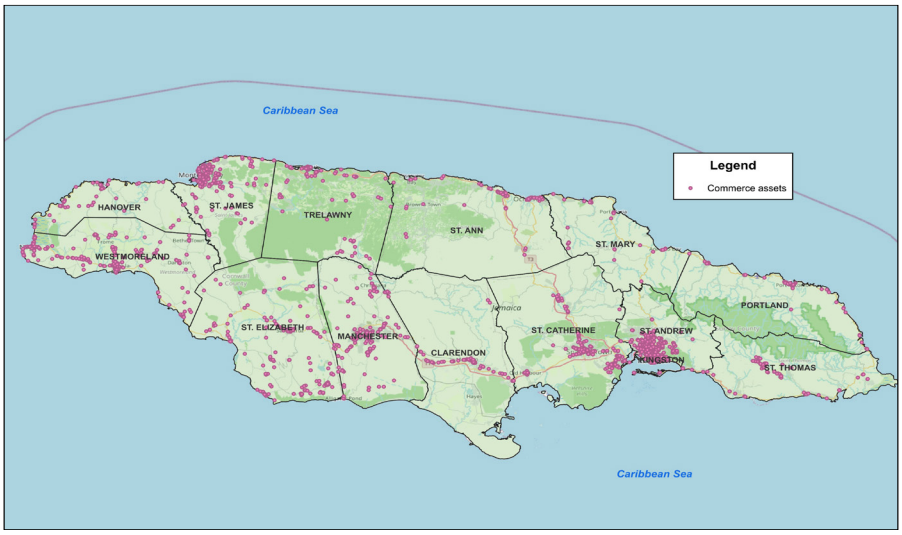
| *Parish* | Number of points |
|---|---|
| *Clarendon* | 161 |
| *Hanover* | 80 |
| *Kingston* | 213 |
| *Manchester* | 457 |
| *Portland* | 107 |
| *St. Andrew* | 626 |
| *St. Ann* | 111 |
| *St. Catherine* | 374 |
| *St. Elizabeth* | 359 |
| *St. James* | 574 |
| *St. Mary* | 53 |
| *St. Thomas* | 109 |
| *Trelawny* | 163 |
| *Westmoreland* | 416 |
| *Unable to locate* | 1 |
| ***Total*** | **3,804** |

*Source: DaLA team, 2025.*

Map X 1 illustrates the spatial distribution of the georeferenced commerce assets. It is important to acknowledge that this database is likely to underestimate the true number of commercial establishments for several reasons. In particular, many small, informal, and micro-enterprises are not consistently captured in open geospatial data sources such as OpenStreetMap or Google Maps, especially outside major urban centers.

By way of illustration, the Report on the Jamaica Survey of Establishments 2018 published by the Statistical Institute of Jamaica (STATIN) identified 6,288 establishments classified under Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles. This figure is more than double the number of establishments included in the baseline constructed for this assessment. Unfortunately, the establishment-level data from this survey were not provided to the assessment team, nor is the team aware of any georeferenced version of this dataset that could be directly integrated into the GIS-based baseline.

**Map X 1:** Georeferenced commerce assets




*Source: DaLA team, 2025.*

The search process also enabled the classification of establishments into their respective International Standard Industrial Classification (ISIC) categories. This classification was fundamental for assigning appropriate values to the different types of commercial assets, as asset characteristics and replacement costs vary significantly across commercial activities. Table X 10 presents the distribution of the commerce-sector baseline by ISIC category.

**Table X 10:** Number of commerce points per ISIC code

| *ISIC* | Number of points |
|---|---|
| *Retail sale in non-specialized stores with food, beverages or tobacco predominating* | 904 |
| *Maintenance and repair of motor vehicles* | 469 |
| *Retail sale of clothing, footwear and leather articles in specialized stores* | 405 |
| *Retail sale of hardware, paints and glass in specialized stores* | 377 |
| *Retail sale of automotive fuel in specialized stores* | 311 |

**Table X 10:** Number of commerce points per ISIC code *(continuation)*

| *ISIC* | Number of points |
|---|---|
| *Retail sale of pharmaceutical and medical goods, cosmetic and toilet articles in specialized stores* | 225 |
| *Retail sale of computers, peripheral units, software and telecommunications equipment in specialized stores* | 215 |
| *Sale of motor vehicle parts and accessories* | 189 |
| *Other retail sale in non-specialized stores* | 183 |
| *Sale of motor vehicles* | 100 |
| *Other retail sale of new goods in specialized stores* | 89 |
| *Retail sale of food in specialized stores* | 71 |
| *Retail sale of electrical household appliances, furniture, lighting equipment and other household articles in specialized stores* | 64 |
| *Non-specialized wholesale trade* | 59 |
| *Retail sale of beverages in specialized stores* | 46 |
| *Retail sale of books, newspapers and stationery in specialized stores* | 41 |
| *Retail sale of cultural and recreational goods n.e.c.* | 26 |
| *Retail sale of textiles in specialized stores* | 18 |
| *Sale, maintenance and repair of motorcycles and related parts and accessories* | 4 |
| *Retail sale of sporting equipment in specialized stores* | 4 |
| *Retail sale of tobacco products in specialized stores* | 2 |
| *Retail sale of audio and video equipment in specialized stores* | 1 |
| *Retail sale of second-hand goods* | 1 |
| ***Total*** | **3,804** |

*Source: DaLA team, 2025.*

To construct the commerce-sector baseline, a replacement cost was estimated for each commercial asset. For a subset of establishments, building footprint areas were derived by spatially intersecting point locations with a polygon shapefile of building footprints. For the majority of establishments, where such information was not available, representative average floor areas were applied. In the absence of establishment-specific asset data, replacement costs were estimated based on the type of establishment, using average characteristics and typical sizes observed for similar commercial activities in the Caribbean region.

A schedule of replacement costs by type of commercial establishment was developed and applied to estimate the value of building assets. Once a construction area had been assigned to each establishment, the valuation of other asset categories—including furniture and equipment, inventories, and other assets—was carried out using standardized factors. These factors were derived from previous Damage and Loss Assessments (DaLAs) and from baseline construction exercises conducted across the region. At the conclusion of this process, each establishment was assigned a replacement value for each asset category, as well as a total replacement value. Table X 10 presents the resulting baseline values by parish. The total replacement value of the commerce-sector baseline is estimated at JMD 363 billion.

**Table X 11:** Commerce baseline by parish, in thousands of JMD

| *Parish* | Value |
|---|---|
| *Clarendon* | 16,877,733 |
| *Hanover* | 6,680,070 |
| *Kingston* | 21,133,874 |
| *Manchester* | 42,021,128 |
| *Portland* | 9,657,750 |
| *St. Andrew* | 67,399,323 |
| *St. Ann* | 10,639,959 |
| *St. Catherine* | 35,477,313 |
| *St. Elizabeth* | 32,957,690 |
| *St. James* | 51,339,202 |
| *St. Mary* | 5,117,460 |
| *St. Thomas* | 12,383,678 |
| *Trelawny* | 14,005,603 |
| *Westmoreland* | 36,737,824 |
| *Unable to locate* | 92,282 |
| ***Total*** | **362,520,889** |

*Source: DaLA team, 2025.*

Table X 12 presents the distribution of replacement costs for the commerce sector by asset type. As expected, the majority of the total replacement value is concentrated in buildings and inventories. This reflects both the physical nature of commercial activity and the central role of inventories as a core productive asset for retail and wholesale establishments.

**Table X 12:** Tourism baseline by type of asset, in thousands of JMD

| *Type of asset* | Value |
|---|---|
| *Inventories* | 138,589,641 |
| *Buildings and facilities* | 177,261,225 |
| *Furniture & equipment* | 48,508,683 |
| *Other assets* | 3,799,599 |
| ***Total*** | **362,520,889** |

*Source: DaLA team, 2025.*

Constructing a baseline for the commerce sector requires estimating sales flows for all establishments that comprise the sector. As expected, this is a challenging task, particularly when the objective is to produce estimates disaggregated at the parish level.

In summary, the approach followed consisted of three main steps. First, national accounts data were used to construct a quarterly time series of total commercial sales at the national level. Second, information on electronic payments and General Consumption Tax (GCT) collections was used to derive a national monthly sales series that is fully consistent with the quarterly totals obtained in the

previous step. Finally, this national monthly series was disaggregated to the parish level using a linear combination of population and Individual Income Tax data, allowing for the construction of a parish-level baseline of commercial sales.

The first step involved using quarterly, non–seasonally adjusted, current-price GDP data for the activities Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles; and Installation of Machinery and Equipment, together with the 2007 Supply and Use Table (SUT), to derive a quarterly series of commercial sales:

From the SUT, the value-added ratio (VAR) is defined as:

$$\text{VAR} = \frac{\text{GVA}}{\text{Output}}$$

For each quarter, commercial sales are then recovered by inverting this relationship

$$\text{Sales}_q = \frac{\text{GVA}_q}{\text{VAR}}$$

To convert quarterly commercial sales into a monthly series, a state-space model estimated via the Kalman filter was employed.

The latent variable is monthly commercial sales c_t, modeled as an autoregressive process:

$$c_t = \phi c_{t-1} + \varepsilon_t$$

Quarterly sales enter the measurement equation as the sum of three consecutive monthly states:

$$\text{Sales}_q = c_t + c_{t-1} + c_{t-2}$$

High-frequency indicators used to inform the monthly dynamics include:

- Monthly General Consumption Tax (GCT) collections,
- Monthly debit and credit card payment volumes in local currency.

The Kalman filter and smoother were used to:

- Estimate a coherent historical monthly series consistent with quarterly totals,
- Produce a nowcast for the most recent incomplete quarter using available monthly indicators.

To construct the monthly forecast, the quarterly series was first projected forward, and monthly figures were then fitted within this forecast using the average intra-quarter weights observed over the previous three years. This approach was adopted to avoid the need to forecast the monthly indicator variables directly. At the end of this step, a national monthly commercial sales series was generated and forecast through the end of 2027.

National monthly commercial sales were subsequently disaggregated to the parish level using a dynamic weighting scheme based on Individual Income Tax (IIT) data and population shares.

### Income-Tax-Based Shares

For each month tand parish p, income-tax shares are defined as:

$$\text{IIT_share}_{p,t} = \frac{\text{IIT}_{p,t}}{\sum_{p} \text{IIT}_{p,t}}$$

For months beyond the last available IIT observation (September 2025), income-tax shares are fixed at the average value observed over the previous 36 months:

$$\text{Base_IIT_share}_{p} = \frac{1}{36} \sum_{t \in \text{last } 36} \text{IIT_share}_{p,t}$$

### Population Shares

Population data from the 2022 Census were used to compute parish population shares:

$$\text{POP_share}_{p} = \frac{\text{POP}_{p}}{\sum_{p} \text{POP}_{p}}$$

### Combined Parish Weights

Final parish weights are constructed as a convex combination of income-tax and population shares:

$$w_{p,t} = (1 - \lambda)\ \text{IIT_share}_{p,t} + \lambda\ \text{POP_share}_{p}$$

with $\lambda = 0.20$. This assigns:

- 80 percent weight to dynamic economic activity captured by IIT,
- 20 percent weight to population-based stabilization.

Weights are normalized monthly to ensure:

$$\sum_{p} w_{p,t} = 1$$

### Parish-Level Monthly Sales

Parish-level monthly commercial sales are finally computed as:

$$\text{Sales}_{p,t} = w_{p,t} \cdot \text{Sales}_{t}$$

By construction, parish-level sales aggregate exactly to the national monthly total, and the sum of these monthly values is equivalent to the corresponding quarterly sales. At this stage, a consistent baseline of commerce-sector sales at the parish level was obtained.

# Infrastructure
# **Sectors**



# 11 TRANSPORT INFRASTRUCTURE

# Chapter XI - Transport infrastructure

The transport infrastructure in Jamaica is critical to the functioning of the national economy as it provides connectivity across the island, facilitates domestic and international trade, and is closely linked to other sectors such as tourism, as international airports and cruise ship ports serve as the primary entry points for visitors. As a result, damage to transport infrastructure can severely disrupt economic activity, limit access to essential services, and delay recovery efforts following a disaster.

Hurricane Melissa had a significant impact on the transport systems, causing damage and severe disruption to road infrastructure, ports, and the airport in Montego Bay, where gate capacity was reduced. The total impact on the transport sector is estimated at JMD 48 billion. Of this amount, JMD 29.6 billion corresponds to physical damage to transport-related infrastructure, JMD 10.4 billion reflects economic losses resulting from reduced operational capacity and decreased demand, which led to lower tax revenues, and JMD 8 billion represents increased costs associated with emergency response, temporary measures, and recovery activities, marked as additional costs.

Table XI 1 presents a detailed breakdown of these impacts by component and distinguishes between public and private sector effects. For this assessment, the private sector includes privately operated cruise ports and Sangster International Airport in Montego Bay. Although these facilities remain publicly owned and fall under the mandate of government authorities (such as the Port Authority of Jamaica and the Airport Authority of Jamaica), their operations are managed by private entities as previously mentioned. Consequently, the associated impacts are classified as private-sector effects for this report.

**Table XI 1:** Summary of economic impact in the transport sector in Jamaica (expressed in thousands of JMD)

| *Effect* | Public | Private | Total |
|---|---|---|---|
| *Damages* | 27,809,508 | 1,811,278 | 29,620,786 |
| *Losses* | 688,725 | 9,766,869 | 10,455,594 |
| *Additional costs* | 7,806,056 | 202,238 | 8,008,294 |
| ***Total*** | **36,304,289** | **11,780,385** | **48,084,674** |

*Source: DaLA team, 2025.*

The results presented in this chapter are based on damage reports prepared by transport-related institutions, information gathered through in-person and virtual meetings with relevant stakeholders[41], publicly available damage reports, and field visits to affected areas during the week of November 24, 2025. Accordingly, the economic impacts reported reflect damage, losses, and additional costs identified and estimated up to that date. Transport-related institutions that contributed to this assessment through meetings and information sharing include the Port Authority of Jamaica (PAJ), the Office of Disaster Preparedness and Emergency Management (ODPEM), the Maritime Authority of Jamaica, the Airports Authority of Jamaica (AAJ), the National Works Agency (NWA), MBJ Airport Limited, the Transport Authority, and the Jamaica Urban Transit Company (JUTC).

[41] At the time of preparation of this report, some information had not yet been received from relevant institutions. This includes detailed additional cost estimates from the Port Authority of Jamaica, the Maritime Authority, and the Airports Authority of Jamaica; internal damage assessment reports prepared by the Airports Authority of Jamaica; detailed descriptions of port-related damage from the Port Authority of Jamaica; and vessel damage assessment reports from the Maritime Authority. In addition, for several port and airport facilities, building floor areas were estimated using GIS techniques due to the unavailability of official plans from the respective authorities.

## A. Damages

Damage in the Transport sector is estimated at a total of JMD 29.6 billion, which is mostly related to road infrastructure damage. This damage is estimated at JMD 27.1 billion, representing over 93 percent of total economic damage in the sector. As mentioned in Box XI 1, even though roads are managed by different entities (NWA for main roads and parish-level administration for municipal roads), the damage has been classified as public. This amount reflects the extensive impact of Hurricane Melissa across the country. Damage to airports is fully attributed to the Sangster International Airport, totaling JMD 590 million, which corresponds to moderate damage in 5 gates, the fence, and some equipment. Port-related damage amounts to JMD 1.7 billion and is distributed between the cargo and cruise-ship ports in Montego Bay, the Cruise-ship port in Falmouth, and a yacht pier in Black River. Finally, other damage has also been reported by the Transport Authority to some offices across the country. Details of general damage are presented in Table XI 2.

**Table XI 2:** Damage in the Transport sector, in thousands of JMD

| *Categories* | Public | Private | Total |
|---|---|---|---|
| *Roads* | 27,139,508 | - | 27,139,508 |
| *Airports* | - | 590,890 | 590,890 |
| *Ports* | 552,000 | 1,220,387 | 1,772,387 |
| *Others* | 118,000 | - | 118,000 |
| ***Total*** | **27,809,508** | **1,811,278** | **29,620,786** |

*Source: DaLA team, 2025.*

Road damage is estimated at JMD 27.1 billion and is associated with approximately 10,200 km of road segments affected following Hurricane Melissa. According to estimates from NWA, approximately 3,422 km of main roads experienced impacts at some point during the event. In addition, NWA estimates that at least twice this length was affected within the municipal road network, which, as mentioned in Box 1, had a higher level of pre-disaster deterioration. Table X I3 presents a detailed breakdown by parish, including affected road length, the number of damaged traffic signals, and the corresponding economic damage estimates. It is important to note that the reported affected kilometers do not imply uniform damage along entire road corridors. Field assessments and NWA estimates indicate that, on average, approximately 10 percent of each affected segment had actual damage, an assumption that has been validated through site visits and incorporated into the cost estimations. Clarendon was the most affected parish, with more than 1,200 km of impacted road segments, followed by Westmoreland. Finally, it should be noted that damaged traffic signals in Kingston and St. Andrew were jointly reported by NWA and, for the purposes of this assessment, have been assigned to Kingston in Table XI 3.

**Table XI 3:** Damage in roads by Parish, in thousands of JMD

| *Parish* | Total Length Affected Main Roads (kms) | Total Length Affected Municipal Roads (kms) | Number of Affected Traffic Signals | Estimated Damage (thousands of JMD) |
|---|---|---|---|---|
| *Clarendon* | 445 | 890 | 6 | 3,518,028 |
| *Hanover* | 232 | 464 | 3 | 1,834,079 |
| *Kingston* | 20 | 40 | 179 | 211,307 |
| *Manchester* | 295 | 590 | 16 | 2,335,754 |

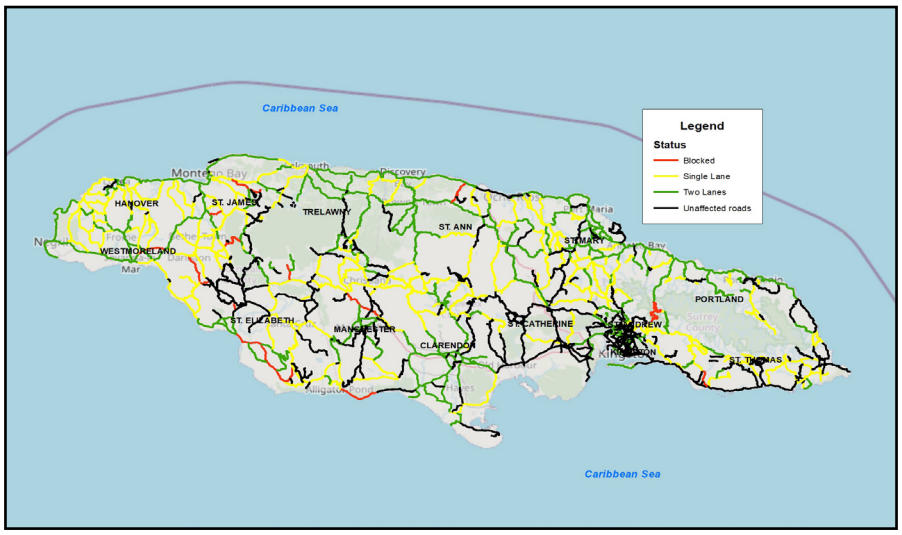
**Table XI 3:** Damage in roads by Parish, in thousands of JMD *(continuation)*

| *Parish* | Total Length Affected Main Roads (kms) | Total Length Affected Municipal Roads (kms) | Number of Affected Traffic Signals | Estimated Damage (thousands of JMD) |
|---|---|---|---|---|
| *Portland* | 240 | 480 | 0 | 1,896,400 |
| *St. Andrew* | 223 | 446 | 0 | 1,762,072 |
| *St. Ann* | 338 | 676 | 15 | 2,675,228 |
| *St. Catherine* | 181 | 362 | 38 | 1,441,511 |
| *St. Elizabeth* | 216 | 432 | 4 | 1,707,950 |
| *St. James* | 210 | 420 | 56 | 1,676,016 |
| *St. Mary* | 330 | 660 | 0 | 2,607,550 |
| *St. Thomas* | 187 | 374 | 4 | 1,478,802 |
| *Trelawny* | 165 | 330 | 12 | 1,307,346 |
| *Westmoreland* | 340 | 680 | 3 | 2,687,460 |
| ***Total*** | **3,422** | **6,844** | **336** | **27,139,508** |

*Source: National Work Agency (NWA) and DaLA team (2025).*

At the time of this report, more than 95 percent of the main road network had been fully or partially cleared, as illustrated in Map XI 1. However, 16 main road segments remain blocked or severely damaged. As mentioned previously, affected roads are shown as entire segments, even though the actual physical damage is estimated to affect only approximately 10 percent of each segment, based on NWA observations and field validation. Due to the absence of precise georeferenced information for individual damage locations, the full length of each affected road segment is presented in the map.

**Map XI 1:** Main Road Network Status November 21, 2025




*Source: National Work Agency (NWA), 2025.*

Road damage was observed through different mechanisms and severity levels. For example, Image XI 1a illustrates a road that was partially washed away during the hurricane, resulting in the loss of an entire lane. Although the asphalt surfacing was observed to be relatively thin (approximately 1 to 2 cm) the underlying granular base layer suffered extensive damage. Another common damage mechanism involved widespread surface deterioration (large cracks, potholes, and edge failure), particularly along coastal roads. In several locations, severe damage to chip seal surfaces was observed. Image XI 1b,

for instance, shows extensive surface degradation along the road. The coastal road in Black River (St. Elizabeth Parish), which was recently resurfaced, experienced substantial damage and a consequent loss of structural capacity. Similar damages were identified across multiple coastal road segments, indicating accelerated deterioration due to the hurricane. This type of damage implies a significant reduction in the level of service and a shortened remaining service life.

**Image XI 1:** Damage to Roads



(a) (b)

*Source: DaLA team, 2025.*

Another commonly observed impact on pavement structures and road operations resulted from slope instability, leading to landslides and embankment failures that damaged significant portions of the roads. These failures were predominantly observed in areas with saturated soils, where prolonged and intense rainfall during the hurricane reduced soil strength and induced slope instabilities. Finally, road damage was estimated considering several factors, including (i) pavement structure (for example, if the road pavement surface was asphaltic concrete, chip seal, or unpaved gravel, among others); (ii) the pre-disaster condition of each road (assumed to be different for main and municipal roads according to what was mentioned in the introduction); (iii) severity of damage following the hurricane; and (iv) reference construction costs calibrated for Jamaica.

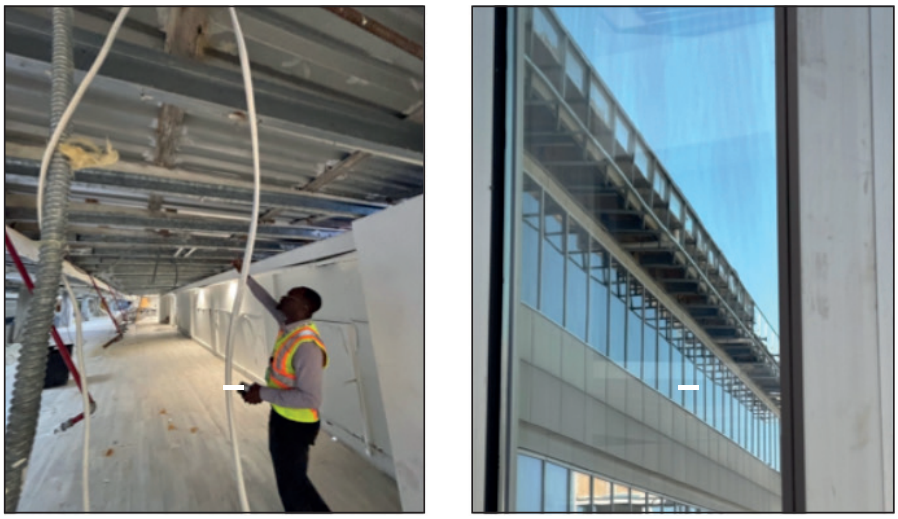
Moderate damage was also recorded at Sangster International Airport in Montego Bay, where five passenger boarding gates experienced substantial impacts and remain non-operational at the time of this report. Despite this reduction in gate capacity, passenger arrivals have continued, with airport operations adapting to using alternative gates and the deployment of mobile stairs. Damage at the affected gates included mostly non-structural elements, as well as associated systems, in addition to localized damage to roofing elements, some equipment, and perimeter fence, as shown in Image XI 2a, which shows damage in the terminal gates, while Image XI 2b shows damage to the roof area in the airport.

The total damage to Sangster International Airport is estimated at JMD million[42]. Approximately 10 percent of this amount corresponds to damage to equipment (JMD 50.5 million), including cooling systems, passenger boarding bridges, seating, and other terminal furnishings. A technical inspection of the runway confirmed that no deterioration or structural damage occurred, and, therefore, no damage costs were associated with airside pavement infrastructure. In addition, no damage was recorded at the

[42] Damage is classified as a private impact, as the Sangster International Airport is operated under a 30-year concession contract between the Airports Authority of Jamaica and MBJ, which commenced in 2003. Under the terms of this contract, MBJ is responsible for addressing physical damage and restoring services through insurance coverage and contractual

control tower or other airport facilities. Overall, the airport continues operating under normal conditions from a structural perspective. However, as it is explained in the losses section, passenger demand has significantly decreased for the airport and, therefore, it operates below its normal efficiency.

**Image XI 2:** Damage Assessment to Sangster International Airport, Montego Bay



(a) (b)

*Source: DaLA team, 2025.*

Port infrastructure suffered damage primarily in the north-western region of the country, where impacts were largely associated with roof failures, flooding, and damage to equipment. Total damage in ports is estimated at approximately JMD 1.7 billion, of which JMD 872 million corresponds to the Montego Bay cargo port. Other port facilities assessed include the Montego Bay cruise port, the Falmouth cruise port, and the yacht pier in Black River, all of which experienced varying degrees of damage during Hurricane Melissa.

The Montego Bay cargo port, which is privately operated by Port Handlers Limited (PHL), had extensive damage to roof structures, including severe damage to the roofs of two buildings and the collapse of an entire warehouse roof structure, as illustrated in Images XI 3a and XI 3b. Additional damage was recorded to approximately thirty containers, four fenders, seating areas, non-structural elements, and other operational equipment. No damage was reported to the cargo scanning equipment at the facility. The administrative office areas experienced moderate damage, primarily affecting ceiling elements.

obligations, while the Airports Authority of Jamaica retains ownership of the facility and an oversight role, including the ability to renegotiate contractual terms in the event of extraordinary circumstances. For the purposes of this report, publicly owned facilities operated under concessionary agreements with private entities are therefore classified as private impacts.

**Image XI 3:** Bay Roof Damage to Montego Bay Cargo Port



(a) (b)

*Source: DaLA team, 2025.*

Additional port facilities affected by Hurricane Melissa include the Montego Bay cruise port, which suffered damage primarily to operational equipment, including baggage conveyor systems and walk-through security scanners, as well as damage to perimeter fencing and extensive loss of landscaping. The total damage to this facility, including both infrastructure and equipment, is estimated at approximately JMD 311 million. Furthermore, the cruise port in Falmouth experienced comparatively minor damage, largely limited to non-structural components of several buildings, particularly roofing elements, doors, and windows. In addition, some equipment losses were reported within the main customs building.

**Box XI 1:** Institutional Framework of the Transport Sector in Jamaica

Jamaica's transport sector operates under a multimodal institutional structure involving several agencies responsible for infrastructure development, regulation, oversight, and service delivery. The National Works Agency (NWA) is the primary authority in charge of planning, designing, constructing, and managing the main road network, representing about 20 percent of the country's 26,000 km of roads. Municipal and parish authorities manage the remaining network; however, in disaster situations, the NWA assumes responsibility for emergency debris clearance, temporary road access, and safety inspections across all classifications of roads. In addition, two tolled highway corridors: East–West and North–South, operate under concession agreements with private operators, namely TransJamaican Highway Limited and the Jamaica North South Highway Company Limited, respectively.

Port and airport infrastructure fall under the remit of the Port Authority of Jamaica (PAJ) and the Airports Authority of Jamaica (AAJ). While these entities own the infrastructure, the operation of major assets including Kingston Container Terminal, Norman Manley International Airport, and Sangster International Airport, is delegated to private concessionaires. Sangster International Airport is the country's busiest airport, handling over 4.5 million annual arrivals, while PAJ regulates 22 port facilities, including five cruise ports, the largest of which is Falmouth.

The Transport Authority, under the Ministry of Science, Energy, Telecommunications and Transport (MSETT), regulates vehicle licenses including public transport vehicles. The Jamaica Urban Transit Company (JUTC), the state-owned bus operator, manages intra- and inter-urban transit and played a critical role in evacuation operations during Hurricane Melissa.

Prior to the hurricane, road conditions varied significantly by classification. According to NWA assessments (2025), only 15 percent of main roads and 5 percent of municipal roads were in good condition, while 55 percent and 80 percent, respectively, were rated as poor or bad, indicating a widespread deterioration of the road network, particularly at the parish level.

*Source: DaLA team, 2025. Based on information collected from: National Work Agency (meeting), TransJamaican Highway Limited (website), Jamaica Norht South Highway (website), Port Authority of Jamaica (annual report 2024/2025 found in the website), Airport Authority (website) and Jamaica Urban Transit Company (meeting).*

## B. Losses

Losses presented in this chapter are estimated based on reductions in tax revenues associated with transport-related services, including airport and port passenger flows, vehicle and vessel licensing, cargo flows, and toll road revenues. In some parts of the country, the operational impact of Hurricane Melissa was limited, such as the case of the airport and cargo port in Kingston, where transport services continued operating in the days following the event with normal capacity. In contrast, in areas such as Montego Bay, where there was damage to transport infrastructure and to tourism-related buildings such as hotels, a significant decline in visitor arrivals is observed. This demand reduction resulted in significant decreases in tax revenues and, consequently, economic losses.

Accordingly, this section quantifies losses across three main components: (i) reduced passenger arrivals at airports, (ii) reduced passenger flows at cruise ports, and (iii) decreased revenues from vehicle registration and licensing. Other potential impacts, such as changes in traffic volumes and revenues on tolled roads, as well as reduced income from privately operated parking facilities associated with transport infrastructure, are not included in this assessment due to a lack of data.

Total losses in the transport sector are estimated at JMD 10.4 billion and are largely explained by the significant decline in passenger flow at the Sangster International Airport in Montego Bay. As the country's busiest airport and the one most affected by reduced passenger arrivals following Hurricane Melissa, Sangster International Airport accounts for the largest portion of losses. Table XI 4 presents a detailed breakdown of losses, including airports, ports, and vehicle licensing.

Total losses are estimated over a one-year period following Hurricane Melissa. However, the most significant impacts are expected to occur in the months immediately after the event, reflecting both the disruption to peak tourism season and the temporary unavailability of key transport/tourism infrastructure. As a result, a significant portion of losses is concentrated in the initial post-disaster period. Particularly, of the total estimated losses of JMD 10.4 billion, approximately JMD 5.48 billion, equivalent to 52 percent, are expected to occur in 2025, while the remaining JMD 4.92 billion are projected for 2026.

As previously noted, airport losses dominate the overall estimate, representing approximately 91.5 percent of total sector losses. This is followed by revenue losses in the port sector, which account for about 7.1 percent of the total. Losses associated with reduced vehicle licensing revenues, as estimated by the Transport Authority due to vehicle losses across the country, represent the remaining 1.4 percent of total losses.

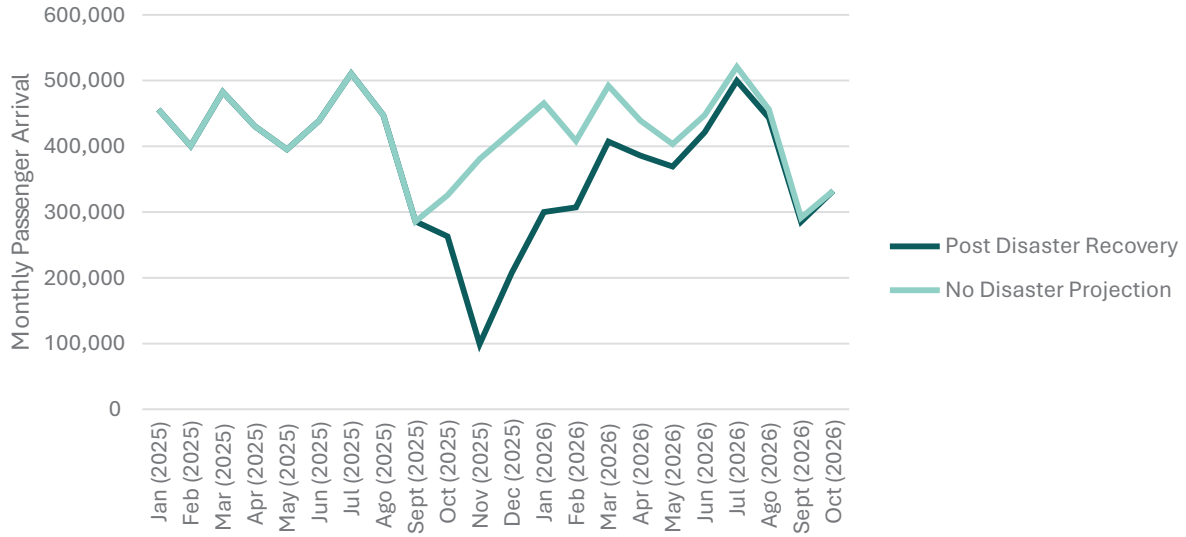
**Table XI 4:** Losses in the Transport sector, in thousands of JMD

| *Losses* | Public | Private | Total |
|---|---|---|---|
| *Ports* | 544,992 | 197,866 | 742,858 |
| *Airports* | - | 9,569,003 | 9,569,003 |
| *Vehicle Licensing* | 143,732 | - | 143,732 |
| ***Total*** | **688,725** | **9,766,869** | **10,455,594** |

*Source: DaLA team, 2025.*

Losses were estimated based on three factors: (i) taxes per passenger arrival, (ii) projected passenger traffic under a no-disaster scenario, and (iii) the expected recovery function following the event. First, historical passenger arrival data were analyzed for each transport facility. Using this data, a no-disaster scenario passenger flow was projected for the next 12 months. Thereafter, a monthly recovery trend was defined and used to estimate the deviation between projected post-disaster passenger volumes and the baseline scenario (scenario with no hurricane). This difference in passenger flows was then converted into tax revenues, which constitute losses for the transport sector. Figure XI 1 illustrates the recovery process for Sangster International Airport, which accounts for more than 90 percent of total losses in the sector.

**Figure XI 1:** Passenger Arrivals Sangster International Airport (Disaster vs No Disaster Scenarios)




*Source: DaLA team, 2025.*

The loss modeling for Montego Bay airport has some assumptions: (i) the initial post-disaster impact was estimated at approximately 27 percent of expected passenger arrivals during the weeks immediately following Hurricane Melissa. In practical terms, this implies that passenger arrivals in November reached only 27 percent of the volumes originally projected for that month, based on information obtained through meetings with the airport operator; and (ii) the recovery of passenger demand is assumed to follow an exponential trajectory over a one-year period. It is important to note that the recovery of passengers does not only depend on the availability of transport infrastructure, but also on the availability of other sectors' infrastructure, such as tourism.

## C. Additional Costs

Additional costs in the transport sector are primarily associated with emergency response, including road clearance, demolition works, and debris removal. This also includes expenditures incurred to immediately restore connectivity in the transport network, as well as costs incurred by transport institutions for preparedness and preventive actions undertaken before Hurricane Melissa. For example, the NWA reported expenditures of approximately JMD 400 million in the weeks before the hurricane for cleaning of roads' drainage systems to reduce flood risks during the hurricane.

Additional costs in the transport sector are estimated at approximately JMD 8 billion, as detailed in Table XI-5. Most of these costs (nearly 92%) are related to road clearance and emergency works carried out by the NWA, reflecting the extensive scale of debris accumulation, fallen trees, and impacts throughout the road network. Additional costs incurred at ports and airports are mainly related to debris removal, cleanup operations, and temporary measures required to restore safe and continuous operations.

**Table XI 5:** Additional costs in the Transport sector, in thousands of JMD

| *Additional Costs* | Public | Private | Total |
|---|---|---|---|
| *Roads* | 7,332,542 | - | 7,332,542 |
| *Airports* | - | 77,947 | 77,947 |
| *Ports* | 29,513 | 124,292 | 153,805 |
| *Others* | 444,000 | | 444,000 |
| ***Total*** | **7,806,055** | **202,239** | **8,008,294** |

*Source: DaLA team, 2025.*

Other additional costs considered in this analysis include a range of expenditures, such as cleanup activities at damaged Transport Authority facilities across the country, as well as evacuation support operations. The evacuation support activities are estimated to have generated costs of approximately JMD 37 million.

It is important to note that, in some cases, clearance and cleanup activities were carried out by own staff members and, therefore, did not result in direct financial expenditures for each institution. However, cleanup costs have been systematically estimated for all damaged facilities to reflect the economic value of these activities. These estimates account for the removal of debris and the cleanup of both structural and non-structural elements.



# 12 POWER

# Chapter XII - Power

Jamaica's power sector infrastructure suffered catastrophic and unprecedented destruction. The western parishes—St. Elizabeth, Westmoreland, St. James, Hanover, Trelawny, and Manchester—were the hardest hit. Following Hurricane Melissa, the immediate priority was emergency response and the restoration of essential electricity services.

The primary operator, Jamaica Public Service (JPS), characterized the event as one of the most severe system-wide disruptions ever recorded, given the extensive operational impact on its transmission and distribution network. The storm left more than 532,000 customers without electricity, representing 77 percent of the customer base, and the effects on the sector were estimated at JMD 52.8 billion. Infrastructure damage amounted to JMD 38.6 billion, losses from undelivered electricity totaled JMD 9,675 million, and additional costs were estimated at JMD 4.5 billion.

The electricity transmission and distribution infrastructure is owned and operated by the Jamaica Public Service Company (JPS), a privately held utility. Accordingly, for the purposes of this assessment, all associated damages and operational losses have been classified as impacts to the private sector.

**Table XII 1:** Summary of economic impact in the Power sector in Jamaica (expressed in thousands of JMD)

| *Effect* | Public | Private | Total |
|---|---|---|---|
| *Damages* | | 38,555,731 | 38,555,731 |
| *Losses* | | 9,675,893 | 9,675,893 |
| *Additional costs* | | 4,513,881 | 4,513,881 |
| ***Total*** | | **52,745,505** | **52,745,505** |

*Source: DaLA team, 2025.*

These estimates are based on the proportion of assets impacted and on high-level information gathered during rapid site visits conducted in the immediate aftermath of the hurricane. Together, these elements provided the basis for the initial working assessment of damages. During the mission to Jamaica on November 25, 2025, a meeting was held between JPS, PIOJ, IDB, and ECLAC, where JPS was requested to provide information such as a detailed damage assessment of the system and data on power flows. As of the date of this document, this information has not been received.

## A. Damages

Hurricane Melissa caused unprecedented, catastrophic damage to Jamaica's electrical grid, with the total damage estimated at up to JMD 38.6 billion. While an exact count of damaged poles has not been officially released to the public, the scale of destruction is immense. According to the president and CEO of JPS, the system is largely designed for a Category 3 storm, so the damage is consistent with the impact of a Category 5 hurricane.

The primary cause was extreme wind speeds of up to 185 mph, which destroyed both wooden and concrete utility poles and robust steel transmission towers.

The transmission lines connecting the west to the east of the island were severely damaged, so at the time of this assessment, the network is not operating in an interconnected manner and is functioning more like two isolated systems. JPS is focusing its efforts on restoring transmission first and then restoring distribution and connections to customers.

In the sub-sector of generation, the hurricane caused catastrophic destruction of Jamaica's largest solar power generator, the Eight Rivers Solar Park in Paradise Park, Westmoreland Parish, a 52-megawatt facility owned by the InterEnergy Group, leading to a complete operational shutdown. This represents 5 percent of the installed generation capacity of Jamaica.

**Baseline**

Jamaica Public Service Company Limited (JPS) is an integrated electric utility and the sole distributor of electricity in Jamaica. The company is responsible for the generation, transmission, and distribution of electricity, and also purchases power from several Independent Power Producers (IPPs).

*Ownership Structure*. JPS is majority-owned by Marubeni Corporation of Japan and East West Power Company (EWP) of Korea, which jointly hold 80 percent of the company's shares. The remaining shares are owned by the Government of Jamaica and a small group of minority shareholders.

*Operations and Infrastructure*. JPS serves approximately 701,670 residential, commercial, and industrial customers through a workforce of over 1,600 employees and a network of offices across the island. The company owns and operates approximately 21,000 kilometers of transmission and distribution lines, and the total installed generating capacity in Jamaica is close to 1,000 MW. JPS manages and operates the entire transmission and distribution system.

- Generation: Capacity on the grid is close to 1,000 MW, of which JPS owns 51 percent; the rest comes from Independent Power Producers (IPPs), distributed in 26 generating units.
- 51 substations.
- Transmission Lines: Approximately 1,200 km, primarily operating at 138 kV and 69 kV.
- Distribution Lines: Approximately 20,534 km, operating at various voltages including 24 kV, 13.8 kV, and 12 kV.
- Poles: 323,636 (wooden and concrete).
- Transformers: 41,307.

The Office of Utilities Regulation (OUR) is the statutory body responsible for regulating JPS. OUR ensures that JPS delivers quality service at fair and reasonable costs while complying with operational standards established under Jamaican law.

Jamaica's electricity generation matrix is diversified, with both renewable and non-renewable sources located throughout the country. The country has 26 power plants with an installed capacity of nearly 1,000 MW, of which 21 percent comes from renewable energy sources and 79 percent from fossil fuels (see Table XII 2).

In Jamaica, private capital is allowed to participate in electricity generation; 51 percent of the installed capacity of power plants is state-owned, and 49 percent corresponds to private investments.

**Table XII 2:** Jamaica's Power Plants

| *Name* | Operator | Parish | Fuel | Capacity (MW) |
|---|---|---|---|---|
| *Bahia Principe Runaway Bay Cogeneration Plant* | Sampol | St. Ann | Heavy fuel oil (HFO) and diesel | 8.1 |
| *Bogue Power Station* | JPS | St. James | Liquefied natural gas (LNG) | 120.0 |
| *Doctor Bird Power Station* | JEP | St. Catherine | HFO and diesel | 124.4 |
| *Grand Palladium Jamaica Trigeneration Plant* | Sampol | Hanover | LNG, diesel, and solar | 10.1 |
| *H10 Ocean Coral Spring Trigeneration Plant* | Sampol | Trelawney | LNG and diesel | 2.7 |
| *Jamaica Broilers Cogeneration Plant* | Jamaica Broilers Group | St. Catherine | LNG | 6.5 |
| *Jamaica Private Power Company* | JEP | Kingston | HFO and diesel | 60.0 |
| *Jamalco Power Plant* | New Fortress Energy | Clarendon | LNG | 150.0 |
| *Rockfort Diesel Station* | JPS | Kingston | Diesel | 36.0 |
| *South Jamaica Power Centre* | JPS | St. Catherine | LNG | 194.0 |
| *The Nest Power Station* | JPS | St. Catherine | LNG | 10.0 |
| *UWI Co-generation Plant* | Mona-Tech Engineering Services | St. Andrew | LNG | 7.0 |
| *West Kingston Power Partnes* | JEP | Kingston | HFO and diesel | 65.5 |
| *Constant Spring Hydroelectric Plant* | JPS | St. Andrew | Hydro | 0.8 |
| *Lower White River Hydroelectric Plant* | JPS | St. Ann | Hydro | 4.8 |
| *Maggotty Falls Hydroelectric Plant* | JPS | St. Elizabeth | Hydro | 13.2 |
| *Rams Horn Hydroelectric Plant* | JPS | St. Andrew | Hydro | 0.6 |
| *Rio Bueno A Hydroelectric Plant* | JPS | Trelawney | Hydro | 2.5 |
| *Rio Bueno B Hydroelectric Plant* | JPS | Trelawney | Hydro | 1.1 |
| *Roaring River Hydroelectric Plant* | JPS | St. Ann | Hydro | 4.5 |
| *Upper White River Hydroelectric Plant* | JPS | St. Ann | Hydro | 3.6 |
| *BMR Wind Farm* | BMR Energy | St. Elizabeth | Wind | 36.0 |

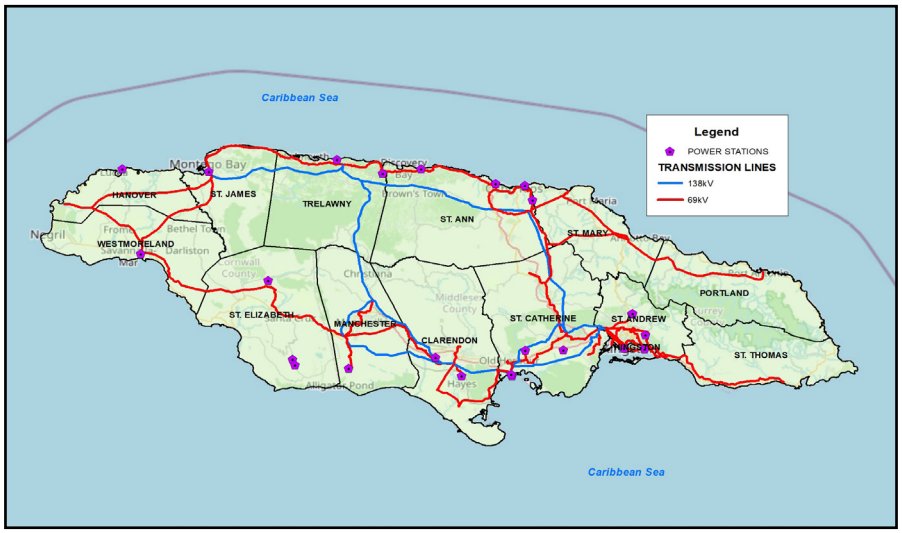
**Table XII 2:** Jamaica's Power Plants *(continuation)*

| *Name* | Operator | Parish | Fuel | Capacity (MW) |
|---|---|---|---|---|
| *Munro Wind Farm* | JPS | St Elizabeth | Wind | 3 |
| *Wigton Windfarm* | Wigton Windfarm Limited | Manchester | Wind | 62.7 |
| *Content Solar Farm* | WRB Enterprises | Clarendon | Solar | 20.0 |
| *Paradise Park Solar Farm* | InterEnergy (JEP) | Westmoreland | Solar | 52.0 |
| ***Total*** | | | | **999.1** |

*Source: DaLA team, 2025.*

The electrical transmission infrastructure comprises an extensive system of high-voltage lines, collectively spanning a significant total distance of 1,200 kilometers across the country. The core of the system, responsible for moving bulk electricity across substantial distances from generation points to key substations, operates at a high voltage level of 138 kilovolts kV. This critical segment of the network alone accounts for approximately 400 kilometers of the total line length. The secondary transmission network, which functions at a lower voltage of 69 kV, is primarily utilized for shorter distances. The 69 kV network is over 800 kilometers, see Map XII 1.

**Map XII 1:** Jamaica's Transmission Grid

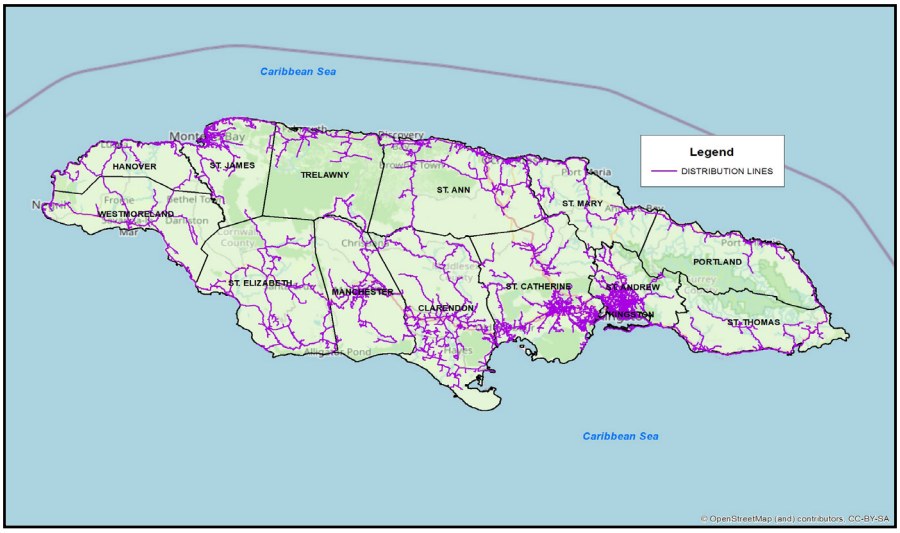



*Source: DaLA team, 2025 with information from JPS provided by National Spatial Data Management Branch (NSDMB)*

Jamaica has an extensive primary distribution network to deliver electricity to JPS's more than 701,670 customers (see Map XII 2). The damage to the distribution network in the western parishes was catastrophic; thousands of poles failed, some fractured, others were uprooted, damaging power lines and distribution transformers, leaving entire towns without service for months. The customer service office in Black River suffered severe damage, rendering it inoperable.

In the absence of a detailed damage assessment report from JPS, this damage estimate has been prepared based on data obtained during the visit to the affected areas, information gathered during meetings, and research to determine the potential impact on assets located in the most affected geographical areas.

**Map XII 2:** Jamaica's Electric Distribution Grid




*Source: DaLA team, Jamaica has an extensive primary distribution network to deliver electricity to JPS's more than 701,670 customers.*

The damage in the sub-sector of generation was mainly located at the "Eight Rivers Solar Park" plant. To estimate these damages, the cost of building the plant was used as a basis, and then the costs were broken down into their main components. A percentage of damage was then assigned to each of these categories, which include, among others, major equipment and materials, labor, and design. Upon completing these calculations, we obtain the amount needed to replace the damaged parts of this plant (see Table XII 3).

**Table XII 3:** Damage in generation, 52 MW Eight Rivers Solar Park, in thousands of JMD

| *Item* | Ratio of total Installed Cost (%) | Initial Cost (JMD) | Damage (%) | Total Damage (JMD) |
|---|---|---|---|---|
| Solar Panels | 35 | 3,487,287 | 70 | 2,441,101 |
| Inverters | 12 | 1,195,641 | 20 | 239,128 |
| Supports | 8 | 797,094 | 30 | 239,128 |
| Labor | 25 | 2,490,919 | 30 | 747,276 |
| Design, permits, others | 20 | 1,992,735 | - | - |
| ***Total*** | **100** | **9,96,676** | | **3,666,633** |

*Source: DaLA team, 2025.*

To estimate the damage to the transmission and distribution system, we started with the number of poles, towers, and distribution transformers installed nationwide. We estimated the percentage of these affected in each parish, based on visits to the affected areas. As a result, we determined that 11 percent of the poles and 7 percent of the transformers need to be replaced (see Table XII 4 and XII 5).

**Table XII 4:** Percentage of Poles and Transformers affected

| *Parrish* | Number of Poles/ Towers | % of Poles Affected | Affected Poles/ Towers | Number of Transf. | % of Transf. Affected | Affected Transf. |
|---|---|---|---|---|---|---|
| *Kingston* | 24,538 | 0 | - | 3,132 | 0 | - |
| *St. Andrew* | 43,073 | 0 | - | 5,498 | 0 | - |
| *St. Catherine* | 41,890 | 0 | - | 5,347 | 0 | - |
| *Portmore* | 24,637 | 0 | - | 3,145 | 0 | - |
| *Clarendon* | 24,149 | 0 | - | 3,082 | 0 | - |
| *Manchester* | 23,146 | 10 | 2,315 | 2,954 | 5 | 148 |
| *St. Elizabeth* | 21,678 | 65 | 14,090 | 2,767 | 50 | 1,383 |
| *Westmoreland* | 16,256 | 65 | 10,566 | 2,075 | 50 | 1,037 |
| *Hanover* | 7,848 | 20 | 1,570 | 1,002 | 10 | 100 |
| *St. James* | 29,334 | 15 | 4,400 | 3,744 | 7.5 | 281 |
| *Trelawny* | 9,863 | 15 | 1,480 | 1,259 | 10 | 126 |
| *St. Ann* | 22,213 | 0 | - | 2,835 | 0 | - |
| *St. Mary* | 14,180 | 0 | - | 1,810 | 0 | - |
| *Portland* | 10,889 | 0 | - | 1,390 | 0 | - |
| *St. Thomas* | 9,943 | 0 | - | 1,269 | 0 | - |
| ***Total*** | **323,636** | **11** | **34,420** | **41,307** | **7** | **3,075** |

*Source: DaLA team, 2025.*

**Table XII 5:** Total Poles & Transformer, in thousands of JMD

| *Item* | Total Installed | Affected % | Total Affected | Unit Price | Total |
|---|---|---|---|---|---|
| *Poles* | 323,636 | 11 | 35,600 | 191.60916 | 6,821,278 |
| *Transformers* | 41,307 | 7 | 2,891 | 718.53435 | 2,077,635 |

*Source: DaLA team, 2025.*

Subsequently, we estimated the average cost of poles and transformers in Jamaica, for which we used a 40-foot-long concrete pole and a 25 KVA three-phase transformer. Once the prices of these main elements have been obtained, we use industry-standard factors to determine the total installed price of the element and the components of the cost structure (see Table XII 6).

**Table XII 6:** Damages in Transmission & Distribution, in thousands of JMD

***Poles***

| *Description* | Factor of the Total Cost | Total Damage | Labor | Material |
|---|---|---|---|---|
| Poles (Structures) | 26 | 6,821,278 | | 6,821,278 |
| Conductor | 20 | 5,247,137 | | 5,247,137 |
| Hardware & Insulators | 10 | 2,623,569 | | 2,623,569 |

**Table XII 6:** Damages in Transmission & Distribution, in thousands of JMD *(continuation)*

***Poles*** *(continuation)*

| Description | Factor of the Total Cost | Total Damage | Labor | Material |
|---|---|---|---|---|
| *Labor (Direct)* | 44 | 11,543,702 | 11,543,702 | |
| *Burden and Benefits (Overhead)* | 13 | 3,410,639 | 1,500,681 | 1,909,958 |
| ***Total Poles*** | | **29,646,325** | **13,044,383** | **16,601,942** |

***Transformers***

| Description | Factor of the Total Cost | Total Damage | Labor | Material |
|---|---|---|---|---|
| *Transformer* | 45 | 2,077,635 | | 2,077,635 |
| *Hardware* | 15 | 692,545 | | 692,545 |
| *Labor (Direct)* | 40 | 1,846,787 | 1,846,787 | |
| *Burden and Benefits (Overhead)* | 13 | 600,206 | 240,082 | 360,123 |
| ***Total Transformers*** | | **5,217,172** | **2,086,869** | **3,130,303** |
| ***Total*** | | **34,863,498** | **15,131,252** | **19,732,246** |

*Source: DaLA team, 2025.*

The JPS commercial office in Black River sustained significant damage, and the estimated cost to restore it is JMD 25.6 million. This estimate was based on the established cost per square foot of construction in the housing sector. The total damage to the electricity sector amounts to JMD 38.6 billion.

**Table XII 7:** Damages in the Power sector, in thousands of JMD

| Categories | Public | Private | Total |
|---|---|---|---|
| *Generation* | | 3,666,633 | 3,666,633 |
| *Transmission & Distribution* | | 34,863,498 | 34,863,498 |
| *Buildings* | | 25,600 | 25,600 |
| ***Total*** | | **38,555,731** | **38,555,731** |

*Source: DaLA team, 2025.*

Image XII 1: Power lines Black River



Source: DaLA team, 2025.

## B. Losses

According to JPS's 2024 Annual Report, Jamaica has 701,670 electricity customers, of whom 89.4 percent are residential, 10.5 percent are commercial, and 0.1 percent fall into other categories. Annual billing amounts to JMD 174 billion, distributed as follows: 39 percent from residential customers, 57 percent from commercial and industrial customers, and 4 percent from other categories (see Table XII 8).

Table XII 8: Customers by category, in thousands of JMD

| *Category* | Customers | Revenues 2024 | Customers (%) | Revenue (%) | Average per customer daily (JMD) |
|---|---|---|---|---|---|
| *Residential* | 627,242 | 67,515 563 | 89.4 | 38.7 | 271 |
| *Commercial & Industrial (sml)* | 73,763 | 72,093,425 | 10.5 | 41.3 | 2,678 |
| *Commercial & Industrial (lrg)* | 179 | 28,168,782 | 0.0 | 16.1 | 431,144 |
| *Other* | 486 | 6,720,053 | 0.1 | 3.9 | 37,883 |
| ***Total*** | **701,670** | **174,497,823** | **100** | **100** | **660** |

Source: DaLA team, 2025.

At the peak of the crisis, over 532,000 customers, approximately 77 percent of the total customer base, were without power. JPS indicated that sections of the grid, particularly in the hardest-hit western parishes (Westmoreland, Hanover, St. Elizabeth, St. James), require months for full restoration.

Losses in the electricity sector are associated with the reduction in energy demand, primarily due to the unavailability of facilities to provide service. Total losses attributable to Hurricane Melissa were estimated at JMD 9.7 billion, of which JMD 8.3 billion correspond to 2025 and JMD 1.4 billion to 2026.

Two main information sources were used to generate this estimate. First, the 2024 JPS Annual Report provided the average daily expenditure per customer, estimated at JMD 660 per customer per day. Second, data from the Office of Utilities Regulation (OUR) were used to determine the number of service-interruption days, indicating that approximately 14.7 million customer-days were lost as a result of the hurricane. Multiplying these two elements yields a total estimated loss for the sector.

**Table XII 9:** Losses in the Power sector, in thousands of JMD

| *Category* | Customers | Revenues 2024 | Customers (%) | Revenue (%) | Average per customer daily (JMD) |
|---|---|---|---|---|---|
| *Residential* | 627,242 | 67,515 563 | 89.4 | 38.7 | 271 |
| *Commercial & Industrial (sml)* | 73,763 | 72,093,425 | 10.5 | 41.3 | 2,678 |
| *Commercial & Industrial (lrg)* | 179 | 28,168,782 | 0.0 | 16.1 | 431,144 |
| *Other* | 486 | 6,720,053 | 0.1 | 3.9 | 37,883 |
| ***Total*** | **701,670** | **174,49,823** | **100** | **100** | **660** |

*Source: DaLA team, 2025.*

## C. Additional Costs

Additional costs in the electricity sector are primarily associated with emergency response and service restoration, including overtime payments, the hiring of foreign personnel at rates higher than local wages, and logistical expenditures related to materials, equipment, and personnel management. The estimated additional costs for the sector amount to JMD 4.5 billion (see Table XII 10).

To estimate these additional costs, a labor distribution chart was first developed, reflecting the number of workers required to complete reconstruction tasks under normal working hours and local wage rates. A revised scenario was then constructed, incorporating the foreign personnel mobilized by JPS (over 400 international line workers, according to JPS) and shortening the reconstruction time to match JPS's reported timelines. This generated a volume of overtime hours paid at 1.5 times the standard rate. The difference between the two scenarios represents the additional labor cost attributable to the emergency response.

Due to insufficient data, this estimate does not include a specific provision for logistical costs; however, it is important to note that, in emergency or fast-track construction, budgets frequently experience significant escalation due to the necessity of compressed timelines. Primary cost drivers include expedited materials procurement and last-mile logistics, where premiums are paid to bypass standard lead times. Furthermore, the rapid mobilization of personnel necessitates substantial expenditure on travel, temporary accommodation, and per diems. The increased complexity of managing local crews under urgent conditions also requires intensified management and administrative oversight, further inflating the logistical cost.

**Table XII 10:** Additional costs in the Power sector, in thousands of JMD

| *Category* | Base Amount | Public | Private |
|---|---|---|---|
| *Estimate of Labor Working extended hours with local and foreign workers.* | 19,645,133 | | 19,645,133 |
| *Estimate of Labor Working regular-time with local workers.* | 15,131,252 | | 15,131,252 |
| ***Additional Cost*** | **4,513,881** | | **4,513,881** |

*Source: DaLA team, 2025.*



# 13 WATER AND SANITATION

# Chapter XIII - Water and Sanitation

The intense rainfall, flash flooding, and prolonged power outages that occurred in the wake of Hurricane Melissa severely affected the physical integrity and functional performance of some water treatment plants, pipe networks, sewerage systems, and on-site sanitation infrastructure. These impacts occurred against an already vulnerable backdrop of aging water supply and sewerage assets, limited redundancy, and high exposure to hydrometeorological hazards.

The hurricane also generated immense quantities of diverse solid waste, such as vegetation debris, construction and demolition waste, and damaged personal property. This waste had accumulated and blocked essential infrastructure, posing a significant health and mobility hazard.

NWC is the major provider of water supply and wastewater services in Jamaica, providing piped water to just under 75 percent of its 2.8 million population, and the remaining 25 percent receives water from small water supply systems operated by the municipal corporations, private operators, water trucks, as well as through self-supply via on-site systems such as rainwater harvesting. About 20 percent have access to sewer networks that mainly belong to NWCs, while most of the remaining population uses onsite wastewater systems for sanitation, such as septic tanks, soak-away pits, and tile fields.

It is estimated that, an average of 1.1 million tons of solid waste is generated annually in Jamaica. Solid waste is collected by the National Solid Waste Management Authority (NSWMA) through four government-owned limited liability waste management companies. They are: (a) Western Parks and Markets (WPM) Waste Management Limited; (b) Metropolitan Parks and Markets (MPM) Waste Management Limited; (c) North-Eastern Parks and Markets (NEPM) Waste Management Limited, and (d) Southern Parks and Markets (SPM).

The assessment of the impact of Hurricane Melissa on water supply and sanitation relied heavily on information provided by the National Water Commission (NWC), Water Resources Authority (WRA), Ministry of Health and Wellness (MOHW), Rural Water Supply Limited, private water operators, and community-level observations. Information from interviews with key persons from these entities, documented responses to information requests, and cost estimates that were prepared by operational personnel were used to help quantify physical impacts, estimate service disruption, and evaluate public health risks. Field inspections of selected facilities that were affected were conducted as part of the validation process. The estimates were calculated with information received up to December 8, 2025.

In the wake of Hurricane Melissa, the water and sanitation sector in Jamaica was severely impacted, with effects estimated to cost of JMD 8.3 billion. Table XIII 1 provides a summary of this impact. St. James and Trelawny were the parishes that had the most damage, accounting for some 77 percent of the estimated JMD 2.2 billion for physical damage to facilities that belong to NWC and private operators.

**Table XIII 1:** Summary of the effects in the Water & Sanitation sector, in thousands JMD

| *Effect* | Public | Private | Total |
|---|---|---|---|
| *Damages* | 2,103,877 | 132,000 | 2,235,877 |
| *Losses* | 4,100,000 | 1,140,000 | 5,240,000 |
| *Additional costs* | 758,296 | 56,000 | 814,296 |
| ***Total*** | **6,962,173** | **1,328,000** | **8,290,173** |

*Source: DaLA team, 2025.*

## A. Damages

### i. Water

***Baseline***

Based on Jamaica's Survey of Living Conditions, published by the PIOJ, access to improved drinking water was 73 percent in 2021 (PIOJ, STATIN, 2021). Table XIII 2 below is based on this PIOJ report and shows the portion of the population that has access to drinking water by source and region.

Table XIII 2: Access to Water (%) by Source and Region

| *Region* | Improved Drinking Water Source | Rainwater (Tank) | Private Trucked Water | River/Lake Spring/Pond | Other |
|---|---|---|---|---|---|
| ***National*** | **73** | **17** | **5** | **3.0** | **3** |
| *Urban Area* | 95 | 3 | 1 | 0.4 | 1 |
| *Rural* | 51 | 31 | 8 | 5.0 | 6 |

*Source: DaLA team, 2025.*

The 2019 Water Policy divides the country into Utility Service Areas (USAs) and Non-Utility Service Areas (NUSAs) (MEGJC, 2019). USAs are parts of the country where piped water supply is the least-cost method of providing water, while NUSAs are parts of the country where piped water supply is not the least-cost method and other supply modalities, such as rainwater harvesting systems, are considered more appropriate. NWC is the major provider of water in the USA, while the municipal corporations, supported by the Rural Water Supply Company Limited, provide water in the NUSAs.

NWC reports that it annually supplies about 300 million cubic meters of water to its 551,876 customers, through over 550 water supply facilities (water treatment plants, wells, and pump stations) across the country. Through its operations, it generated revenue of JMD 39.8 billion for the financial year 2023/24 (NWC, 2024).

There are at least 14 private operators licensed to retail piped water to just under 8,000 customers. Water for these operators is obtained primarily from wells adjacent to the areas that they serve. The major operators are Can-cara Limited (CCL), Rosehall Development Limited (RDL), Dynamic Environmental Management Limited (DEML), and the Runaway Bay Water Company Limited (RBWCL).

The municipal corporations operate "minor water supply" systems, mainly comprising piped gravity-fed water systems using water from naturally occurring springs that are located above communities that they supply. They also oversee community rainwater harvesting systems.

The WRA is responsible for the management, protection, and controlled allocation and use of Jamaica's water resources. Based on its 2019/2020 annual report, it has 68 continuous stream-gauging stations, 61 spot measurement points, 31 rain gauge stations, and one early warning system that are used to monitor and manage Jamaica's water resources. The data from these instruments are important for long-term planning for the use of the water resources and disaster mitigation.

### *Impact*

NWC prepared reports on the impact of the hurricane on its water supply infrastructure, which included preliminary estimates of the damage to its facilities. It prepared regular progress reports on its restoration efforts, including a dashboard that was publicly available on its website.[43]

Data provided by NWC showed that on November 1, 2025, 395 of its 570 (69%) water production and pumping facilities were not operating for various reasons – 66 percent affected by lack of electricity, 18 percent due to turbidity or heavy silting, and the remainder included dislocated pipelines caused by landslides. Based on the preliminary estimates provided by NWC, the major cost of damage to NWC's assets was for facilities in St. James and Trelawny. The types of damage included: (a) flooding of pump stations and water treatment plants, impairing electrical and mechanical equipment; (b) heaving silting of water intakes and water treatment facilities; (c) dislocation of pipelines due to landslides or scouring; (d) torn off roofs and extensive waterlogged ceilings of buildings ; (e) extensive obstruction to access, caused by road scouring, fallen trees and electric poles and the destruction of a bridge in one case.

It was difficult to access some facilities initially due to blocked roads caused by fallen trees, electric poles, and badly scoured roads.

Data provided by NWC, shortly after the hurricane (November 3, 2025), showed that 190,095 of its 551,876 customers were without piped water (i.e., 34% of its customer base). This represents under 600 thousand persons based on Jamaica's average household size of 3 persons/dwelling (STATIN, 2025). St. James had the highest impact, with almost 15 percent of the affected customers. By December 8, 2025, water supply was restored to over 97,000 of these customers.

**Table XIII 3:** Impact on Water Supply to NWC's Customers

| *Parish* | No. Customers | Customers Without Service | | Customers With Service | | Customer with Service (%)/ by Parish | |
|---|---|---|---|---|---|---|---|
| | | Nov 3 2025 | Dec 8 2025 | Nov 3 2025 | Dec 8 2025 | Nov 3 2025 | Dec 8 2025 |
| *St. Thomas* | 22,484 | 3,650 | 2,017 | 18,834 | 20,467 | 83.8 | 91.0 |
| *KSA* | 124,507 | 25,620 | 8,854 | 98,887 | 115,653 | 79.4 | 92.9 |
| *St. Catherine* | 120,769 | 15,224 | 3,410 | 105,545 | 117,359 | 87.4 | 97.2 |
| *Clarendon* | 43,149 | 15,540 | 7,159 | 27,609 | 35,990 | 64.0 | 83.4 |
| *Manchester* | 25,276 | 19,615 | 8,839 | 5,661 | 16,437 | 22.4 | 65.0 |
| *St. Elizabeth* | 28,087 | 20,196 | 12,455 | 7,891 | 15,632 | 28.1 | 55.7 |
| *Westmoreland* | 28,722 | 18,480 | 10,045 | 10,242 | 18,677 | 35.7 | 65.0 |
| *Hanover* | 17,140 | 10,533 | 7,140 | 6,607 | 10,000 | 38.5 | 58.3 |
| *St. James* | 49,830 | 27,167 | 15,962 | 22,663 | 33,868 | 45.5 | 68.0 |
| *Trelawny* | 18,314 | 7,353 | 7,684 | 10,961 | 10,630 | 59.9 | 58.0 |
| *St. Ann* | 30,911 | 8,636 | 5,436 | 22,275 | 25,475 | 72.1 | 82.4 |
| *St. Mary* | 26,856 | 11,979 | 3,349 | 14,877 | 23,507 | 55.4 | 87.5 |
| *Portland* | 15,831 | 6,102 | 574 | 9,729 | 15,257 | 61.5 | 96.4 |
| ***Total*** | **551,876** | **190,095** | **92,924** | **361,781** | **458,952** | **66.0** | **83.0** |

*Source: DaLA team, 2025.*

[43] https://goj.maps.arcgis.com/apps/dashboards/45689b3d66884462baf2b64d62337961

The OUR had prepared a summary report on the impact that the hurricane had on some private operators, using information that these operators had provided them. The OUR provided the ECLAC team with this summary report. The ECLAC team conducted interviews with two of these operators – CCL and RDL; RDL had provided information to the OUR. The information obtained from the OUR and the interviews is summarized in the Appendix of this chapter. The operators experienced damage to electro-mechanical equipment, water tanks, and wastewater facilities.

The minor water supply systems operated by the municipalities were also impacted by Hurricane Melissa, having dislocated pipes, damaged water catchments, water tanks, and perimeter fencing. The RWSL is working with the municipal corporations to prepare estimates of damage

Key components of the WRA monitoring network and equipment are located adjacent to or in rivers, and the WRA reported that many of these components were badly damaged. At least one station located in the hills was reported by the agency to have been completely washed away.

### ii. Sanitation

***Baseline***

Access to improved sanitation was 99.8 percent of the population in 2021, with 54 percent having access to onsite sanitation facilities connected to water closets, 23 percent are connected to central sewerage, and 17 percent use pits (see Table XIII 4).

**Table XIII 4:** Access to Sanitation by Type and Region, percentages (%)

| *Type of Access* | National | Urban | Rural Area |
|---|---|---|---|
| *WC Linked to Central Sewer Network* | 23.0 | 39.0 | 6.0 |
| *WC Linked to Offsite Disposal System* | 5.0 | 6.0 | 4.0 |
| *WC Linked to Onsite Disposal System* | 54.0 | 44.0 | 65.0 |
| *Pit* | 17.0 | 11.0 | 24.0 |
| *Other* | 0.1 | 0.1 | 0.2 |
| ***Access to Improved Sanitation*** | **99.9** | **100.0** | **99.8** |

*Source: Jamaica Survey of Living Conditions 2021 report.*

There are at least 60 municipal wastewater treatment plants across the island, of which 55 are owned and operated by the NWC, the remaining are owned and operated by private operators. There are lift stations that form part of the wastewater conveyance systems to most of these plants.

It is estimated that the combined installed wastewater treatment capacity of these facilities is 180,000 m3/day, of which the Soapberry Wastewater Treatment Plant in St. Andrew accounts for 75,000 m3/day (42%) and the Bogue Wastewater Treatment Plant in St. James accounts for just under 45,000 m3/day (25%). Both are waste stabilization plants. The other types of wastewater treatment technologies used in Jamaica include oxidation ditch and activated sludge.

Soakaway/absorption pits are the most common onsite wastewater disposal systems used in Jamaica, with septic tanks used as pre-treatment in some cases. Other types of systems include a septic tank followed by a tile field or bio-digesters. Septic tank/tile field and septic tank/biodigesters are used in a limited way for off-site disposal for small communities (e.g., a small housing scheme).

***Impact***

The major reported impacts on NWC's wastewater systems were the flooding and damage to switchgears and stand-by generators at wastewater lift stations. The affected lift stations could not operate immediately after the hurricane, and made communities susceptible to sewage overflows onto streets once the water supply was restored, posing serious public health and safety risks. Where there was no electricity available from the public supply, NWC had to rent generators and use them to restore pumping operations at the critical stations.

The section of the transfer main from the Freeport No. 5 Lift Station to the Bogue Wastewater Plant that crosses the Pye River was washed away during the passage of the hurricane. A temporary arrangement has since been made to allow pumping to resume and avoid sewage overflows on the streets in Freeport, a major commercial district in Montego Bay, St. James.

The building that housed the control systems for the wastewater treatment plant operated by CCL was almost completely submerged by flood waters, extensively damaging its motors, electrical, and control systems.

At this stage, no report was obtained about the impact of the hurricane on onsite sanitation systems. However, with flooding, soakaways and tile fields will become saturated, and infiltration will be impeded, causing sewage to back up into toilets or overflows onto the surrounding area. Septic tanks can float, shift, or crack under flooding conditions. These are undesirable situations with potential public health consequences.

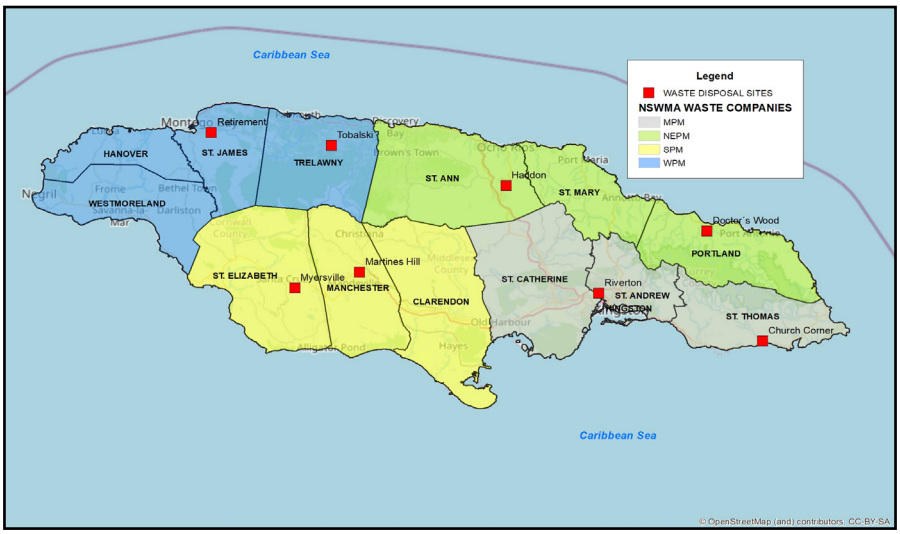
### iii. Solid Waste

***Baseline***

The Auditor General of Jamaica conducted a performance audit of the NSWMA in 2022, and based on data presented in the report of this audit, the average annual residential waste generated in Jamaica was estimated to have been 1,114,312 tons.

Map XIII 1 shows the parishes covered by the four NSMA companies, as well as the approximate locations of the 8 waste disposal sites that it operates.

**Map XIII 1:** Parishes Covered by the Four Solid Waste Companies & Waste Disposal Locations




*Source: Auditor General Performance Audit Report of NSWMA.*

### *Impact*

The United Nations Development Programme (UNDP) estimated that Hurricane Melissa generated over 4.8 million tons of debris across western and central Jamaica, based on preliminary satellite imagery analysis (UNDP, 2025). The UNDP further estimated that this is equivalent to 480,000 truckloads of solid waste. The 4.8 million tons is four times the average annual generation of 1.1 million tons reported by the Auditor General. This estimate of 4.8 million tons of solid waste will be further refined; in the UNDP article, it reports that this debris comprises: (a) 2.1 million tons of building and construction waste; (b) 1.3 million tons of vegetation; and (c) 1.4 million tons of household and personal property waste.

The excessive debris that was generated not only contributed to solid waste problems but also blocked roads, delaying restoration of water supply, electricity, and telecommunication services, and transportation systems.

### *Damage – Water Supply and Sanitation*

Total damage of Hurricane Melissa in the Water Supply and Sanitation sector is estimated at JMD 2.2 billion, primarily due to damage to facilities at water treatment plants, water pump stations, wastewater lift stations, and buildings for water supply and wastewater operations. Table XIII 5 summarizes this impact.

The estimates are based on information provided by NWC up to December 8, 2025, which they emphasized are preliminary and that they had not been able to access all facilities to conduct assessments. In addition, the ECLAC team made visits with some NWC's operations persons to some of the badly affected facilities/sites; the NWC persons provided detailed descriptions about the conditions of these facilities in the immediate aftermath of the hurricane and the steps taken to restore them to service.

At an estimated cost of JMD 0.5 billion (24% of the total cost of damage), damage to the 3,400 $m^3$/day capacity Dornoch Water Treatment Plant in Trelawny, located adjacent to the Rio Bueno River, was the facility most severely affected. It was extensively damaged, and there was extensive scouring of the riverbank to the extent that it has placed this facility in serious jeopardy, with the potential for the progressive undermining of the foundations of the building. Access to the plant has been cut off as the bridge that crosses the Rio Bueno River to provide this access was completely destroyed. Provision made in the costing includes relocating the plant to a less vulnerable site, consistent with "build back better" and long-term sustainability and resilience considerations.

**Table XIII 5:** Water Supply and Sanitation Damage Summary, in thousands JMD

| *Category* | Public | Private | Total |
|---|---|---|---|
| *Building Repairs - Operations* | 368,070 | 10,000 | 378,070 |
| *Building Repairs- Commercial & Admin Offices* | 62,850 | - | 62,850 |
| *Office Equipment & Furniture Replacement* | 16,600 | - | 16,600 |
| *Boundary Fencing (Repairs and/or Replacement* | 126,820 | 1,000 | 127,820 |
| *Well Station Repairs (electro-mechanical)* | 44,142 | - | 44,142 |
| *Water Treatment Plant (Dornoch)* | 500,000 | - | 500,000 |
| *Water Treatment Plant (Other than Dornoch WTP)* | 14,320 | - | 14,320 |
| *Access Bridge to Dornoch WTP* | 100,000 | - | 100,000 |

**Table XIII 5:** Water Supply and Sanitation Damage Summary, in thousands JMD *(continuation)*

| *Category* | Public | Private | Total |
|---|---|---|---|
| *Pipeline Repair or Replacement* | 384,866 | 2,000 | 386,866 |
| *Pump Station Repairs (electro-mechanical) - Water* | 143,748 | 2,000 | 145,748 |
| *Tank* | 163,300 | 10,000 | 173,300 |
| *Wastewater Treatment Plant Repairs* | 8,881 | 40,000 | 48,881 |
| *Sewer/Pumping Main* | 50,000 | - | 50,000 |
| *Wastewater Lift Station (electro-mechanical)* | 100,280 | 67,000 | 167,280 |
| *Water Monitor Network* | 20,000 | - | 20,000 |
| ***Total*** | **2,103,877** | **132,000** | **2,215,877** |

*Sources: NWC, OUR, CCL, RHDL.*

**Image XIII 1:** Impact on the Dornoch Water Treatment Plant in Trelawny



Dornoch Water Treatment Plant adjacent to the Rio Bueno

Column (top) for former bridge destroyed; girder in foreground

Source: National Water Commission.

In St. James, a section of the 600 mm treated water transmission that runs through the Liluput Gulley and the section of the 800mm raw water main that crosses the Great River to the Great River Water Treatment Plant were severely damaged, as well as a section of the pipeline to Davis Town in Trelawny. The combined cost to restore these three pipelines amounted to JMD 300 million, which is almost 80 percent of the total cost attributed to pipeline damage.

**Image XIII 2:** Pipeline Damage by Lilliput Gulley and Barrett Town in St. James



Pipeline repairs to transmission main through the Lilliput Gulley

Pipeline in Barrett Town hanging precariously by steep scoured hillside

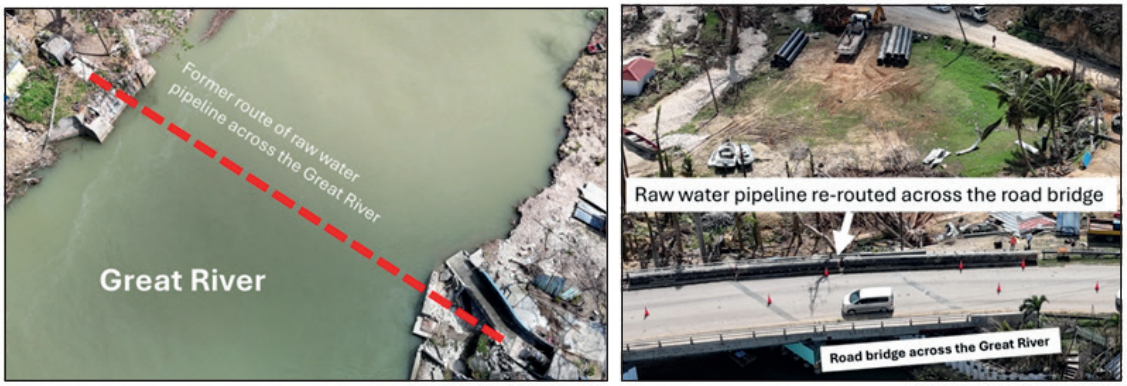
*Source: National Water Commission.*

About 50 percent of the cost of damage to buildings is related to roof issues, with some due to trees falling onto buildings. NWC has found ways to maintain customer service even for those damaged buildings that are used for customer service delivery; offices such as some of those in Portland, St. James, Hanover, and Westmoreland were badly damaged.

Office furniture and equipment were damaged when the roofs failed, causing water damage to the building's interior and its contents.

Damage to motors, switchgears, and stand-by electrical generators due to flooding was the main issue at water pump stations and wastewater lift stations.

**Image XIII 3:** Raw Water Pipeline to the Great River Water Treatment Plant in St. James




Section of the raw water pipeline to the Great River WTP and its pipe bridge across the Great River WTP were washed away

Raw water pipeline re-routed across the road bridge

*Source: National Water Commission.*

Table XIII 6 below summarizes the estimated cost of damage by parish.

**Table XIII 6:** Water Supply and Sanitation Damage Summary by Parish, in thousands JMD

| | Public | Private | Total |
|---|---|---|---|
| *Clarendon* | 19,531 | | 19,531 |
| *Hanover* | 43,002 | | 43,002 |
| *KSA* | 20,710 | | 20,710 |
| *Manchester* | 17,560 | | 17,560 |
| *Portland* | 10,700 | | 10,700 |
| *St Ann* | 29,627 | | 29,627 |
| *St. Catherine* | 13,442 | | 13,442 |
| *St. Elizabeth* | 102,567 | | 102,567 |
| *St. James* | 1,049,061 | 132,000 | 1,181,061 |
| *St. Mary* | 11,000 | | 11,000 |
| *St. Thomas* | 2,475 | | 2,475 |
| *Trelawny* | 713,377 | | 713,377 |
| *Westmoreland* | 70,827 | | 70,827 |
| ***Total*** | **2,103,877** | | **2,235,877** |

*Source: DaLA team, 2025.*

**Damage – Solid Waste**

The NSWMA did not provide information regarding damage to its assets. Its Retirement and Tobaiski was te disposal facilities would have been among the most vulnerable of its assets.

## B. Losses

**Water and Sanitation**

It is estimated that losses in the Water and Sanitation sector will amount to JMD 5.2 billion by November 2026 (see Table XIII 7). These are largely related to the loss of income to NWC and Rose Hall Development Limited from hotels in St. Ann, Trelawny, St. James, and Hanover, that were severely damaged by the hurricane. This impact has necessitated them closing for extended periods, some slated to re-open as late as November 2026.

**Table XIII 7:** Losses Water Supply and Sanitation, in thousands JMD

| | Public | Private | Total |
|---|---|---|---|
| Losses Water Supply and Sanitation | 4,100,000 | 1,140,000 | 5,240,000 |

*Source: DaLA team, 2025.*

NWC had not provided projections for potential loss of revenue arising from the hotel closures; however, the ECLAC team projects that this loss is likely to amount to at least JMD 4.1 billion. Based on data provided by NWC for the period April 2025 to November 2025, its average monthly billing for Trelawny, St. James, Hanover, and Westmoreland are about JMD 1 billion. More than 60 percent of this revenue is derived from commercial customers; the NWC's 2017 Annual report indicated that, "... commercial and government accounts including hotels, guest houses and government institutions provide approximately 65 percent of the area's monthly collections". NWC's loss was based on the estimated loss of revenue from its hotel customers; it was assumed that prior to the hurricane, its hotel customers accounted for 55 percent of the revenue for these four parishes, and 75 percent of its hotels were closed and will be reopened by August 2026.

Rose Hall Development Limited (RDL) is a private operator of water supply and sewerage services that serve major hotel properties in Rose Hall, St. James. In the interview with a key RDL representative, it was indicated that the projected revenue loss to November 2026 was put at JMD 1.1 billion.

It should be noted that there were losses from leaks due to disrupted pipelines and from water sales due to disruptions in service in the immediate aftermath of the hurricane, but these would be relatively minor when compared to the losses outlined above.

### Solid Waste

The primary source of income for NSWMA is government subsidies. Information was not obtained from the NSWMA for this assessment; however, it is noted in its 2023/24 consolidated financial statements (SFAI Jamaica, 2024) that it earned almost JMD 0.7 billion for commercial activities, just under JMD 0.1 billion per month. These commercial activities relate to collecting and disposing of solid waste for businesses, as well as charging tipping fees at its disposal sites. Revenue loss would be affected by the extent to which these activities are disrupted.

## C. Additional Costs

**Water and Sanitation**

The Additional Cost incurred in the Water and Sanitation sector as of December 8, 2025, is estimated at JMD 0.8 billion (see Table XIII 8).

In the case of NWC, the additional costs were largely attributed to the clearing of access to water supply and wastewater facilities (cutting, clearing, and removal of fallen trees; removal of debris), purchasing fuel for electrical generators, rental of electrical generators, and the trucking of water. NWC continues to operate stand-by generators at some water supply and wastewater facilities. On December 8, 2025, NWC's website indicated that 16 facilities were relying on electrical generators to operate.

For the private water operators, the additional cost was mainly due to the use of electrical generators to provide power to their facilities.

**Table XIII 8:** Additional Costs Water Supply and Sanitation, in thousands of JMD

| *Category* | Public | Private | Total |
|---|---|---|---|
| *Additional Staff & Provision for Temporary Accommodation* | 17,000 | - | 17,000 |
| *Clearing of Access (cutting trees, debris removal)* | 232,788 | 1,000 | 233,788 |
| *Cleaning (water intakes, pump sumps,* | 34,270 | - | 34,270 |
| *Water Trucking* | 302,700 | - | 302,700 |
| *Fuel for Electrical Generators & for Vehicles* | 83,843 | 55,000 | 138,843 |
| *Rental of Electrical Generators* | 104,500 | - | 104,500 |
| *Other Items* | 195 | - | 195 |
| ***Total*** | **758,296** | **56,000** | **814,296** |

*Source: NWC, OUR, CCL and RHDL.*

It should be noted that flooding at some of the NWCs' sites caused damage to standby generators that were installed at these sites, necessitating either installing replacement units or renting generators.

**Solid Waste**

As indicated earlier, the UNDP estimated that Hurricane Melissa generated over 4.8 million tons of debris across western and central Jamaica, which is four times the 1.2 million tons of solid waste that was collected in all of 2024. This amount is equivalent to 480,000 truckloads of solid waste. It was noted that in NSWMA's 2023/24 consolidated financial statements, total expenses amounted to JMD 10.6 billion for the period.

## D. Appendix Water and Sanitation

**Table XIII 9:** Summary of Impact on Five Private - Water Supply and Wastewater Operators

| *Company Name* | Number of Customers | Service Provided | Parish (s) in which Systems Located | Types of Impact | Comments |
|---|---|---|---|---|---|
| *Can-Cara Development Limited* | 1,922 | Water & Wastewater | St. Catherine & St. James | Control station for WW plant in St. James submerged by flood water (almost to the roof), causing extensive damage to electronics & electro-mechanical equipment. Complete overhaul needed. Lift station covered with mud. | Water to housing developments served in St. Catherine was suspended just prior to the hurricane & restored within 24 hours using standby generator. Provides NWC with 16,000 $m^3$/ day. Supply was suspended at the request of NWC |
| *Dynamic Management limited* | 2,320 | Water & Wastewater | St. Catherine | Broken water mains, service lines, valves. Flooding of WW treatment facilities Damaged to generators | Water supply to 3 of the 4 housing developments restored by Nov 7th 2025 |
| *Rose Hall (Developments) Limited (RHDL)* | 59 | Water, Wastewater & Irrigation | St. James | Section of 200mm pipeline in a gully was washed away. Roof of water tanks damaged Pumping equpment damaged | Used standby generators for 4 weeks - for water & wastewater operations. Only disruption was due to damage pipeline |

**Table XIII 9:** Summary of Impact on Five Private - Water Supply and Wastewater Operator

*(continuation)*

| *Company Name* | Number of Customers | Service Provided | Parish (s) in which Systems Located | Types of Impact | Comments |
|---|---|---|---|---|---|
| *Runaway Bay Water Company* | 1,179 | Water | St. Catherine & St. Ann | Broken water mains, service lines, valves. Flooding of WW treatment facilities Damaage to generators | Water supply to the housing development served in St. Catherine was not disrupted (used standby generator for 4 days). Up to Nov 10th, 2025, supply to areas served in St. Ann was maintained through use of standby generator |
| *Oceanpointe Utilities Limited (OUL)* | 432 | Water & Wastewater | Hanover | Broken water mains, service lines, valves. Damage to building, storage tanks, generators and backup | Service restored by Nov 6th 2025 using standby generators |

*Source: DaLA team, 2025.*

*Note: Based on Information from the OUR and interviews with two operators.*



# 14 TELECOMMUNICATIONS

# Chapter XIV - Telecommunications

Telecommunications play a critical role in disaster response and recovery. During a disaster, reliable communication systems are essential for coordinating emergency services, disseminating timely information to the public, and maintaining contact between affected communities and relief agencies. They enable first responders to share real-time updates, prioritize resources, and ensure that life-saving assistance reaches those in need.

In the aftermath of a storm, telecommunications become equally vital for reconstruction and economic recovery. Businesses depend on connectivity to resume operations, governments rely on communication networks to organize rebuilding efforts, and individuals need access to information and services to restore normalcy. Furthermore, telecommunications support remote work, digital transactions, and education, which are crucial when physical infrastructure is damaged. Without robust and resilient networks, recovery efforts can be delayed, increasing both economic losses and social vulnerability.

The telecommunications sector in Jamaica sustained severe and widespread damage following Hurricane Melissa. The hurricane severely compromised critical network assets, particularly mobile infrastructure, which required widespread emergency repairs and equipment replacement. These damages reflect not only the physical destruction of towers and transmission systems but also the significant operational disruption experienced during the weeks following the event. Immediately after the hurricane, national connectivity fell to approximately 30 percent of normal levels. According to the latest report from The Ministry of Energy, Transport and Telecommunications (December 12, 2025), 80 percent of mobile sites have now been restored. The overall impact on the sector is estimated at JMD 20.4 billion, comprising JMD 8.4 billion in infrastructure damage, JMD 11.6 billion in losses from service outages, and JMD 0.3 billion in additional recovery-related costs. The parishes that experienced the most significant impact were St. Elizabeth, Westmoreland, Hanover, St. James, Trelawny, and Manchester.

Table XIV 1: Summary of the effects in Telecommunications sector, in thousands of JMD

| *Effect* | Public | Private | Total |
|---|---|---|---|
| *Damages* | | 8,415,924 | 8,415,924 |
| *Losses* | | 11,636,583 | 11,636,583 |
| *Additional costs* | | 342,053 | 342,053 |
| ***Total*** | **-** | **20,394,560** | **20,394,560** |

*Source: DaLA team, 2025.*

This assessment was based on multiple sources, including site visits to affected areas, consultations with the Office of Utilities Regulation (OUR), and reviews of reports from the Broadcasting Commission, OUR's Telecommunications Market Information: Q2 2024 – Q2 2025, and ODPEM's Preliminary Damage Assessment. Publicly available data was also analysed. This approach was necessary because, at the time of preparing this estimate, operators had not yet submitted detailed reports on the extent of damage and its impact on the sector. During the mission to Jamaica in late November, we requested information and sought meetings with the operators to obtain details on damages and losses. Subsequently, on December 5, 2025, a meeting was convened with OUR, PIOJ, IDB, and ECLAC, where comprehensive data on system damage and the revenue streams of Digicel and Flow were formally requested again. As of the date of this document, this information has not been received.

The country's two main telecommunications operators, Digicel and Flow, have reported significant progress in restoring services following the storm. On November 12, 2025, Digicel stated that it had

restored approximately 89 percent of its fixed network infrastructure and 60 percent of its mobile network, marking a substantial step in its recovery efforts.

Similarly, on December 11, 2025, Flow reported that 86 percent of its network had been restored, with 64 percent of customers reconnected and 80 percent of mobile sites carrying 97 percent of pre-storm traffic. This represents a major improvement, considering that only 22 percent of its sites were online immediately after the hurricane. Both operators continue working to accelerate recovery, though challenges related to electricity supply and damaged infrastructure remain significant obstacles. Jamaica has numerous broadcasting licensees throughout the country, of which 29 are for FM and 33 for subscription television. Hurricane Melissa also severely disrupted Jamaica's broadcasting media sector, leaving about 20 percent of licensees non-operational due to equipment damage and power loss. Some, such as Home Time Entertainment, experienced near-total shutdowns. Infrastructure damage is extensive, with over 20 percent of licensees losing more than 75 percent of their facilities, and backup systems proving inadequate. Approximately 4.5 percent of employees were displaced or injured, creating urgent needs for financial assistance, temporary housing, and psychosocial support—though only one employer implemented formal interventions. Editorial functions remain constrained by misinformation and limited access to affected communities. Despite these challenges, 67 percent of licensees maintain partial operations, and 84.2 percent have expressed interest in media literacy initiatives to combat disinformation.[44]

## A. Damages

***Baseline***

Jamaica's main telecommunications operators, both wireless and cable, are Digicel Jamaica and Flow. These two companies provide the majority of the country's telecom services.

The Office of Utilities Regulation (OUR) oversees the telecommunications sector under the Telecommunications Act. Its responsibilities include regulating specified services and facilities, receiving and processing license applications, and promoting the interests of customers.

**Table XIV 2:** Telecommunications customers, in JMD

| *Categories* | Customers | Average Monthly Bill |
|---|---|---|
| *Cellphone lines* | 3,247,010 | 2,067 |
| *Land lines* | 465,920 | 715 |
| *Internet* | 468,240 | 5,716 |
| *Cable TV* | 600,000 | 5,100 |

Source: DaLA team, 2025. With data from Telecommunications Market Information: Q2 2024 – Q2 2025.

[44] Rapid Electronic Media Recovery – Post-Hurricane Melissa (Jamaica, Eric Falt/UNESCO &C. Green/ Broadcasting Commission, November 21, 2025

**Image XIV 1:** Telecommunication lines destroyed in Montego Bay



*Source: DaLA team, 2025.*

The telecommunications network is closely linked to the power grid's infrastructure, as many communication lines depend on utility poles[45]. To estimate restoration costs, we considered the labor required to first reestablish the poles and then repair telecommunications systems. For telecommunications recovery, we assumed a workforce of 340 technicians dedicated to repairs, including 100 international specialists at the peak of operations and an average of 220 workers throughout the effort. Additionally, we estimated that the cost of restoration materials would be comparable to labor costs. At the time this report was prepared, the information requested from telecommunications operators regarding the impact of the storm on their network assets had not yet been provided. This lack of data limits the ability to fully assess the extent of damage and the resources required for complete restoration.

Hurricane Melissa caused extensive damage to Jamaica's telecommunications sector, with total damages estimated at up to JMD 8.4 billion (see Table XIV 3). The primary cause of the damage was extreme winds reaching speeds of up to 185 mph, which destroyed utility poles—both wooden and concrete—as well as numerous telecommunications sites. This resulted in severe damage to equipment and antennas, disrupting connectivity across the affected areas. The western parishes, including Westmoreland, Hanover, St. Elizabeth, St. James, Trelawny, and Manchester, experienced the most significant impact, with widespread infrastructure failures and service interruptions.

**Table XIV 3:** Damages in Telecommunications sector, in thousands of JMD

| Categories | Public | Private | Total |
|---|---|---|---|
| *Telecommunication Operators* | | 8,415,924 | 8,415,924 |
| ***Total*** | | **8,415,924** | **8,415,924** |

*Source: DaLA team, 2025.*

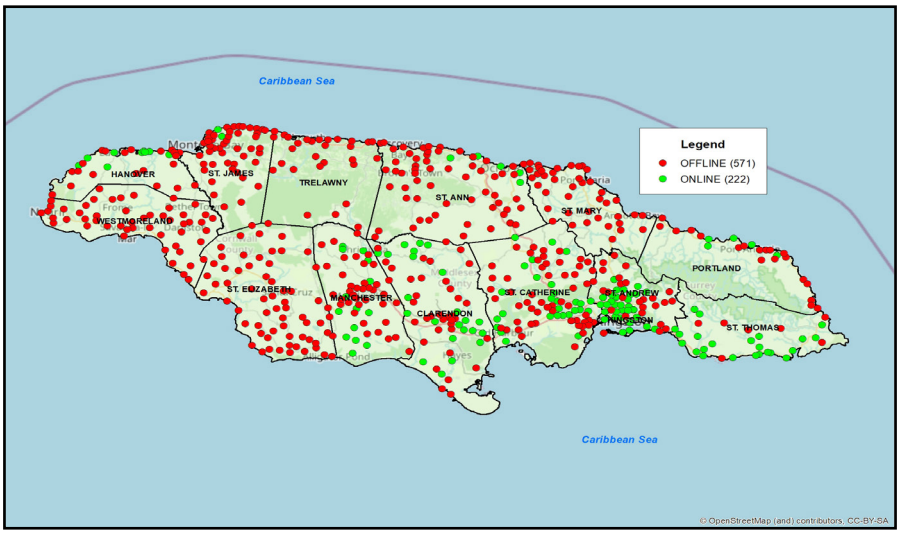
## B. Losses

Jamaica has over 3 million mobile phone users, 450,000 internet and landline subscribers, and 600,000 cable television subscribers[46]. It's important to note that, for the purposes of this estimate, the inability to provide a service is considered a loss, and these services were severely affected by the storm, not

[45] Supplement to the estimate of poles in the electricity sector

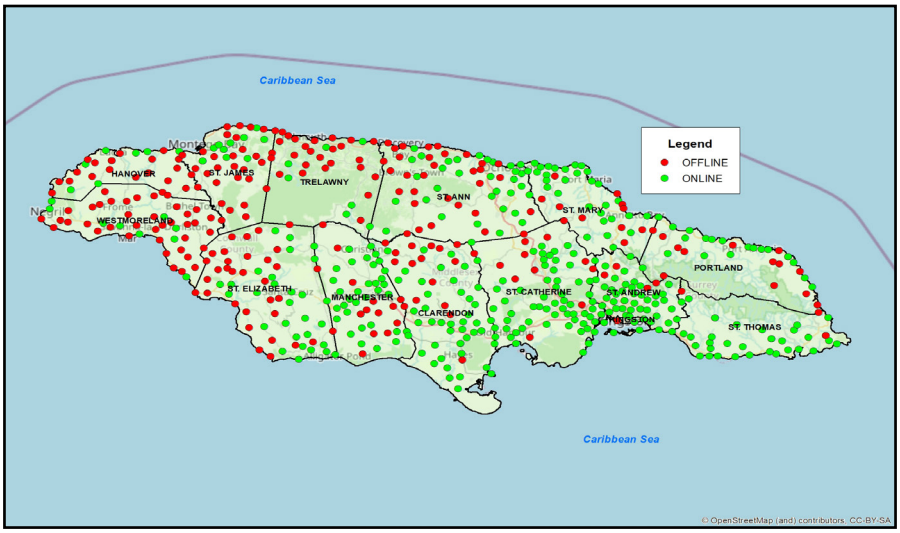
only due to damage to telecommunications infrastructure, but also because a significant portion of the service disruptions were caused by power outages, which prevented service delivery.

**Map XIV 1:** Flow Jamaica Mobile Network Coverage Map as of November 17, 2025




*Source: DaLA team, 2025. With information of Flow Jamaica, 2025.*

**Map XIV 2:** Digicel's Network Coverage as of November 18, 2025




*Source: DaLA team, 2025. With information of Digicel Jamaica, 2025.*

Losses in Jamaica's telecommunications sector resulting from Hurricane Melissa are estimated at JMD 11.6 billion. Of this amount, approximately JMD 9.7 billion is expected to occur in 2025, reflecting immediate disruptions to infrastructure, services, and operations. An additional JMD 1.9 billion is projected for 2026, primarily due to ongoing restoration activities, delayed service recovery, and the replacement of critical assets (see Table XIV 4). These figures highlight the significant financial impact of the hurricane on the sector and underscore the need for sustained investment in resilience and recovery measures.

[46] Telecommunications Market Information: Q2 2024 – Q2 2025, Office of Utilities Regulation (OUR)

**Table XIV 4:** Losses in the telecommunications sector, in thousands of JMD

| *Losses* | Public | Private | Total | 2025 | 2026 |
|---|---|---|---|---|---|
| *Cell Phone* | | 5,493,767 | 5,493,767 | 4,688,459 | 805,308 |
| *Cable TV* | | 323,774 | 323,774 | 272,329 | 51,444 |
| *Land Line* | | 2,599,839 | 2,599,839 | 2,186,750 | 413,089 |
| *Internet* | | 2,972,243 | 2,972,243 | 2,499,983 | 472,260 |
| *Broadcasting* | | 246,960 | 246,960 | 82,320 | 164,640 |
| ***Total*** | **-** | **11,636,583** | **11,636,583** | **9,729,842** | **1,906,741** |

*Source: DaLA team, 2025.*

To estimate losses, information from the OUR website and press releases issued by the Ministry were used, as these sources provided daily updates on the percentage of users without telecommunications service. Based on these updates, the number of users affected each day was estimated for each category of service. This figure was then multiplied by the average daily cost per user, as shown in Table XIV 5, yielding the corresponding loss estimates.

**Table XIV 5:** Customers Without Service, in JMD

| *Categories* | Customers | Average Monthly Bill | Daily Cost per Customer | Cumulative daily Customers Without Service |
|---|---|---|---|---|
| *Cellphone lines* | 3,247,010 | 2,067 | 69 | 79,743,368 |
| *Land lines* | 465,920 | 715 | 24 | 13,576,741 |
| *Internet* | 468,240 | 5,716 | 191 | 13,644,345 |
| *Cable TV* | 600,000 | 5,100 | 170 | 17,483,784 |

*Source: DaLA team, 2025. With information from OUR service restoration tracker post Hurricane Melissa.*

To estimate losses in the broadcasting sector, it was assumed that the 112 workers who lost their jobs would remain unemployed for an average of six months. This assumption reflects the impact of the storm, which in some cases destroyed physical facilities, while in others forced production companies to close indefinitely or relocate operations.

## C. Additional Costs

The additional costs in the sector are primarily associated with responding to the emergency and restoring electricity service, including overtime pay, hiring foreign personnel at rates higher than local rates, and logistical expenses for managing materials and personnel. The estimated additional costs in the telecommunications sector amount to JDM 0.3 billion (see Table XIV 6).

To estimate these additional costs, a labor distribution chart was first developed, reflecting the number of workers required to complete reconstruction tasks under normal working hours and local wage rates. A revised scenario was then constructed, incorporating the foreign personnel to shorten the reconstruction time. This generated a volume of overtime hours paid at 1.5 times the standard rate. The difference between the two scenarios represents the additional labor cost attributable to the emergency response.

Table XIV 6: Additional costs in the Telecommunications sector, in thousands of JMD

| *Additional Cost* | Base Amount | Public | Private | Total |
|---|---|---|---|---|
| *Estimate of Labor Working extended-time with local and foreign workers.* | 4,065,913 | | | |
| *Estimate of Labor Working regular-time with local workers.* | 3,723,860 | | | |
| *Additional cost per overtime hours and foreign personnel* | 342,053 | | 342,053 | 342,053 |

*Source: DaLA team, 2025.*

# Environment



# 15 ENVIRONMENT

# Chapter XV - Environment

This chapter assesses the damage, losses, and additional costs caused by Hurricane Melissa in the environmental sector. Hydrometeorological events, like hurricanes, affect the condition of the ecosystems and their ability to deliver fundamental provisioning, regulating, supporting, and cultural services. The most common impacts are caused by floods, strong winds, and landslides. The intensity of the impact on the environment is also linked to the pre-disaster condition of the ecosystems, as healthy ecosystems are more resilient to shocks. Furthermore, healthy ecosystems are the first barrier to reducing the risk of disasters.

Field visits conducted following the event indicated widespread and severe tree defoliation across multiple parishes, particularly in Western Jamaica. Sustained winds of approximately 298 km/h were the main source of damage, resulting in extensive loss of foliage, canopy thinning, uprooting, and branch stripping, with many trees exhibiting browned, curled, or necrotic leaves consistent with wind-induced desiccation or “windburn”. The loss and degradation of forest cover tend to increase environmental vulnerability, particularly with respect to soil erosion, surface runoff, sediment transport, and flooding risk, which are expected to adversely affect forest ecosystem services.

Approximately 51 percent of the forest cover was impacted, Jamaica Observer. (2025, November 25). Regarding coastal ecosystems, according to the Hurricane Melissa post-disaster needs assessment: Preliminary report done by the National Environment and Planning Agency (NEPA) estimated that 90 percent of mangrove trees in key impacted areas were damaged.

The estimations were elaborated using the preliminary assessments of the Forestry Department and the NEPA, as well as the geographic and satellite data of land cover and use (2023), boundaries of protected areas, post-disaster flooding, and post-disaster analysis of degradation using the Normalized Difference Vegetation Index (NDVI). Satellite images and GIS information were facilitated by the Forestry Department and NEPA, and flood and landslide information was obtained from Copernicus. This information was corroborated during field visits on 26 November 2025.

Recovery costs and ecosystem services valuation for mangroves were obtained from the extensive work of the Government of Jamaica on the assessment of the coastal protection services provided by these ecosystems (World Bank, 2019). Recovery costs and valuation of other ecosystems were obtained from international literature, such as de Groot et al. (2012). The methodology for the estimation of the effects (damage and losses) is detailed in the specific sections below.

The effects are estimated by comparing post-disaster information with baseline or pre-disaster data on the condition and cover of the ecosystems. Based on the country’s information on land use and land cover, the ecosystems analyzed in this chapter are bamboo, fields, forests, mangroves, swamps, wetlands, and water bodies. There was no information available to assess the impact on marine ecosystems, such as seagrasses and reefs. The environmental assessment does not include the estimations related to land cover pertinent to agriculture or forestry, such as plantations and pasture, as these are evaluated in the productive sectors.

Although there were reports of impact on wildlife, there was no baseline or post-disaster information to estimate these effects. However, the loss of ecosystem services could provide some indications of the loss of habitats, nurseries, and food.

The assessment for the environmental sector was carried out in the nine parishes that showed degradation in the post-disaster NDVI: Clarendon, Hanover, Manchester, St. Ann, St. Catherine, St. Elizabeth, St. James, Trelawny, and Westmoreland. Overall, the total effects of Hurricane Melissa on the

environmental sector are estimated at JMD 209 billion, as presented in Table XV 1. Losses associated with the interruption and degradation of ecosystem services account for the largest share of the effects, totaling JMD 185 billion, while damage to natural assets is estimated at JMD 23.8 billion. Information on additional costs was very limited. The Forestry Department identified a cost of JMD 74 thousand for clearing roads and trails in Johnson Mountain and Bogue.

The results are not disaggregated between public and private effects, as environmental assets and the ecosystem services they provide generate non-excludable benefits shared by society as a whole. In addition, available information allows for the identification of state-owned and mixed ownership protected areas, but does not provide sufficient detail to distinguish areas under exclusively private ownership. Consistent with previous DaLA reports, recovery and restoration costs in the environmental sector are therefore assumed to be predominantly public in nature, particularly in the case of forests, mangroves, and protected areas, whose related policy, regulation, management, and long-term conservation fall under governmental responsibility, even when ecosystems are not managed publicly.

**Table XV 1:** Summary of the effects in the environment sector, in thousands of JMD

| | Public | Total |
|---|---|---|
| *Damage* | 23,876,689 | 23,876,689 |
| *Losses* | 185,256,771 | 185,256,771 |
| *Additional Costs* | 74 | 74 |
| ***Total*** | **209,133,534** | **209,133,534** |

*Source: DaLA team, 2025.*

This chapter was made possible by the collaboration of national institutions that provided data, technical inputs, and validation throughout the assessment process. We would like to thank, particularly, the Planning Institute of Jamaica, the National Environment and Planning Agency, and the Forestry Department for their support and contributions to this analysis. The estimations presented in this chapter are based on information made available up to January 9, 2026.

### *Baseline*

Jamaica is approximately 230 km long and 80 km wide, and has a coastline of 1,022 km. The topography consists of a highland interior formed by mountain ranges, central valleys, and surrounding flat coastal plains and wetlands. Forest ecosystems are strongly influenced by elevation, geology, and climate, with broadleaf forests, secondary forests, mangroves, swamp forests, and open dry forests representing the principal forest types. Non-forest land uses are dominated by agriculture, pasture, and expanding built infrastructure, particularly in coastal and peri-urban areas (Forestry Department, 2024). Approximately half of the island is above 1,000 meters, contributing to its biodiversity and microclimates. About 60 percent of the island's bedrock is white limestone, 25 percent is volcanic and cretaceous, 10 percent is alluvial, and 5 percent is yellow limestone (United Nations Framework Convention on Climate Change, 2012; United Nations Convention to Combat Desertification, 2002).

According to the State of Forests (Forestry Department, 2024), between 2013 and 2023, forest cover increased by 7.9 percent in Jamaica, reaching 47.9 percent of the total mainland area, approximately 527,394.5 hectares, largely driven by the regeneration of secondary forests on underutilized agricultural lands. Mixed land use (23%) and non-forest land use (29%) account for the other 52 percent of the mainland. The government manages approximately 35 percent of forests, while 65 percent are managed privately. Most mangrove forests (47%) and closed broadleaf forests (76.4%) are managed

by the government. While most disturbed broadleaf forests (79.7%) and secondary forests (82.8%) are managed privately.

Given the importance of mangroves for disaster risk reduction, the government developed an economic valuation of their coast protection services in collaboration with the World Bank and The Nature Conservancy. It is estimated that mangroves protect USD 386 million in assets in events of 1 in 100 years, reaching USD 2.4 billion in assets protected during events of 1 in 500 years (World Bank, 2019). The coastal protection services that mangroves provide through flood protection are estimated at USD 2,500 per hectare per year. Assessments in Portland Cottage, Clarendon, Bogue Lagoon, St. James, and Salt Marsh, Trelawny estimate the nursery services for fisheries at USD 213 per hectare per year in each site, and carbon sequestration at an average of USD 18,528 per hectare per year (World Bank, 2019).

Jamaica's protected areas and forest estates are governed by a comprehensive legal and institutional framework led by the Natural Resources Conservation Authority (NRCA) Act which provides the overarching basis for the management of protected areas across terrestrial and marine environments, supported by the Forest Regulations (2001) and the National Forest Management and Conservation Plan, which mandate sustainable forest management, biodiversity conservation and watershed protection. The Forestry Department manages approximately 121,824 hectares of forest estates, representing about 23 percent of national forest cover, with a concentration of closed broadleaf forests in ecologically significant areas such as the Blue and John Crow Mountains, Cockpit Country, and Litchfield Matheson's Run.

Complementary legislation administered by the NEPA, including the Natural Resources Conservation Authority Act, Wildlife Protection Act, and Watershed Protection Act, operates within the overarching framework of the NCRA Act, which serves as the primary legislation that supports the designation and management of national parks, forest reserves, protected watersheds, and coastal ecosystems. Collectively, these protected areas play a critical role in conserving biodiversity, regulating hydrological systems, and enhancing Jamaica's resilience to climate-related hazards.

Tables XV 2 and XV 3 show total and degraded hectares, inside protected and unprotected areas, by type of land cover and ecosystem, as well as by parish. These areas were obtained using the updated land use and vegetation cover dataset (2023) and post-disaster NDVI evaluation, provided by NEPA. The NDVI analysis was used to determine which hectares exhibited signs of degradation immediately after the disaster. This approach allows for the estimation of damage and losses specifically associated with degraded areas affected by the floods, landslides, and winds caused by the hurricane. The land use and vegetation cover dataset specifies the ecosystem affected, enabling the application of ecosystem-specific recovery costs and ecosystem service values in the assessment. Pre-disaster NDVI data were not made available, which means that the pre-event condition and quality of vegetation could not be taken into consideration for the estimations. As a result, damage and losses were estimated based on impact intensities and on full ecosystem recovery costs, rather than on the restoration of the exact pre-disaster condition. This approach allows for a consistent estimation of damage and losses in the absence of baseline vegetation quality information, while acknowledging inherent limitations.

**Table XV 2:** Total land cover and post disaster degraded area inside and outside protected areas by type of ecosystem, in hectares

| | Total | Degraded | % |
|---|---|---|---|
| ***Protected*** | **177,080.42** | **20,048.68** | **11** |
| *Bamboo and Fields* | 3,786.26 | 320.43 | 8 |
| *Fields and Secondary Forest* | 15,598.40 | 2,624.09 | 17 |
| *Herbaceous Wetland* | 9,687.97 | 774.85 | 8 |
| *Mangrove Forest* | 8,358.09 | 871.14 | 10 |
| *Open dry forest - Short* | 1,030.61 | 24.93 | 2 |
| *Open dry forest - Tall (Woodland/Savanna)* | 26,066.52 | 484.20 | 2 |
| *Primary Forest* | 71,311.14 | 8,028.51 | 11 |
| *Secondary Forest* | 39,960.01 | 6,839.49 | 17 |
| *Swamp Forest* | 154.48 | 14.87 | 10 |
| *Water Body* | 1,126.95 | 66.17 | 6 |
| | | | |
| ***Unprotected*** | **610,606.353** | **99,525.47** | **16** |
| *Bamboo and Fields* | 49,405.54 | 2,982.98 | 6 |
| *Fields and Secondary Forest* | 181,664.00 | 28,769.32 | 16 |
| *Herbaceous Wetland* | 2,686.77 | 395.07 | 15 |
| *Mangrove Forest* | 6,297.62 | 2,122.69 | 34 |
| *Open dry forest - Short* | 2,839.57 | 1,832.08 | 65 |
| *Open dry forest - Tall (Woodland/Savanna)* | 15,861.66 | 2,197.17 | 14 |
| *Primary Forest* | 17,881.08 | 755.88 | 4 |
| *Secondary Forest* | 330,346.77 | 60,158.06 | 18 |
| *Swamp Forest* | 16.36 | 1.57 | 10 |
| *Water Body* | 3,606.98 | 310.65 | 9 |
| | | | |
| ***Total*** | **787,686.77** | **119,574.15** | **15** |

*Source: DaLA team using data from NEPA satellite imagery and NDVI assessment, 2025.*

**Table XV 3:** Total land cover and post-disaster degraded area inside and outside of protected areas per parish, in hectares

| | Protected | Unprotected | Total | Degraded | % |
|---|---|---|---|---|---|
| *Clarendon* | 24,111 | 59,574 | 83,685 | 7,354 | 9 |
| *Hanover* | 6,349 | 24,377 | 30,726 | 8,510 | 28 |
| *Kingston* | | 298 | 298 | N/A | - |
| *Manchester* | 2,842 | 55,468 | 58,310 | 7,754 | 13 |
| *Portland* | 24,799 | 49,294 | 74,094 | N/A | - |

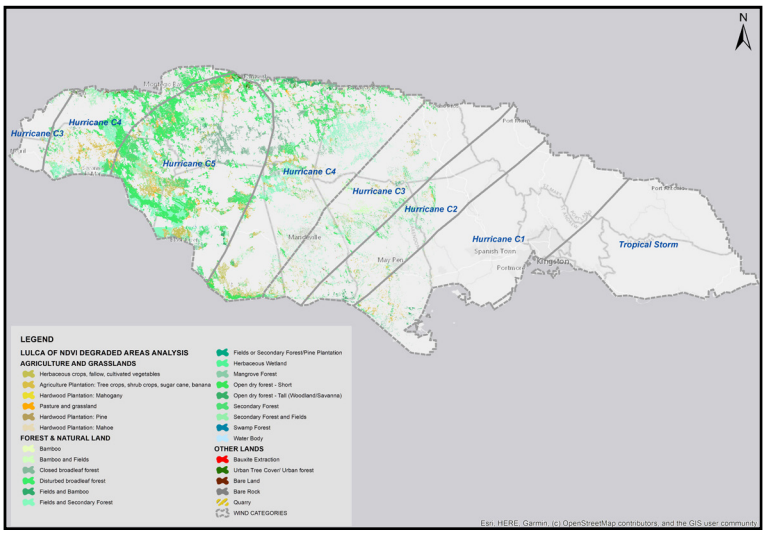
**Table XV 3:** Total land cover and post-disaster degraded area inside and outside of protected areas per parish, in hectares *(continuation)*

| | Protected | Unprotected | Total | Degraded | % |
|---|---|---|---|---|---|
| *St. Andrew* | 2,484 | 25,956 | 28,440 | N/A | - |
| *St. Ann* | 5,717 | 88,874 | 94,591 | 11,073 | 12 |
| *St. Catherine* | 14,486 | 69,264 | 83,751 | 1,093 | 1 |
| *St. Elizabeth* | 20,156 | 52,584 | 72,739 | 21,248 | 29 |
| *St. James* | 14,314 | 28,926 | 43,240 | 20,001 | 46 |
| *St. Mary* | 378 | 39,889 | 40,267 | N/A | - |
| *St. Thomas* | 10,678 | 46,999 | 57,678 | N/A | - |
| *Trelawny* | 41,430 | 29,119 | 70,549 | 18,298 | 26 |
| *Westmoreland* | 9,336 | 39,983 | 49,320 | 24,242 | 49 |
| ***Total*** | **177,080** | **610,606** | **787,687** | **119,574** | **15** |

*Source: DaLA team using data from NEPA satellite imagery and NDVI assessment, 2025.*

Map XV 1 illustrates the main spatial datasets used to estimate damage and losses in the environmental sector. The analysis is based on the Land Use of Jamaica 2023 dataset, complemented by an NDVI-based analysis to identify degraded areas following Hurricane Melissa: no pre-disaster NDVI images were available to assess the previous condition of ecosystems. Administrative boundaries at the parish level were obtained from the PIOJ, while information on protected areas was provided by the NEPA. Hazard layers include flooded areas and landslide occurrences derived from Copernicus emergency mapping products. Wind exposure was characterized using a map of wind intensity zones classified by hurricane category, based on a wind model generated by the Inter-American Development Bank (IDB) team, used for reference purposes. Further details on the methodology applied for the estimation of damage, losses, and additional costs are presented in the corresponding sections of this chapter.

**Map XV 1:** Land use and vegetation cover, Jamaica, 2025




*Source: DaLA team, Copernicus, NEPA satellite imagery and NDVI assessment, 2025.*

## A. Damages

Damage to natural assets in the environmental sector is defined as the partial or total destruction or degradation of ecosystems and their physical components as a direct result of the disaster. Damage is estimated by comparing pre-disaster baseline conditions with post-disaster information through a spatial analysis of land cover degradation. The assessment combines georeferenced and satellite data on vegetation cover and protected areas with post-disaster information on wind exposure, flooding, and landslides.

Tables XV 2 and XV 3 present the distribution of degraded land cover areas inside and outside protected areas, based on the post-disaster NDVI analysis. [47] The results show that the largest share of degraded hectares is located outside protected areas. This pattern is expected, as unprotected areas represent the majority of the country's land surface and were therefore more likely to be affected by a hurricane that traversed a large portion of the national territory (see Map XV 1). The greater spatial extent of unprotected areas increases their probability of exposure to extreme weather events, which is reflected in the higher absolute area of degradation observed outside protected areas.

Nevertheless, the results also highlight that protected areas, particularly those that were in good conservation status prior to the hurricane, likely exhibited higher levels of ecological resilience. While degradation is observed within protected areas, the relative share of affected hectares remains lower in comparison to unprotected areas. It is important to note, however, that ecosystem resilience is not determined solely by protection status, but is also influenced by factors such as topography, vegetation type, ecosystem structure, and exposure to hazards. As such, variations in degradation across both protected and unprotected areas reflect the combined effects of land cover characteristics, conservation status, and physical exposure to Hurricane Melissa.

For each affected ecosystem type, the extent of impacted area in hectares is identified and multiplied by an estimated intensity of damage and by the corresponding unit cost of ecosystem recovery as presented in Table XV 4 for a duration of 14 months.

**Table XV 4:** Ecosystem recovery costs and ecosystem service valuation by land cover type

| | Recovery thousands of JMD/ ha/ year | Valuation thousands of JMD/ ha/ year |
|---|---|---|
| *Bamboo and Fields* | 129.53 | 18,783.15 |
| *Fields and Secondary Forest* | 617.27 | 26,845.12 |
| *Herbaceous Wetland* | 58,005.66 | 50,003.17 |
| *Mangrove Forest* | 115,981.78 | 76,493.61 |
| *Open dry forest - Short (Shrubland/Bushland)* | 29.54 | 23,512.72 |
| *Open dry forest - Tall (Woodland/Savanna)* | 29.54 | 13,005.30 |
| *Closed broadleaved forest (Primary Forest)* | 1,721.43 | 43,110.75 |

[47] The Forestry Department did infield assessments of over 250 sites across the island, they can be used as georeferenced evidence of damage levels to qualitatively contrast the spatial patterns of degradation detected through NDVI and are therefore useful to support the identification of post-hurricane degraded areas and to guide the ecological prioritization of restoration or reforestation zones. However, in the absence of a direct quantitative correspondence between the damage classes observed in the field and the NDVI reduction values (for example, through statistical analysis or a confusion matrix), these records do not constitute a formal validation of the NDVI analysis but rather provide qualitative support demonstrating spatial coherence between field observations and the satellite signal.

**Table XV 4:** Ecosystem recovery costs and ecosystem service valuation by land cover type *(continuation)*

| | Recovery thousands of JMD/ ha/ year | Valuation thousands of JMD/ ha/ year |
|---|---|---|
| *Disturbed broadleaved forest (Secondary Forest)* | 1,205.00 | 30,177.53 |
| *Swamp Forest* | 115,981.78 | 210,328.71 |
| *Water Body* | 186.82 | 34,945.59 |

*Source: DaLA team, 2025 based on de Groot et al (2012) and World Bank (2019).*

Table XV 4 presents the unit values used in the assessment for ecosystem recovery costs and ecosystem service valuation by land cover type, expressed per hectare per year. Recovery costs vary substantially across ecosystems, reflecting differences in ecological complexity, restoration requirements, and intervention intensity. Forest ecosystems, particularly closed and disturbed broadleaved forests, show moderate recovery costs relative to their high ecosystem service values, underscoring their importance in service provision despite comparatively lower restoration expenditures. In contrast, wetlands and coastal ecosystems—such as herbaceous wetlands, swamp forests, and mangroves—exhibit markedly higher recovery costs, reflecting the technical complexity and resource intensity associated with restoring hydrological functions and vegetation structure. Valuation figures further highlight the significant contribution of these ecosystems to regulating and supporting services and are used in the estimation of losses.

Ecosystem recovery costs are used as a proxy for the value of damaged natural assets, given the absence of market prices for most ecosystems. While multiple restoration techniques exist, ranging from natural regeneration to more intensive and costly interventions, this assessment adopts the least-cost recovery approaches, presented in Table XV 4. This choice reflects the prioritization of public resources in post-disaster contexts, where immediate recovery efforts tend to focus on human settlements and critical infrastructure, and where detailed information on ecosystem conditions and site-specific restoration needs is often limited. This approach allows for a conservative and transparent estimation of the damage, while acknowledging that actual restoration costs may vary depending on ecological conditions and management objectives.

The estimation of damage incorporates assumptions regarding the intensity of impact on natural assets, which varies according to the type of hazard. For flood-related impacts, the assessment applies a damage intensity of 1 percent. This assumption is supported by findings from the field mission, which confirmed that significant impacts were largely confined to riverbanks, where erosion, sediment deposition, and localized vegetation damage were observed, for a short period. In contrast, flooded areas beyond the immediate river margins did not exhibit widespread or severe degradation of vegetation or ecosystem structure. Based on these observations, flood impacts on natural assets were assessed as limited and highly localized, justifying the use of a low damage intensity for the estimation of flood-related damage. Floods typically cause partial degradation of vegetation through prolonged waterlogging, reduced soil aeration, sediment deposition, and the accumulation of debris and pollutants, which may lead to partial vegetation mortality but do not generally result in complete removal of plant cover, except in cases of strong currents or associated landslides, which were not available in the data.

For wind-related impacts, the assessment applies differentiated damage intensities according to hurricane category, ranging from 1 to 5 per cent for Category 1 to Category 5 hurricanes, respectively. The adoption of damage intensity is supported by historical evidence from post-disaster assessments and by direct field observations conducted as part of this assessment. Field visits confirmed that wind-related damage to ecosystems varied significantly depending on local topography and exposure to the

coast. In mountainous areas, slopes directly facing the sea exhibited more pronounced defoliation and structural damage, while inland-facing slopes showed considerably lower levels of impact. These spatial dynamics result in heterogeneous damage patterns that are not fully captured by hurricane category alone. In this context, the use of category-based damage intensities is considered appropriate to reflect variations in wind severity, exposure, and topographic conditions, while avoiding overestimation of damage in the absence of detailed, site-specific wind field data. Strong winds primarily affect forest ecosystems through defoliation, canopy thinning, branch breakage, uprooting, and stem snapping, as well as wind-induced desiccation of foliage, all of which reduce forest structure, stability, and ecosystem functioning. These types of damage were observed during the field mission to Jamaica in November 2025, as exemplified by Image XV 1.

**Image XV 1:** Damage of trees in St. Elizabeth



*Source: DaLA team, 2025.*

With respect to landslides, the assessment identified localized impacts occurring exclusively in unprotected areas of the assessed parishes, as observed in Table XV 5. Landslides typically result in the complete removal of vegetation and soil layers on affected slopes, causing full destruction of natural assets and requiring substantially higher recovery efforts.

As presented in Table XV 6, wind-related impacts account for the largest share of total damage, representing almost two-thirds of the total and amounting to more than three times the damage associated with flooding and landslides combined. Flood-related damage is comparatively limited and represents less than 3 per cent of total environmental damage, occurring in both protected and unprotected areas. Landslide-related damage accounts for a very small share of total damage, at less than 1 per cent, and is observed exclusively in unprotected areas. Overall, approximately three-quarters of total environmental damage occurred in unprotected areas, reflecting their larger spatial extent and greater exposure across the national territory.

**Table XV 5:** Damage in natural assets by type of occurrence, in thousands of JMD

| *Occurrence* | Protected | Unprotected | Total |
|---|---|---|---|
| *Floods* | 551,410 | 89,979 | 641,389 |
| *Landslides* | - | 57,620 | 57,620 |
| *Winds* | 6,048,923 | 17,087,552 | 23,136,475 |
| ***Total*** | **6,600,333** | **17,235,151** | **23,835,484** |

*Source: DaLA team, 2025.*

**Table XV 6:** Damage in natural assets by type of occurrence, in thousands of JMD

| | Floods | Landslides | Winds | Total |
|---|---|---|---|---|
| *Black River Protected Area* | 753.92 | | 1,650.38 | 2,404.29 |
| *Cockpit Country Protected Area* | | | 14,694.62 | 14,694.62 |
| *Coral Spring Mountain Spring* | | | 91.90 | 91.90 |
| *Mason River* | | | 3.16 | 3.16 |
| *Montego Bay* | | | 0.06 | 0.06 |
| *Negril Environmental Protection Area* | 28.65 | | 1,751.17 | 1,779.82 |
| *Negril Marine Park* | | | 0.03 | 0.03 |
| *Portland Bight* | | | 1,074.79 | 1,074.79 |
| *Unprotected* | 306.91 | 44.03 | 99,174.53 | 99,525.47 |
| ***Total*** | **1,089.48** | **44.03** | **118,440.64** | **119,574.15** |

*Source: DaLA team, 2025.*

Total damage to natural assets is estimated at JMD 24 billion. Damage per parish can be seen in Table XV 7. St. Elizabeth and Westmoreland were the most affected parishes, accounting for more than two-thirds of the total damage, with JMD 16 billion. In both parishes, wind-related impacts dominated, representing more than 90 per cent of total damage, while flooding and landslides contributed marginally. Other parishes experienced damage almost exclusively associated with wind impacts, including Trelawny (JMD 3.5 billion) and St. James (JMD 1.8 billion). Flood-related damage is limited and localized, occurring mainly in St. Elizabeth and, to a lesser extent, Westmoreland, while landslide-related damage was minimal and restricted to a few parishes. Overall, wind impacts accounted for the vast majority of environmental damage across all assessed parishes.

**Table XV 7:** Damage in natural assets by parish, in thousands of JMD

| *Parish* | Floods | Landslides | Winds | Total |
|---|---|---|---|---|
| *Clarendon* | | | 479,221 | 479,221 |
| *Hanover* | 164 | | 715,486 | 715,650 |
| *Manchester* | | | 315,488 | 315,488 |
| *St. Ann* | | | 780,998 | 780,998 |
| *St. Catherine* | | | 22,150 | 22,150 |
| *St. Elizabeth* | 590,831 | 1,191 | 7,715,670 | 8,307,692 |
| *St. James* | 182 | 56,429 | 1,715,558 | 1,772,169 |
| *Trelawny* | 17 | | 3,519,782 | 3,519,799 |
| *Westmoreland* | 50,194 | | 7,872,122 | 7,922,316 |
| ***Total*** | **641,389** | **57,620** | **23,136,475** | **23,835,484** |

*Source: DaLA team, 2025.*

In addition to damage to natural assets, the environmental sector may also suffer damage to physical assets associated with ecosystem management and conservation. These include access roads within protected areas, monitoring and research facilities, ranger stations, visitor infrastructure, signage, and other built structures located in forest estates, protected areas, and coastal ecosystems. Such damage

is typically estimated by identifying affected structures through field verification or satellite imagery, assessing the extent and severity of physical impacts, and applying appropriate unit reconstruction or replacement costs. In this regard, the only information received by the DaLA team is commented on below.

The Forestry Department has identified damage to nursery facilities and related infrastructure, notably at Williamsfield, where impacts to a bathroom facility, gazebo, nursery building, and fencing are estimated at JMD 38 million. Additionally, it has identified damage estimated at JMD 3.2 million across Williamsfield, Mount Airy, HO, and Moneague related to seedlings at nursery sites, reflecting damage to planting material intended for reforestation and restoration efforts. Total physical asset damage was estimated at JMD 41.2 million.

## B. Losses

Losses in the environmental sector refer primarily to the temporary reduction or interruption of ecosystem services resulting from the degradation or destruction of natural assets caused by the disaster, ECLAC (2014). Ecosystem services represent the benefits that ecosystems provide to society and are grouped into provisioning, regulating, supporting, and cultural services, including food and raw materials, climate and water regulation, soil formation, biodiversity support, and recreational values. These services play a fundamental role in sustaining livelihoods, reducing the risk of disaster, and supporting economic activity. Since some ecosystem services are linked to productive activities like tourism and fisheries, the ecosystem values used in this chapter exclude provisioning services linked to fisheries and cultural services linked to tourism. Tourism and fisheries are assessed in the productive sector. When ecosystems are damaged, their capacity to deliver these services is partially or fully reduced over a given period of time, generating economic losses that, while often non-market in nature, have tangible impacts on human well-being and resilience.

Losses in ecosystem services were estimated by multiplying the area of the affected ecosystems, a timeframe of 14 months of service disruption, and the intensity of impact[48], with reference values for ecosystem service provision derived from Jamaican and international literature (see Table XV 8).

**Table XV 8:** Losses in ecosystem services by type of occurrence, in thousands of JMD

| *Occurrence* | Protected | Unprotected | Total |
|---|---|---|---|
| *Floods* | 477,868 | 138,675 | 616,542 |
| *Landslides* | - | 1,570,355 | 1,570,355 |
| *Winds* | 36,624,374 | 146,443,691 | 183,068,066 |
| ***Total*** | **37,102,242** | **148,152,720** | **185,254,962** |

*Source: DaLA team, 2025.*

Table XV 8 shows that losses related to natural assets are overwhelmingly driven by wind-related impacts, which account for approximately 99 per cent of total losses (JMD 183.1 billion). Flood-related losses are comparatively minor, representing less than 1 per cent of total losses, while landslide-related losses account for just under 1 per cent and occurred exclusively in unprotected areas.

[48] The estimate is carried out under the assumption that no ecosystem services are recovered during the 14-month period —up to the end of 2026—which represents the maximum horizon defined in this report for the estimation of losses. This places the analysis in a maximum-loss scenario. In other words, the methodology assumes that ecosystem services do not resume until the ecosystem has fully recovered. Partial or gradual recovery of services prior to full ecological restoration is not considered in the estimate.

**Table XV 9:** Losses in natural assets by parish, in thousands of JMD

| *Parish* | Floods | Landslides | Winds | Total |
|---|---|---|---|---|
| *Clarendon* | | | 5,352,471 | 5,352,471 |
| *Hanover* | 5,239 | | 12,096,022 | 12,101,261 |
| *Manchester* | | | 9,096,957 | 9,096,957 |
| *St. Ann* | | | 14,526,270 | 14,526,270 |
| *St. Catherine* | | | 719,450 | 719,450 |
| *St. Elizabeth* | 525,874 | 30,786 | 35,102,575 | 35,659,235 |
| *St. James* | 4,644 | 1,539,569 | 33,782,860 | 35,327,073 |
| *Trelawny* | 434 | | 32,168,745 | 32,169,179 |
| *Westmoreland* | 80,351 | | 40,222,717 | 40,303,068 |
| ***Total*** | **616,542** | **1,570,355** | **183,068,066** | **185,254,962** |

*Source: DaLA team, 2025.*

Table XV 9 indicates that losses are unevenly distributed across parishes, with Westmoreland and St. Elizabeth together accounting for more than 40 per cent of total losses. St. James and Trelawny also experienced substantial losses, placing them among the most affected parishes. In most cases, losses were driven almost entirely by wind-related impacts, while flood- and landslide-related losses remained localized and relatively small.

In addition to losses associated with ecosystem services, the environmental sector may experience losses in monetary flows resulting from the temporary disruption of activities and services linked to environmental management and use. These include reductions in visitation to protected areas and natural attractions, interruptions in concession or user-fee revenues, as well as losses associated with the time and dedication of public officials. In post-disaster contexts, staff from environmental agencies are often reassigned from regular functions—such as licensing, monitoring, conservation planning, and enforcement—to emergency response, damage assessment, and recovery coordination, generating opportunity costs due to the suspension or delay of routine services. The estimation of these losses would require information on pre and post-disaster visitation levels, entrance fees, concession revenues, and duration of access restrictions, as well as data on staffing levels, working hours, salary structures, and the period during which regular institutional functions were disrupted.

Based on the information collected to date, the Forestry Department reported revenue losses amount to JMD 1.81 million, associated with guided hikes, forest trekking activities, and the rental of training facilities, reflecting the suspension or cancellation of activities following Hurricane Melissa. These losses reflect foregone income during the disruption period and represent a partial estimate, as comprehensive data on all affected revenue streams were not available at the time of this assessment.

## C. Additional Costs

Additional costs in the environmental sector refer to the expenditures required to restore the provision of environmental public services and to support recovery efforts that arise as a direct consequence of the disaster, but that are not captured as damage or losses. These may include costs related to the cleanup and removal of debris in protected areas and coastal ecosystems, temporary waste management and disposal, emergency stabilization measures to prevent further environmental degradation, and operational expenses associated with post-disaster environmental monitoring and coordination. Additional costs may also arise from the establishment of temporary facilities or logistical arrangements

needed to support environmental response activities. In post-disaster contexts, additional costs are often incurred gradually and managed through multiple institutions and emergency budgets, making them difficult to identify and quantify during the early stages of recovery.

At the time of this assessment, information on additional costs in the environmental sector was limited, and only a number of post-disaster expenditures had been identified. These include costs to clear the access to roads and trails at Johnson Mountain in St. Thomas and in Bogue, with total expenditures estimated at JMD 74 thousand according to NEPA, as presented in Table XV 1. These figures should be interpreted as preliminary, as additional costs may be incurred and identified as recovery activities progress.

# Macroeconomic **Impacts**



# 16 MACROECONOMIC IMPACTS

# Chapter XVI - Macroeconomic Impacts

Jamaica is a relatively highly developed Caribbean country, with a Human Development Index score of 0.720 in 2023, which is categorized as a country with high human development. This score is below the world average of 0.756 and the Latin America and the Caribbean average of 0.783, and places it 117 in the world. With a GDP per capita income of USD 7,018 in 2024, it is classified as an upper middle-income country by the World Bank.

Like many Small Island Developing States, Jamaica is vulnerable to environmental threats, as evidenced by its experience of two hurricanes in consecutive years. In response to this vulnerability, Jamaica implemented a substantial disaster risk financing strategy over the last few years. The strategy included the government's own Contingency Fund and National Natural Disaster Reserve Fund; parametric insurance from the Caribbean Catastrophe Risk Insurance Facility (CCRIF); a Catastrophe Bond from the World Bank; The IDB's Contingent Credit Facility and the World Bank Group's Catastrophe Deferred Drawdown Option (Cat DDO) (World Bank, 2025). This robust strategy should help mitigate the impact of the disaster response on the government's finances.

Prior to the passage of Hurricane Melissa, the Jamaican economy was projected to grow by 2.2 percent in fiscal year 2025/26 and 1.0 percent in 2026/27 (Government of Jamaica 2025). Post-disaster, the economy of Jamaica is expected to contract by 1.4 percent in fiscal year 2025/26 and 1.0 percent in fiscal year 2026/27. This implies that the estimated impact of Hurricane Melissa is a reduction of 3.6 percentage points and 0.0 percentage point in real GDP growth in fiscal years 2025/26 and 2026/27, respectively.

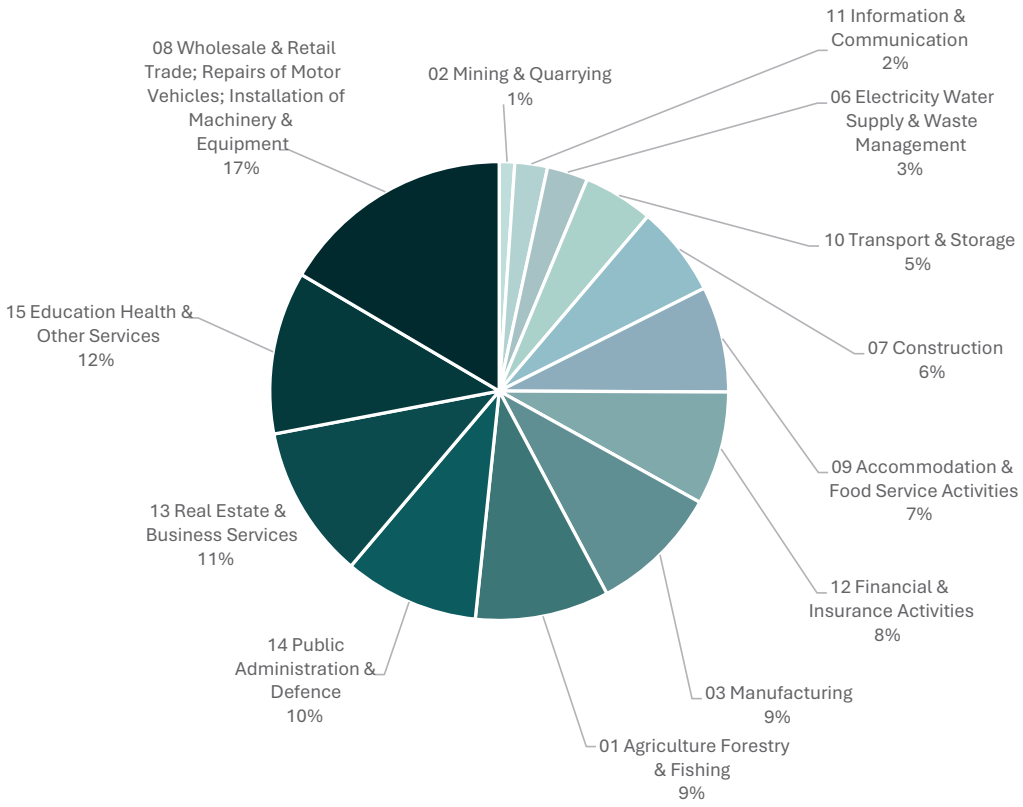
The estimates in this section are based on data from the Statistical institute of Jamaica, the Jamaica Ministry of Finance, the International Monetary Fund and the Bank of Jamaica. The DaLA team had meetings with the Ministry of Finance, STATIN, The Bank of Jamaica, and Tax Administration Jamaica.

## A. Evolution of the economy before Hurricane Melissa

**Macroeconomic review**

Jamaica is a largely service-based economy, with its largest sector, Wholesale & Retail Trade; Repair of Motor Vehicles; Installation of Machinery & Equipment contributing 17 percent to total value added. The next two largest sectors are Real Estate and Business Services (12%) and Education Health and Other Services (11%). The Accommodation and Food Service Activities sector (which is often used as a proxy for tourism) accounted for 7 percent of nominal value added in 2024. According to a tourism satellite account produced by STATIN, the tourism sector contributed 6.9 percent to total GDP on average between 2007 and 2012. With respect to the primary sector, Agriculture, Forestry and Fishing is significant, contributing 8 percent to value added, while Mining and Quarrying contributes just 1 percent. The share of value added by sector is depicted in the figure below.

**Figure XVI1:** Distribution of Jamaica's economic sectors in 2024, in percent of total value added




*Source: DaLA team, based on data from STATIN, 2025.*

Jamaica has a long history of stagnant growth and high debt. Annual GDP growth averaged 1.4 percent between 1980 and 2019 (IMF 2025), and the country has not been able to sustain any economic recovery momentum. In 2020, in the first year of the COVID-19 pandemic, Jamaica's real GDP contracted by 8.3 percent, but rebounded by 5.7 percent and 6.4 percent in 2021 and 2022. However, growth slowed to pre-COVID levels in 2023 with 2.7 percent. In 2024, Jamaica was impacted by both Hurricane Beryl and Tropical Storm Raphael and the economy contracted by 0.5 percent in real terms.

In 2025, before the passage of Hurricane Melissa, Jamaica was rebounding from the impact of the two storms in 2024. Following the contraction of the previous year, economic growth in the first two quarters of 2025 was estimated at between 0.0 percent and 1.0 percent in the first (Bank of Jamaica, 2025b) and 0.1 percent to 2.0 percent in the second (Bank of Jamaica, 2025a). In the first quarter, Agriculture, Forestry and Fishing, Transport & Storage and Information & Communication were the main contributors to the expansion. Favourable weather conditions boosted crop production, while increased telephone and subscriber television services contributed to growth in Transport & Storage. The increase in crop production continued in the second quarter of the year and contributed to GDP growth, along with Accommodation and Food Service Activities; Transport and Storage; and Manufacturing. The increase in activity in the hospitality and transport sectors was connected to an increase in tourism activity. Both the number of tourist arrivals and the average length of stay increased in this quarter. Manufacturing grew due to increased production of food, beverages, and tobacco, along with refined petroleum products. For fiscal year 2025/26, the Bank of Jamaica projected growth between 1.0 and 3.0 percent. Annual GDP growth of 2.1 percent was projected for 2025 by the IMF (2025).

Year-on-year inflation declined over the first three quarters of 2025, falling from 5.0 percent in December 2024 to 1.2 percent in August before rising slightly to 2.9 percent in October. This decline represented a continuation of the downward trend from a recent peak of 11.8 percent in April 2022, resulting from moderating imported inflation. After the passage of Hurricane Beryl affected the supply of local

produce, one of the main drivers of inflation was Food and Non-alcoholic beverages, which increased to 8.1 percent in December 2024. The increase in food prices, however, moderated in 2025. A reduction in the General Consumption Tax on residential electricity rates also contributed to the fall in inflation in 2025. In August 2025, the Bank of Jamaica projected average headline inflation of 4.7 percent over the next eight quarters, primarily based on lower international energy prices.

With respect to the external sector, the current account balance was estimated at 0.7 percent of GDP in Q1 2025, down slightly from a surplus of 1.2 percent in Q1 of the previous year. This decline resulted from the fall in tourist arrivals, which in turn caused a drop in the services balance. In Q2 of 2025, the current account surplus fell further to 0.3 percent of GDP. This reflected a widening of the merchandise trade deficit, mainly due to a fall in exports as well as a fall in the services balance on account of increased transportation outflows resulting from higher freight costs. The fall in the current account surplus was cushioned by an increase in the transfers surplus resulting from higher remittance inflows. According to the Bank of Jamaica, the current account surplus for fiscal 2025/26 and fiscal 2026/27 was projected to fall within the range of 0.5 percent to 1.5 percent of GDP.

The Bank of Jamaica operates an inflation targeting monetary policy. In June 2025, the Bank reduced its signal rate by 25 basis points to 5.75 percent. This followed a reduction in the interest rate corridor by 100 bps and the removal of the minimum interest rate for eligibility in its 14-day repo auctions in March. The Bank reports these moves as meant to prevent the exchange rate from affecting inflation. In the foreign exchange market, between January and June 2025, the Bank of Jamaica sold USD 564 million and purchased USD 527.5 million from the market.

**Fiscal Performance**

While Jamaica was impacted by two storms in 2024, their fallout on the fiscal accounts was relatively minor. Therefore, the shortfall in revenue and the higher than projected expenditure were contained, leading to marginal declines in the primary and overall surpluses to 5.4 percent of GDP and 0.2 percent of GDP in fiscal 2024/25 (Government of Jamaica, 2025). Moreover, in a favourable development, Jamaica was able to execute 94.5 percent of its capital expenditure programme.

During the first half of fiscal 2025/26, Jamaica posted a strong fiscal performance. The overall fiscal deficit stood at JMD 15.5 billion, almost 61 percent below the budgeted target. Meanwhile, the primary surplus was JMD 71.3 billion, over 36 percent above the target. Fiscal developments were influenced by strong growth in revenues (JMD 3.8 billion above the level in the First Supplementary Budget), as well as a decline in expenditure of 3.5 percent (JMD 20,200 million).

For decades, Jamaica grappled with one of the highest debt-to-GDP ratios globally, exceeding 140 percent in the early 2010s, which severely constrained public investment and economic growth. In response, the Government adopted a comprehensive fiscal responsibility framework, including the Fiscal Responsibility Laws and strict fiscal rules aimed at achieving sustainable debt reduction. These reforms mandated primary surpluses, expenditure controls, and transparent reporting, supported by IMF-backed programs and domestic consensus through social partnership agreements. Over time, Jamaica implemented structural reforms, improved tax administration, and strengthened public financial management, enabling a steady and sustained decline in the debt ratio, with a target of 60 percent of GDP.

The public debt ratio improved to 62.4 percent of GDP at the end of March 2025, supported by robust debt management as well as an increase in the level of GDP due to STATIN's rebasing exercise. Public debt stock at end-September was JMD 2,191.1 billion (or 62.6% of the previous fiscal year's GDP), reflecting

a modest 0.3 percent increase over March but still JMD 58.8 billion lower year-on-year, underscoring continued progress in debt restructuring toward a more domestic profile.

## B. Impact on the Macroeconomic

**Impact on GDP**

According to the government's Interim Fiscal Policy Paper FY 2025/26, the Jamaican economy was projected to record real GDP growth of 2.2 per cent for fiscal year 2025/26 and 1.0 per cent for fiscal year 2026/27, before the passage of Hurricane Melissa. Post-disaster, it is estimated that the economy will contract, with real GDP declining by 4.3 per cent for fiscal year 2025/26 and growing by 0.7 per cent for fiscal year 2026/27. This implies that the estimated impact of Hurricane Melissa is a reduction of 6.5 percentage points and 0.3 percentage points in real GDP growth for fiscal years 2025/26 and 2026/27, respectively.

In Box 1 below, the impact on GDP growth based on the DaLA team's estimation of damage and losses is presented. This exercise is what is known as a bottom-up projection, as it is built from sectoral information to arrive at the overall projection. As is well known, projections based on different methodologies may yield different results. It is worth highlighting that both projections point in the same direction and indicate that Hurricane Melissa had a significant impact on GDP growth in Jamaica. It is important to note that this report's estimates differ for several reasons. First, as in any macroeconomic projection that ECLAC publishes twice a year, they are based on the calendar year, while the government reports by fiscal year. Since the hurricane occurred at the end of October, the calendar year impact appears smaller, since the first ten months of economic activity in 2025 were unaffected. Additionally, ECLAC's estimates exclude any adjustments for Taxes less subsidies in the national accounts; incorporating this item would increase the impact on GDP growth. Finally, for 2026, a rise in construction activity linked with reconstruction is anticipated but is not reflected in ECLAC's calculations.

**Box XVI1:** Impact on national accounts and factors of production payments

### Impact on national accounts

This section outlines the process to estimate the impact of the hurricane on the wider economy based on the sectoral estimates of losses and additional costs.

As a first step, a pre-disaster baseline line for 2025 and 2026 GDP was estimated in current and constant (2015) prices. GDP in constant prices was estimated for calendar years 2025 and 2026 using growth rates of 2.1 percent and 1.5 percent respectively from the IMF's most recent World Economic Outlook. The value added in each sector was estimated by applying the average sectoral distributions for the prior three years.

The GDP deflators were calculated using GDP in current and constant prices in previous years. The GDP deflators for 2025 and 2026 were estimated using the Bank of Jamaica's inflation projections of 4.7 percent. The value added by sector and GDP in current prices for 2025 and 2026 were then estimated using the estimated real GDP and GDP deflators.

The second step involved calculating the coefficients of value added and intermediate consumption using the Input-Output tables and Supply and Use tables for each economic activity49. The losses and additional costs, which represent disruptions in economic flows, are estimated by the DaLA team

in gross output terms. With the calculated coefficients the losses in each sector were converted to value added and the additional costs were converted to intermediate consumption. The relationship is displayed in the equations below.

$$Value\ added = Gross\ output - Intermediate\ consumption \quad (1.1)$$

$$Post\ disaster\ value\ added = (Gross\ output - adjusted\ losses) - (Intermediate\ consumption + adjusted\ additional\ costs) \quad (1.2)$$

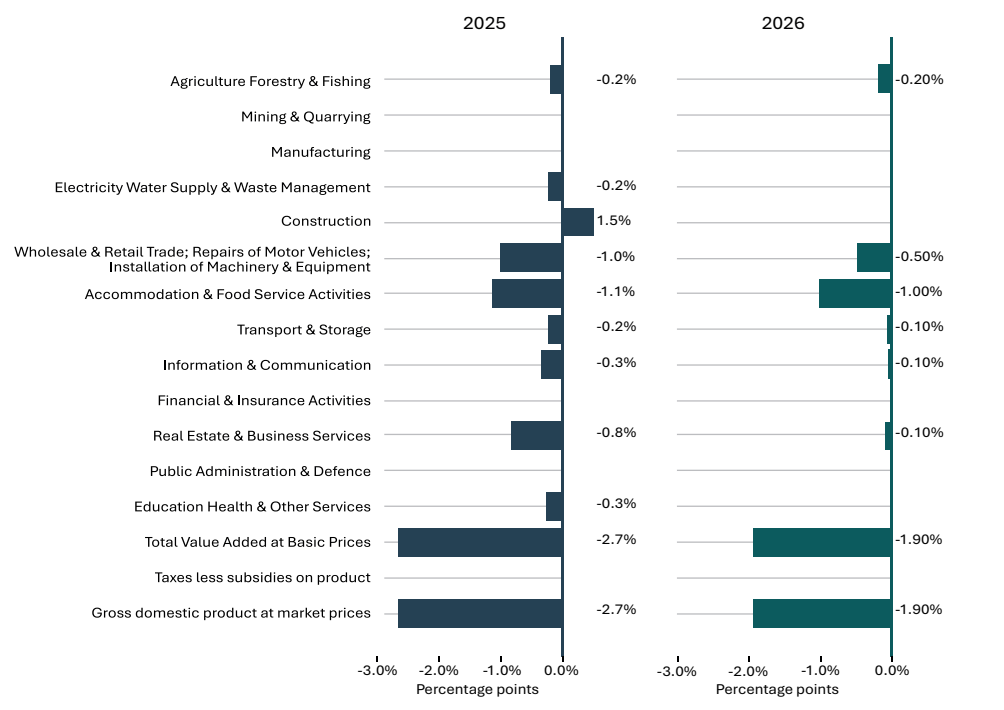
The response to an event like this will naturally involve increased production in some sectors. For example, the clean-up effort at a damaged hotel would be counted as an additional cost (and therefore intermediate consumption) for that sector, but as increased output for another. For this report, it was assumed that all additional costs were incurred in the construction sector. All additional costs across sectors were then summed, and the value-added coefficient for construction was applied to estimate the increased value added in this sector. The post-disaster value added for each sector was then converted to 2015 prices using the estimated GDP deflators.

Finally, the losses (adjusted to value added) and additional costs (adjusted to intermediate costs) were subtracted from the estimated 2025 real value added in each corresponding sector. The new values were summed to calculate the post-disaster GDP estimate.

According to the DaLA estimates, post-disaster annual GDP growth in 2025 was calculated at -0.6 percent. This implies that the impact of Hurricane Melissa was 2.7 percentage points of GDP growth in 2025. For 2026, growth of -0.4 percent is estimated, which corresponds to an impact of 1.9 percentage points.

The figure below depicts the impact on total value added and GDP, disaggregated by sector. Tourism was the sector with the largest impact on GDP growth across both years. This sector also posted the highest losses in value added at 38.2 billion JMD in 2025 and 50.2 billion JMD in 2026.

**Figure XVI2:** Impact on GDP by economic sector in 2025 and 2026, in percentage points



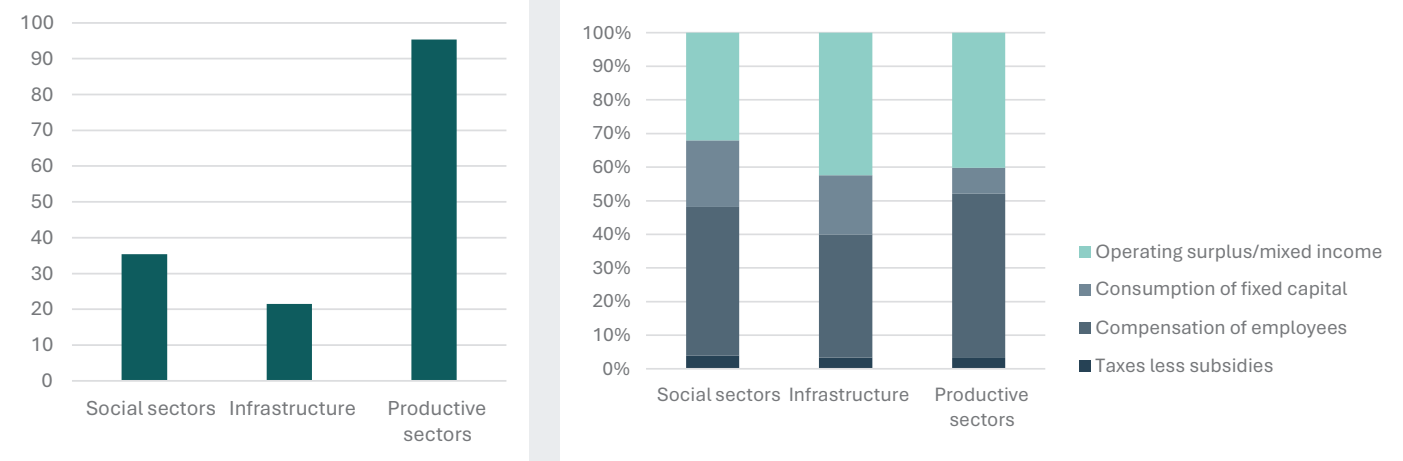

*Source: DaLA team, based on data from STATIN, 2025. Impact on the factors of production payments*

In order to estimate the impact on factors of production, the income approach to measuring GDP is applied. The income approach to measuring GDP sums all the incomes resulting from the production of goods and services in the economy, as depicted in the equation below:

$$Value\ added = Taxes\ less\ subsidies + Compensation\ of\ employees + consumption\ of\ fixed\ capital + operating\ surplus\ and\ mixed\ income \quad (2.1)$$

Based on the exercise done by the DaLA team, and using the ratios of the factors of income to value added, the impact on each factor in 2025 was estimated. It is estimated that Taxes less subsidies will fall by JMD 5.2 billion, Compensation of employees by JMD 70.1 billion, Consumption of fixed capital by JMD 18.2 billion, and operating surplus and mixed income by JMD 58.8 billion. The largest declines in factor incomes were in the productive sectors, with the largest decreases in all factors of production in the tourism sector. The distribution of the impacts on the factors of production payments is depicted in the figure below.

**Figure XVI3:** Impact on value added and distribution among factors of production payments in 2025, in millions of JMD and percentages




*Source: DaLA team, 2025.*

**Fiscal**

The Government of Jamaica has prioritised the recovery and reconstruction, with an emphasis on social assistance for affected citizens. Nevertheless, the government remains committed to fiscal prudence and debt sustainability in the medium- to longer-term. However, Hurricane Melissa will lead to significant short-term fiscal slippage. The overall fiscal deficit is projected to be 3.5 percent of GDP (Government of Jamaica 2025), compared to the balanced budget which was originally targeted.

The fiscal outturn for fiscal year 2025/26 will be adversely affected by developments on both the revenue and expenditure sides. With the adjustment to reflect the hurricane's fallout, revenue & grants are projected to decline by 2.8 percent relative to the approved budget, to JMD 1,065.7 billion (30.6% of GDP). Tax revenues are projected to contract by JMD 80.5 billion, reflecting reduced tax buoyancy stemming from the fall in GDP and government tax relief measures. In particular, the government has shifted the corporate tax payment deadline from March to April, beginning in 2026. Since this action moves the payment deadline into the upcoming fiscal year, this is likely to have a negative impact on tax revenue in the current fiscal year, 2025/26. In addition, import duty and general consumption tax (GCT) waivers have been granted for relief supplies and donations to facilitate the recovery in affected parishes. The waivers have provided relief to affected citizens on items, including food, water, medical equipment, building materials and the Starlink telecommunications equipment. This concession was extended to December 31, 2025, and later to January 15, 2026.

By contrast, non-tax revenues have increased owing to a USD 150 million payout from the cat bond and USD 91 million from the Caribbean Catastrophe Risk Insurance Facility (CCRIF SPC). Also, the Bauxite Levy and capital revenues remain unchanged.

Meanwhile, total expenditure was projected to expand by 7.6 percent to JMD 1,189.4 billion, compared with the Second Supplementary estimates, up to 34.1 percent of GDP from 31.7 percent of GDP before. Recurrent spending is expected to increase by 8.2 percent to JMD 1,133.9 billion (32.5% of GDP), underpinned by higher expenditure on compensation of employees and debt interest payments. The increased outlay on wages and salaries stemmed in part from the wage settlement with public sector workers earlier in the year and from additional workers hired for cleanup and recovery efforts following the hurricane. Despite the impact of the hurricane, capital expenditure is projected to decline by almost 4.0 percent to JMD 2.2 billion (1.6% of GDP). This stems from reduced expenditure for the first half of the fiscal year before the hurricane and the expectation that significant reconstruction would not be undertaken until the last quarter (January to March) of fiscal 2025/26.

The public debt to GDP ratio is projected to rise from 62.4 percent in fiscal 2024/25 to 68.2 percent at the end of fiscal 2025/26. Growth in the debt will result from borrowing from various sources to finance the recovery and reconstruction. While the government remains committed to fiscal responsibility, the debilitating impact of Hurricane Melissa has prompted a temporary suspension of the fiscal rules until March 31, 2027. This suspension, which was approved by parliament, will allow the government to prioritize recovery, rehabilitation, and reconstruction efforts without breaching legislated fiscal targets, particularly the ceiling of 60% for the debt-to-GDP ratio.

**Balance of Payment Impacts**

Hurricane Melissa is expected to lead to a reversal of the current account position for the full year, as the balance will swing from a surplus of US$678.8 million (2.0% of GDP) to a deficit of US$90.7 million (0.5% of GDP). The trade deficit is projected to expand by 16.0 percent, as exports contract by 10 percent and imports increase by 8.0 percent50. It is expected that a significant portion of imports of building materials and equipment will occur in the first quarter of 2026. Meanwhile, the services surplus is expected to decline by over 29 percent, reflecting a fall in tourism receipts and an increase in payments for transport, telecommunications, construction, and other services associated with the hurricane. The deficit on the primary income account is projected to expand by around 13 percent, lower than the over 31 percent for the half year, as insurance inflows help to offset higher debt interest payments. Secondary income will benefit from substantial aid grants and remittance inflows.

## C. A path to building fiscal resilience in Jamaica after Hurricane Melissa

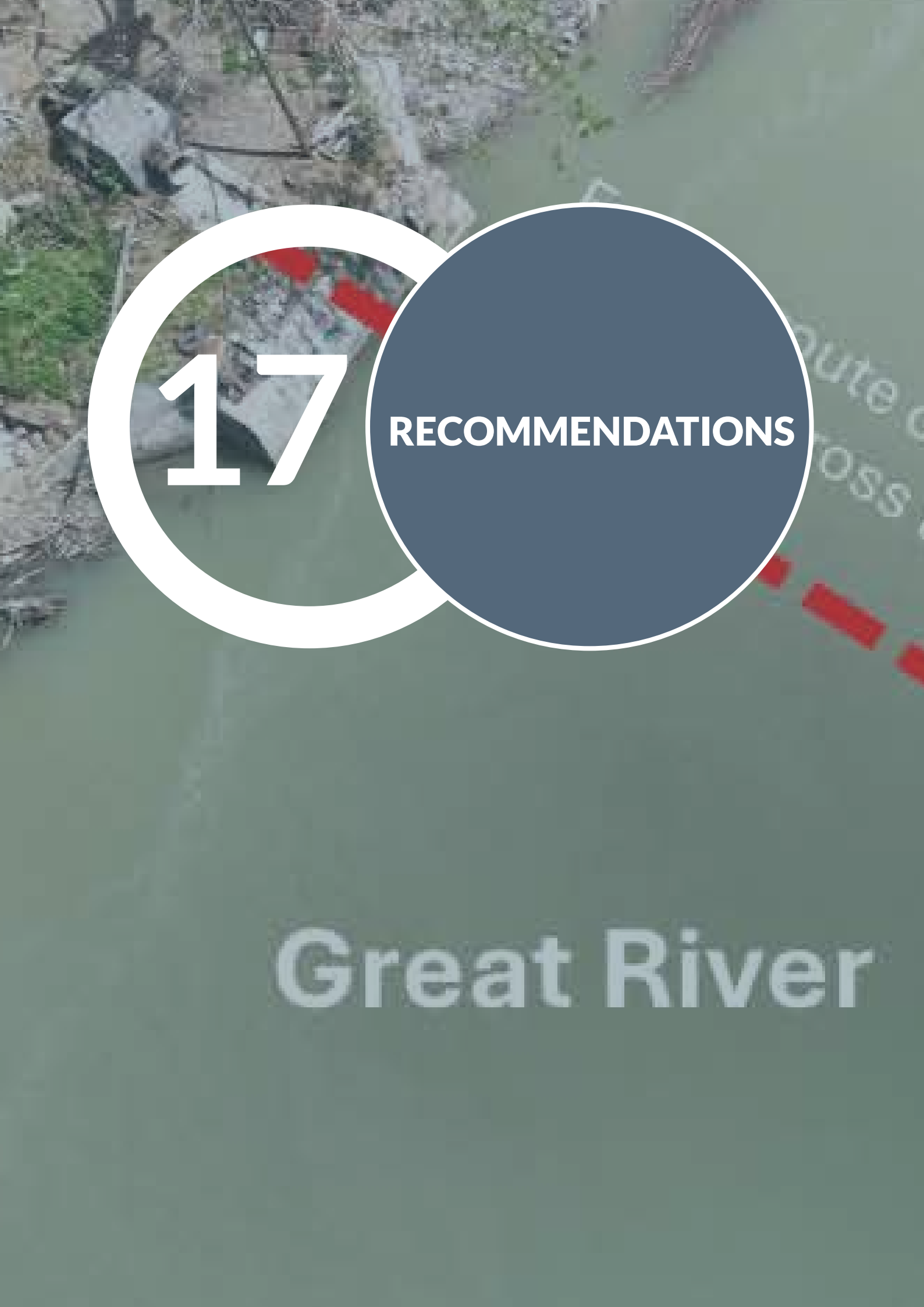
Hurricane Melissa presents Jamaica with both a challenge and an opportunity. On the one hand, the significant fallout from the disaster presents a major shock to the economy. This will cause Jamaica to diverge from its path to debt sustainability and a recovery in growth after many years of stagnant growth. Further, the government will need to switch expenditure away from investment in key developmental activities to address the impact of the disaster.

Nevertheless, the hurricane also provides Jamaica with an opportunity to formulate a strategic, integrated, and comprehensive disaster risk financing and insurance framework to build in resilience against future disasters. Indeed, Jamaica had already taken some proactive measures to reduce risks. Its National Natural Disaster Risk Financing Policy (NNDRFP) focuses on maintaining reserves for high-frequency, but low-severity events, such as floods, and risk transfer mechanisms for low-frequency, but high-severity events, such as major hurricanes and earthquakes. Nevertheless, the government

includes contingency funds and fiscal reserves to deal with minor disasters to facilitate the provision of immediate relief and assistance.

Further, Jamaica needs to maintain and even expand its contingent credit line financing under the Catastrophe Deferred Drawdown Option (Cat DDO) with the World Bank to have adequate financing for moderate to severe disasters. Indeed, the government was able to mobilise around USD 650 million after Melissa from its contingent loans and other instruments. However, alongside these, Jamaica needs to strengthen its established and explore new risk transfer mechanisms. Both sovereign risk insurance and the cat bond have served Jamaica well. Indeed, the island obtained a USD 91.9 million payout from the CCRIF SPC within two weeks of the hurricane. This provided timely financing for relief and recovery. Also, Jamaica's cat bond was triggered for a full payout of USD 150 million. Jamaica should explore increasing its coverage under the CCRIF SPC if possible and maintaining its subscription to the cat bond.

# Recommendations for **Resilient Recovery**


17
RECOMMENDATIONS
Great River

# Chapter XVII - Recommendations for a resilient recovery Jamaica

This chapter presents the main recommendations to guide resilient reconstruction in Jamaica, particularly in the areas affected by Hurricane Melissa. These recommendations were formulated using the Sendai Framework for Disaster Risk Reduction 2015-2030 as a reference, see table A.

**Table XVII 1:** Sendai Framework for Disaster Risk Reduction 2015-2030

| | |
|---|---|
| ***Goal*** | Prevent new and reduce existing disaster risk through the implementation of integrated and inclusive economic, structural, legal, social, health, cultural, educational, environmental, technological, political and institutional measures that prevent and reduce hazard exposure and vulnerability to disaster, increase preparedness for response and recovery, and thus strengthen resilience. |
| ***Outcome over the next 15 years*** | The substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries. |
| ***Priorities for action*** | |
| *Understanding disaster risk.* | Improving the identification and understanding of disaster risks by developing capacities for risk assessments and analyses (exposure and vulnerability) |
| *Strengthening disaster risk governance to manage disaster risk.* | Improving the institutional, regulatory and budgetary conditions for effective disaster risk management. |
| *Investing in disaster risk reduction for resilience.* | Avoiding the creation of new risks and seeking to reduce existing risks in society through greater consideration of disaster risk in policies, planning and investments. |
| *Enhancing disaster preparedness for effective response and to "Build Back Better [49]" in recovery, rehabilitation and reconstruction.* | It includes: (i) improving crisis management capacity by developing disaster forecasting and management capabilities, (ii) increasing the financial resilience of governments, the private sector and households through financial protection strategies, and (iii) promoting a recovery that does not create new risks and reduces existing ones, and that focuses on the most vulnerable people. |

*Source: UNDRR (2015), "Sendai Framework for Disaster Risk Reduction 2015-2030".*

The Government of Jamaica has, over many years, pursued a steady process of strengthening its disaster risk management (DRM) architecture in response to repeated disaster shocks and structurally high natural hazard exposure. The Disaster Risk Management Act (2015) provides the legal foundation for a modern DRM system, while the 2020–2040 DRM Policy advances a comprehensive policy framework that encompasses building codes, early warning, and the institutional and financial mechanisms needed to protect the Government, society, and households from disaster-induced fiscal shocks. Together, these instruments constitute the institutional backbone that underpins Jamaica's national risk management capabilities.

[49] In this report, and taking into account the Caribbean context, the term **"Build Forward Better"** is used in place of "Build Back Better." While "Build Back Better" is widely recognized in global disaster recovery discourse, "Build Forward Better" more explicitly reflects the objective of addressing underlying risk drivers, structural vulnerabilities, and development deficits.

However, the impacts generated by Hurricane Melissa demonstrated that, despite the existence of this institutional framework, implementation gaps and operational vulnerabilities remain. These were particularly evident in the limited wind resistance of housing and public infrastructure; the uneven use and enforcement of existing building codes; disparities in subnational capacity for debris removal and emergency response; and the cascading effects triggered by the failure of lifeline infrastructure, most notably the widespread electricity outages, that in some cases propagated to water supply, health, telecommunications, and education services. Such structural and systemic weaknesses amplified the social and economic impacts of the event.

This chapter aims to provide an integrated set of policy and institutional recommendations, structured along three temporal phases: Rehabilitation, Resilient Reconstruction, and Building Long-Term Resilience, to guide Jamaica toward a more resilient social and economic development pathway. For this chapter, these three phases are collectively referred to as "Resilient Recovery," reflecting a comprehensive approach that goes beyond immediate rehabilitation and reconstruction to include long-term risk reduction and resilience strengthening. While many proposed actions are targeted at the areas affected by Hurricane Melissa, the long-term resilience measures have a national character and are intended to strengthen the climate and disaster resilience of Jamaica's social, economic, and infrastructure systems as a whole.

For this chapter, key terms are defined as follows:

- Rehabilitation (0–12 months) refers to the transition from emergency response to the restoration of minimum functionality in essential services, infrastructure, and livelihoods. It includes repairs, temporary and transitional arrangements, social support, and measures aimed at stabilizing basic living conditions.
- Resilient Reconstruction (6 months–5 years) refers to the rebuilding and strengthening of damaged housing, public facilities, and critical infrastructure within the affected areas. It uses risk information and applies the internationally recognized principle of Build Forward Better —which emphasizes reconstruction that not only restores pre-disaster conditions but also enhances structural, institutional, and operational resilience in the communities most impacted by the disaster.
- Building Long-Term Resilience (2–10 years) focuses on strengthening resilience beyond the affected areas, across Jamaica as a whole. It involves improving governance systems, upgrading risk information and early warning capacity, instituting resilient land-use and urban planning, enhancing disaster risk financing and fiscal preparedness, and reinforcing the foundations of social and economic resilience at the national level.

In the Caribbean context, the notion of "Build Forward Better" (BFB) is increasingly used to signal a broader ambition: not only to rebuild what was lost in a safer manner, but also to address underlying structural vulnerabilities, development gaps, and chronic risk drivers that predated the disaster. In this report, the term Build Forward Better is adopted to reflect this forward-looking, transformative approach to resilient recovery in Jamaica.

This chapter adopts a problem-driven analytical approach that examines the mechanisms through which the impacts of Hurricane Melissa were amplified. Section 2 provides a systematic analysis of the hazard characteristics and damage patterns, such as structural vulnerabilities to extreme winds, cascading failures in lifeline infrastructure, and heterogeneity in local government/parish-level response capacities. Building on this assessment, Section 3 outlines cross-cutting policy priorities that address systemic, cross-sectoral challenges, including the cascading failures observed across lifeline infrastructure and essential services, whereas Section 4 then provides sector-specific recommendations, anchored in these overarching priorities. All proposals are also framed to remain consistent with institutional mandates under the Disaster Risk Management Act (2015).

The Theory of Change underpinning this chapter envisions Jamaica's transition toward a resilient nation (i.e., one that systematically reduces the socioeconomic impacts of future high-intensity events by addressing the structural vulnerabilities revealed by Hurricane Melissa). In the medium term, progress will be reflected in the timely restoration of essential services; the repair and strengthening of housing; the reactivation of key public functions; improved robustness of lifeline infrastructure; stronger implementation capacity within local governments; and enhanced risk information and land-use planning systems. Over the long term, resilience will be demonstrated by the integration of climate and disaster risk into national land-use, urban, and coastal planning; more inclusive and adaptive institutional frameworks; stronger community preparedness, evacuation, and shelter capacities; higher systemic resilience of critical infrastructure; and a more robust disaster risk financing architecture that reduces the macro- and microeconomic impacts of future events.

Trade, logistics, and investment flows are essential economic lifelines whose disruption significantly amplifies disaster impacts. Hurricane Melissa revealed that interruptions in electricity, digital connectivity, customs processing, cargo handling, and air and maritime operations can create nationwide delays in essential goods movement, reconstruction inputs, and export flows. Because Jamaica's economy is highly open and relies heavily on both imports and exports, maintaining continuity of trade and investment functions is central to restoring livelihoods, reducing economic losses, and supporting a resilient reconstruction pathway. Trade and investment considerations, therefore, cut across all phases of recovery.

Although the recommendations in this chapter are principally directed toward the central government, they also seek to clarify the roles of local authorities, communities, and international development partners. Particular emphasis is placed on the private sector (at micro, small, medium, and large scale) whose investments are crucial for local economic development and whose rapid reactivation is critical for an effective and timely recovery.

## A. Impact of Hurricane Melissa: A Synthesis of the Drivers Behind Asymmetric Impacts

Although Hurricane Melissa reached Category 5 intensity as it passed near and made landfall in Southwest Jamaica, the zone of extreme wind damage was confined to a high-intensity band located within several tens of kilometers of the hurricane eye. This pattern differs somewhat from the common expectation, based on previous events in the Caribbean, that a Category 5 hurricane produces uniformly catastrophic damage over a wide area. For instance, while Black River (denoted as the "ground zero" of the event) experienced severe destruction, nearby areas such as Manchester, located approximately 30 km away, and Kingston, roughly 100 km from the location of the maximum wind speeds, reported less severe and more dispersed impacts.

Within the area of highest wind speeds, damage was highly heterogeneous. Localized wind amplification driven by terrain features, the geometry of buildings, the presence or absence of surrounding structures, and variations in construction quality created a mosaic of impacts. Housing stock characteristics also varied widely, from recently built structures compliant with modern building codes to older or incrementally expanded low-income structures, resulting in stark differences in structural performance when subjected to similar wind loads. In the upland regions, topographically enhanced rainfall contributed to flooding and mass movement, while along the coast, storm surge and wave action led to foundation scour. These compound hazards interacted with underlying social vulnerability, further accentuating the uneven distribution of impacts.

**Melissa constitutes an extreme event but must be interpreted within pre-existing historical risk trajectories.** Hurricane Melissa represents an event of exceptional intensity and spatial reach;

however, its analysis should not be detached from the country's vulnerability and exposure patterns. Melissa represented a maximum-stress event that exposes accumulated vulnerabilities in the different sectors rather than as an isolated phenomenon. This finding calls for caution regarding explanations that attribute damage exclusively to climatic factors, without considering the territorial and social configuration of risk. Melissa's analytical value lies in its ability to reveal structural limits of the system under extreme conditions.

**Socio-economic conditions.** The socioeconomic context prior to the event helps to understand the level of vulnerability of the population living in the areas affected. It is important to highlight that Hurricane Melissa impacted several parishes that were also affected by Hurricane Beryl in 2024 (e.g. St Elizabeth, Clarendon, Manchester, Westmoreland, Trelawny, and St Ann), where many communities are still experiencing and recovering from those effects, especially low-income families. Repeated impacts affecting the same geographic areas have been observed in various contexts within and beyond the Caribbean region. While such patterns are not inevitable, they underscore the importance of strengthening long-term resilience to reduce cumulative socio-economic vulnerability over time.

In order to support the most vulnerable and leave no one behind, social protection efforts need to expand and give priority to the most at-risk population groups, namely households living in rural areas, children under 17 years of age, female-headed households, and households with children. Livelihood recovery support should give priority to those who are disproportionately impacted, such as smallholder farmers and agricultural workers, formal as well as informal MSMEs, low-skilled labor, and seasonal workers who account for much of the tourism workforce, and women who represent a high proportion of workers in commerce and tourism.

**Structural Damage Concentrated in Roof Failures.** The most defining feature of damage during Hurricane Melissa was the widespread failure of roof structures across residential buildings and public facilities. Corrugated galvanized steel sheeting (commonly referred to as "zinc") is ubiquitous across Jamaica, not only in housing but also in commercial, educational, and industrial buildings, airports, port facilities, and government buildings. While economically accessible, lightweight, and easy to install, zinc roofing systems have limited resistance to strong winds, especially when compromised by inadequate fastening, corrosion, poor edge detailing, or inconsistent construction practices resulting from incremental home expansions.

In many cases, partial detachment rapidly progressed to full roof loss (i.e., truss collapse) once wind uplift initiated failure. Across affected areas, roof loss was typically the initiating point of broader structural damage, enabling water intrusion, damage to structural elements, and the temporary uninhabitability of homes and usability of other types of buildings.

A notable finding is that even within the high-speed wind zone, numerous zinc-roofed buildings remained largely undamaged, demonstrating the decisive influence of micro-level factors such as construction quality, number and type of fasteners, material thickness, roof pitch, connection detailing, age, and condition (maintenance).

Importantly, in most damaged homes, the primary structural system (i.e., beams, columns, and foundations) remained largely intact. Repairs were therefore concentrated on light cover replacement and roof retrofitting. Total structural collapse was less pronounced, indicating that Melissa's housing impacts were not characteristic of a full reconstruction demand, but rather of a pervasive physical vulnerability concentrated in specific elements of the roof systems.

**Cascading Failures in Critical Infrastructure.** Even in areas where physical damage to buildings was limited, Melissa exposed systemic vulnerabilities in Jamaica's critical infrastructure. In several southwestern parishes, although power generation facilities sustained minimal direct damage,

extensive impacts on the transmission and distribution network, such as the collapse of poles and, therefore, overhead lines, resulted in prolonged, large-scale electricity outages.

These power outages triggered cascade effects across essential services, disrupting water supply, telecommunications, refrigeration and food storage, commercial operations, and government services. Notably, these cascading impacts extended beyond the maximum wind zone. In Savanna-la-Mar, for example, structural damage was limited, yet many commercial establishments, such as restaurants and retail businesses, remained closed for weeks due to sustained outages.

This illustrates that vulnerabilities in the electricity network can significantly expand the geographical footprint of socioeconomic disruption beyond the areas of direct physical damage. Strengthening lifeline infrastructure, therefore, must represent a top priority for enhancing national resilience. In parallel, particular attention should be given to ensuring reliable emergency backup power systems for critical facilities, so that essential services can be maintained during future shock events.

**Restoration of Road Network Accessibility.** More than 400 main road corridors across Jamaica were identified as impacted by Hurricane Melissa, highlighting the extensive disruption to the national road network. The central focus of the works agency has been roadway clearance, involving the removal of fallen trees, landslide debris, silt deposits, and other obstructions from both main and secondary roads to restore accessibility through at least one lane of traffic. These activities were critical to reopening priority corridors and ensuring that emergency services, supplies, and communities can move safely through affected areas. It was reported that 96 percent of the more than 400 road corridors were cleared at the time of the DaLA mission (1 month after the landfall).

In tandem with roadway clearance, targeted flood cleanup and drainage restoration were being carried out to remove standing water from inundated road surfaces where feasible and to clear blocked culverts, side drains, and gullies. These interventions were essential for re-establishing proper runoff capacity and mitigating against renewed flooding during subsequent rainfall events. Emergency repairs were being prioritized along high-traffic corridors to maintain continuity of the network and accessibility for users.

**Local-Level Early Recovery and Community Response.** Field observations revealed no systematic evidence that disparities in municipal budgets or institutional capacity were the dominant drivers of damage severity. However, an important pattern was the prominent role of community-led early recovery efforts. In locations such as the Black River Municipality Chambers, residents organized spontaneous clean-up activities. Many households procured zinc sheets and conducted emergency roof repairs independently. These actions highlight the role of community resilience where formal surge support mechanisms are limited.

In the electricity sector, despite the scale and complexity of system-wide outages, local repair crews carried out sustained restoration work, including pole repairs and reconnection of lines. Nevertheless, the volume of required repairs resulted in extended delays, particularly around the high-intensity wind corridor. Most of the damage observed in the electricity poles is a consequence of deficient attachments of these structures to the ground, and even if the poles remain on the ground, no major structural damage exists on these elements.

A major impediment to early recovery was the slow pace of debris removal. Even four weeks after the event, large volumes of debris remained in many areas, obstructing road access, commercial activity, and housing repairs. Unlike some countries with formalized systems for large-scale volunteer mobilization after disasters, Jamaica lacks a structured surge capacity for debris management. As a result, removal efforts depended primarily on local authorities and residents, limiting both scale and

speed. Additionally, gaps in debris collection points and disposal protocols appear to have contributed to these delays.

**Early Warning Systems and Last-Mile Challenges.** Jamaica's early warning system (EWS) performed well during Hurricane Melissa, with timely issuance of alerts (up to three days of lead time), dissemination through official channels, and broad coverage across television, radio, and social media. Most residents were able to access essential information and undertake basic protective actions.

However, field assessments identified variation in last-mile effectiveness, where receiving a warning did not consistently translate into timely action. Barriers included limited access to transportation, challenges faced by vulnerable populations (elderly people, people with disabilities, and single-headed households), and reliance on informal communication networks in remote or mountainous areas. While many residents began reinforcing homes or preparing for evacuation soon after receiving warnings, others lacked the necessary resources, information, or community support structures to act effectively.

Three weeks after the hurricane, shelter conditions for displaced populations indicated significant fatigue and stress. Both the physical conditions of shelters and the management arrangements require review against international humanitarian assistance standards.

These observations suggest that while alert issuance was largely effective, the enabling environment for converting warnings into actionable behavior was not fully institutionalized. Improvement of warnings to shift from hazard-based information to Impact-Based Forecasting (IBF), that is, communicating anticipated consequences on people, infrastructure, and services rather than meteorological parameters alone, is key to enhancing the understanding of timely messages. Improvements are needed in shelter access, protocols for supporting vulnerable groups, community-based preparedness training, evacuation logistics, and redundancy in local communication networks.

**Impacts on Forests and Ecosystems.** Melissa caused extensive damage to forest ecosystems across southern and northern regions of Jamaica, including widespread treefall, canopy loss, and degradation of coastal and marine ecosystems such as mangroves, seagrass beds, and coral communities. These impacts were amplified in areas already affected by land-use change, deforestation, and other anthropogenic pressures that had weakened natural resilience.

At the same time, available evidence suggests that in locations where mangrove forests and reef systems remained relatively intact, these ecosystems helped attenuate wave energy, reduce coastal flooding, and limit shoreline erosion, thereby mitigating damage to adjacent communities and infrastructure.

Beyond physical destruction, the event disrupted critical ecosystem services, such as soil retention, carbon sequestration, water regulation, coastline protection, and slope stability, thereby reducing natural buffers against storm surge, flooding, and coastal erosion. Damage to ecosystems also affected livelihood systems tied to nature-based activities such as ecotourism, apiculture, and coastal resource use.

At locations with steep terrains, the sudden loss of forest cover elevates the risk of soil erosion and slope instability during rainfall events, potentially increasing the likelihood of floods and landslides in the short and medium term. Along the coast, the weakening of mangrove and reef systems may temporarily reduce natural wave attenuation capacity, increasing exposure to future storm impacts while these services are restored.

These findings underscore that ecosystem degradation can diminish community resilience and contribute significantly to disaster risk, highlighting the importance of integrating environmental recovery and nature-based solutions (NbS) into the broader reconstruction and resilience agenda.

## B. Main Recommendations.

### Rehabilitation Phase

Based on the challenges observed during the initial stages of recovery following Hurricane Melissa, the Rehabilitation phase (0–12 months) provides a framework for rapidly restoring minimum functionality in the affected areas by addressing seven cross-cutting priority issues. Sector-specific recommendations are presented in Section 4.

While many of these actions are already being undertaken by the Government of Jamaica, local authorities, NGOs, community organizations, and private sector stakeholders, this section intentionally consolidates them in a systematic manner, both to recognize these ongoing efforts and to reinforce a coordinated and comprehensive approach to rehabilitation.

***(1) Debris Management***

Several weeks after landfall, large volumes of disaster debris, particularly zinc roofing materials, remained scattered across affected regions. This significantly delayed a wide range of early recovery activities, including housing repair, restoration of power distribution lines, leak detection and repair in water systems, reopening of schools, road clearance (all lanes), and the reactivation of fishing ports. The inability to promptly manage disaster waste created a systemic bottleneck across multiple sectors. During the rehabilitation phase, priority actions include:

- Identifying and clearing critical routes, including main roads, access routes to schools and health facilities, and primary electricity and water distribution corridors.
- Establishing temporary coordination mechanisms to mobilize community groups, volunteer networks, private waste-removal contractors, and construction firms to supplement municipal capacity.
- Securing temporary debris collection and staging sites, enabling segregation of treefall, zinc, and large debris.
- Using short-term rental or emergency contracting arrangements for heavy equipment and trucks to accelerate debris removal.

These measures are essential to restoring terrestrial mobility, enabling service providers to operate, and preventing prolonged disruption of economic and social functions.

***(2) Safe Self-Recovery / Roofing and Transitional Housing***

Self-recovery efforts by households played a significant role in restoring basic habitability after Melissa. However, the scale of roof damage and the lack of technical guidance resulted in many repairs being undertaken without adequate safety or wind-resistance standards, potentially reproducing vulnerabilities for future events and overall increasing disaster risk. Housing safety is also critical for ensuring the availability of essential workers (i.e., teachers, healthcare personnel, and public officers) whose presence is necessary for wider recovery efforts.

Priority actions during the rehabilitation phase include:

- Issuing practical, simplified Safe Roof Repair Standards to ensure minimum wind resistance in self-repair efforts. These can be aligned with the simplified building code, which applies to certain types of structures only.
- Providing standardized Roof Repair Kits (roofing sheets, appropriate nails/screws, waterproofing materials, fasteners).

- Delivering technical training for local carpenters and roofing workers to promote safe and durable repairing techniques.

Where households cannot safely return due to extensive roof loss or water damage, transitional housing will be required. Feasible supply options include: Modular housing providers within the Caribbean; Emergency or transitional shelter units from UN agencies; Short-term housing models used by bilateral donors or NGOs in previous hurricane events; Modular units available from suppliers in North America; Pre-fabricated emergency housing units stored by countries such as Japan.

These options should be positioned as complementary, short-term solutions that facilitate stability without creating dependency or delaying permanent reconstruction.

***(3) Restoration of Lifeline Services***

Hurricane Melissa triggered extensive cascading failures across Jamaica's interdependent service systems. Widespread power outages led to disruptions in water supply and sanitation systems, telecommunications, medical services, schools, local governance, and market activities. Because these cascading impacts cannot be mitigated through isolated sector-level interventions, restoring minimum functionality requires rapid prioritization and coordinated action.

Priorities for the Rehabilitation phase include:

- Establishing a hierarchy of critical services, with road accessibility and electricity restoration as the top priorities, followed by water supply, health, education, and community services.
- Rapidly redeploying personnel, materials, and equipment to priority services and ensuring safe access routes for repair and social teams.
- Deploying alternative interim solutions, such as pre-positioned or rapidly mobilized backup generators for hospitals and water facilities, emergency shelters, and key public service hubs, ensuring adequate fuel supply and operational maintenance until grid power is restored; temporary water distribution, and emergency telecommunications systems.
- Ensuring that schools and health facilities meet minimum power, water, and sanitation conditions to guarantee a safe reopening.

Timely reactivation of lifeline services is essential for restoring public confidence, stabilizing daily life, and reducing socioeconomic losses.

***(4) Community-Level Business and Social Reactivation***

Hurricane Melissa caused widespread disruptions in livelihoods due to housing damage, employment interruption, and loss of productive assets, particularly in the agriculture, fisheries, and tourism sectors. In coastal fisheries communities, the destruction of boats, engines, and fishing gear caused immediate income loss. These impacts have also contributed to heightened household insecurity and psychosocial (mental health) stress.

Priority actions for the rehabilitation phase include:

- Facilitating the rapid reopening of small businesses, markets, and tourism-related activities by ensuring debris clearance, temporary restoration of electricity and telecommunications, safety inspections, and simplified permitting processes.
- Providing targeted livelihood support for fisheries communities, including replacement of essential gear, ensuring safe docking areas, and short-term cash assistance.

- Delivering community-based psychosocial support through schools, health centers, and local organizations.
- Implementing short-term income recovery programs, including cash-for-work, microfinance, and emergency livelihood grants. **Implementing temporary expedited customs and SPS procedures** for essential recovery inputs, including construction materials, agricultural inputs, pharmaceuticals, medical equipment, and cold chain components.
- **Establishing fast track clearance lanes for export oriented SMEs and firms** in agro processing, fisheries, manufacturing, and tourism supply chains to prevent loss of buyers and export markets.
- **Supporting rapid restoration of market access and logistics connectivity** for farmers, fishers, and SMEs through temporary transport services, short term storage/cold chain solutions, and digital platforms for commerce.

These measures ensure that livelihood reactivation is linked to functioning domestic and export markets.

An integrated approach addressing both business continuity and community well-being is essential for stabilizing local economies and supporting early social recovery.

***(5) Building Safety Assessments (BSA)***

Building Safety Assessment (BSA) refers to a technical process for systematically evaluating, on a building-by-building basis, after a disaster, structural safety, usability, and the need for repair, retrofitting, or reconstruction. BSA serves as a key input to guide concrete implementation decisions during the resilient reconstruction phase, and its effective deployment should be prepared during the rehabilitation phase.

Key actions include:

- Clarifying the objectives, scope, and intended use of future BSAs, including the identification of priority building types for assessment, such as damaged housing units, schools, health facilities, and critical infrastructure.
- Ensuring transparency and access to public response information.
- Defining institutional responsibilities, roles, and coordination mechanisms at national and local levels, including the organization and integration of relevant damage, hazard, and asset information, particularly in geo-referenced formats.
- Establishing the technical framework for subsequent detailed assessments, including approaches to field inspections, technical analysis, performance classification (e.g., usable, repairable, requiring retrofitting, or requiring reconstruction), cost-effectiveness considerations, and integration into GIS platforms.

Through these preparatory actions, the resilient reconstruction phase can efficiently generate key outputs such as building safety databases, building-level assessment sheets, technical guidance for retrofitting and reconstruction, prioritized investment lists, and integrated GIS maps linking risk and building information. These outputs will provide a robust technical basis for retrofitting decisions, application of reconstruction standards, and prioritization of public and private investments during the resilient reconstruction phase.

*(6) Analysis of Underlying Risk Factors and Planning for the Reconstruction Phase*

The rehabilitation period is not only a time for emergency repairs; it also serves as a critical bridge to the resilient reconstruction phase. Melissa revealed multiple underlying risk factors, including but not limited to the widespread vulnerability of roof structures, exposure to fluvial and coastal hazards, outdated building codes and standards, location of settlement patterns and roads in high-risk zones, and insufficient redundancy in power and water networks.

To avoid perpetuating these vulnerabilities into the next disaster cycle, the rehabilitation phase should include early planning for reconstruction:

- Developing a National Reconstruction Master Plan and complementary Parish-Level Reconstruction Action Plans informed by field data collected during early recovery and with a multi-hazard approach.
- Incorporating mid- and long-term multi-hazard risk reduction measures, including infrastructure upgrades, land-use adjustments explicitly informed by disaster risk, resilient housing and public facilities, and strengthened lifeline redundancy.
- Anticipating temporary labor migration, particularly toward the Montego Bay metropolitan area, and mitigating associated risks, such as the emergence of informal peri-urban settlements in high-hazard zones, through coordinated land-use regulation, monitoring, and temporary worker accommodation planning.

These measures ensure that short-term recovery and long-term resilience are aligned and mutually reinforcing.

*(7) Strategic Communication for Tourism and Local Economic Recovery*

The interruption of critical services (e.g., electricity, water, and transport) had a direct impact on Jamaica's tourism sector, leading to the temporary closure of key tourism areas and sudden declines in domestic and international travel demand. Given the central importance of tourism to Jamaica's economy, strategic communication is essential during the rehabilitation phase. Strategic signaling to international travel trade partners is essential for restoring Jamaica's services exports. This reduces uncertainty, accelerates the return of visitors, and supports the recovery of the wider tourism services ecosystem.

Priority actions include:

- Coordinated multi-channel communication by the Government, Ministry of Tourism, and private-sector partners to provide verified, up-to-date information on safety, accessibility, and restored services.
- Countering misinformation and exaggeration of damage through clear and timely messaging from official channels.
- Communicating a phased reopening roadmap to provide predictability for visitors, travel agencies, and airlines.
- International experience shows that strategic communication after a disaster reduces uncertainty, encourages early tourist return, and accelerates the reopening of small businesses. In Jamaica's case, coherent public messaging will be essential to stabilizing local economies and supporting broader recovery.
- Coordination with airlines, cruise lines, tour operators, and online travel platforms should provide clear information on restored infrastructure, phased reopening of destinations, and safety conditions.

## Resilient Reconstruction

This section is structured in alignment with the four priorities of the Sendai Framework for Disaster Risk Reduction, providing an integrated approach to understanding risk, strengthening governance, investing in risk reduction, and enhancing preparedness for effective response and recovery.

### A. Understanding disaster risk

**Forensic Analysis of Structural Damage.** A cornerstone for a resilient reconstruction is the strengthening of impact-based risk intelligence through empirical verification of the damages observed during Hurricane Melissa. The event revealed a wide spectrum of structural and non-structural failures, with a notably widespread distribution of damage to roofs, which provides a unique opportunity to conduct forensic analyses linking hazard characteristics (extreme winds, flooding, storm surge). Such forensic analysis should adopt a multi-dimensional perspective, integrating structural engineering assessments with land-use patterns, construction practices, enforcement gaps, infrastructure interdependencies, and underlying socio-economic vulnerabilities. This broader lens enables a more comprehensive understanding of how physical hazard exposure interacts with institutional, economic, and social conditions to generate disaster risk. As part of the ex-post risk assessment, it is essential to conduct a detailed mapping of Melissa´s storm surge and perform a probabilistic assessment of storm surge recurrence, incorporating historical data, dating existing storm surge deposits, and modeling.

While the impacts have been severe for affected households and communities, systematically analyzing these damage patterns offers an important and respectful opportunity to improve Jamaica's understanding of risk and to inform future standards, designs, and investments.

During the resilient reconstruction period (0–5 years), forensic assessments should examine:

- Gaps between existing design and construction standards and their effective enforcement and application in practice, including compliance and inspection challenges, particularly in housing, public facilities (especially roofs), power distribution networks, water systems, and transport infrastructure.
- Levels of exposure, vulnerability, and criticality of essential facilities such as schools and hospitals.
- Levels of exposure, vulnerability, and criticality of road and drainage infrastructure.
- Risks arising from land-use patterns and settlement configurations.
- Hazardous location of productive assets in agriculture and fisheries (e.g., boats, engines, storage facilities).

These analyses represent the first step toward future revisions of design standards and their strict enforcement, enhanced risk information systems, and adjustments to land-use policy, which are all key components of the long-term resilience agenda (10-year horizon). The post-disaster period provides a valuable opportunity for observed damage data to be systematically translated into national policy.

To conduct this analysis effectively, temporary cross-sectoral forensic teams should be established at both national and parish levels.

- At the national level, ODPEM (working with PIOJ, STATIN, JPS, NWC, NWA, land-use and building authorities, MOAF/RADA/Fisheries Division, the Met Office, and UWI) should coordinate the integration of damage data, hazard information, asset exposure, vulnerability characteristics, and design parameters.

- At the parish level, Parish Disaster Coordinators, Municipal Corporations, engineering units, and local fishing and farming organizations should contribute field knowledge and asset-distribution information.

Together, these institutions can operate as Reconstruction Forensic Task Teams, updating analyses throughout the recovery and reconstruction process and providing the evidence base for investment prioritization, code revisions, and land-use adjustments.

During recovery, data-driven decision making must be maintained by expanding information Management System (IMS) capabilities to support recovery and early reconstruction planning. Specifically, the Government should prioritize the development of a Disaster Infrastructure Registry, creating a national critical infrastructure database essential for future prioritization of reconstruction interventions.

**B. Strengthening disaster risk governance to manage disaster risk.**

**Dual-level governance system for resilient recovery.** Effective implementation of resilient reconstruction requires a dual-level governance system in which the central government provides overall coordination and policy direction, while parish governments lead prioritization and implementation at the local level.

Central government responsibilities include:

- Managing the progress and coherence of the reconstruction program and investment plan.
- Initiating the review of building and infrastructure standards and their enforcement and use.
- Securing financial resources and facilitating inter-ministerial coordination through PIOJ.
- Ensuring transparency, quality, and accountability through monitoring and evaluation.

Parish governments should lead:

- Prioritization and coordination of reconstruction of public facilities and local infrastructure.
- Adjustments to land-use and settlement patterns, including reconfiguration of high-risk areas.
- Administrative actions needed to restore local livelihoods and public services.
- Operational response to cross-cutting reconstruction challenges.

To align these actions, it is recommended that Jamaica should develop a Strategic Framework (or Master Plan) for Resilient Reconstruction, informed by the 2020–2040 Comprehensive Disaster Risk Management Policy. Building on the existing Model National Recovery Master Plan, this framework would articulate shared goals, principles, and indicators, clarify institutional roles across central and local entities, and organize reconstruction actions into short-term (1–2 years), medium-term (3–5 years), and long-term (5–10 years) investment horizons.

To ensure coherence and accountability in implementation, Jamaica should establish a light but systematic Monitoring–Evaluation–and Learning (MEL) mechanism for resilient recovery. This mechanism would track progress on priority actions, document lessons emerging from Melissa, and support adaptive management across sectors.

**Participatory Territorial Reconstruction Planning at the Community and Local Levels.** In parallel with governance arrangements, participatory reconstruction planning is essential to ensuring that recovery is inclusive, effective, and sustainable. A phased compact-resilient community model, suited to the Jamaican context, should be redeveloped through risk-informed land use planning. Rather than rebuilding housing, public services, commercial functions, and ecosystems in isolation, this model

emphasizes walkability, mixed-use development, safety, and social inclusion to simultaneously enable functional recovery and long-term sustainability.

Benefits include:

- Risk-informed land use.
- Reduction in disaster risk arising from multiple hazards.
- Improved access to public services.
- Reduced proliferation of high-exposure and high-risk informal settlements.
- Strengthened social cohesion.

International experience demonstrates that engaging residents, livelihood groups, and community organizations meaningfully in reconstruction enhances legitimacy, transparency, and long-term resilience.

In Jamaica, Community Reconstruction Planning Workshops should be convened in affected parishes, enabling residents, fishers, farmers, SMEs, and education and health stakeholders to co-design reconstruction priorities. Topics should include:

- Approaches to rebuilding in hazard-prone areas.
- Prioritization of housing and public infrastructure reconstruction.
- Alignment of livelihood-support programs.
- Improvements to public facilities and accessibility.

This participatory process strengthens both parish-level reconstruction plans and the wider governance framework, enhancing trust and social cohesion. Such an approach may be particularly valuable in territories that experienced severe and concentrated impacts, such as Black River, where reconstruction efforts offer an opportunity to operationalize a "Build Forward Better" vision at the territorial level. By aligning spatial planning, infrastructure upgrading, and community participation, reconstruction can serve not only to restore functionality but also to reduce future risk and strengthen long-term socio-economic resilience.

### C. Investing in disaster risk reduction for resilience

**Sector-Specific Resilient Reconstruction Investments.** Resilient reconstruction (0–5 years) strengthens the systems brought back to minimum functionality during Rehabilitation, ensuring they do not fail in the next disaster cycle. These short-term resilience investments form the foundation for long-term national resilience.

Several priority sectors are highlighted below. Together, they form a Resilient Reconstruction Investment Portfolio (5-year horizon) that can be integrated into parish and national reconstruction programs. Public works programs should maximize the use of local materials, skills, and SMEs, supporting livelihoods and economic recovery.

Where feasible, reconstruction programs should incorporate local materials and community-based labor arrangements. This approach reduces costs, accelerates implementation, and strengthens local ownership while supporting livelihoods during recovery.

***(1) Housing.*** Given the widespread roof and cover failures observed during Melissa, priority housing interventions include:

- Retrofitting of roof structures (at the truss level).
- Improvements in attachment and fastening techniques, including structural detailing compliant with building core requirements.
- Combined technical assistance and material support for owner-driven reconstruction.

Given the predominance of zinc roofs in Jamaica, the introduction of alternative, more wind-resistant roofing materials and fastening systems (for instance, at the parish-level with pilot projects) would help demonstrate feasibility, cost, and maintenance requirements. These low-cost, scalable interventions offer the highest cost-effectiveness for improving resilience across the largely informal housing stock.

***(2) Electricity.*** To prevent a recurrence of the widespread outages observed during Hurricane Melissa, selective strengthening and retrofitting of specific elements that are part of the power distribution network are required. Priority actions include:

- Enhance the attachment of poles, regardless of their material, to the ground.
- Replacing vulnerable wooden poles in high-hazard locations with concrete or FRP-composite poles.
- Applying wind-resilience upgrades to primary feeders and to facilities such as hospitals, schools, and water plants.
- Improving flood protection for substations and waterproofing outdoor equipment.
- Piloting community-scale distributed energy solutions (e.g., microgrids, solar-battery hybrids).

These measures will reduce the likelihood of system-wide failure and shorten recovery times.

***(3) Water, Health, and Education (Integrated Lifeline Approach).*** Because cascading failures were driven largely by electricity outages, resilience measures must be designed for these sectors as an integrated system. Priority investments include:

- Backup power systems (generators and solar/battery hybrids) for water treatment plants pumping stations, hospitals, and major schools and designated shelters.
- Wind- and water-resilience upgrades for critical equipment.
- Strengthening WASH capabilities in schools, clinics, and community centers (shelters).
- Ensuring essential facilities can operate as community emergency hubs.

These actions reduce the risk of future cascade failures and enhance continuity of essential services.

***(4) Transport.*** Damage to coastal and mountain road sections, erosion, debris, and inadequate drainage hindered access and delayed recovery. Priority short-term interventions include:

- Retrofitting of high-risk road segments directly affected by the storm (slope stabilization, guardrails, coastal protection).
- Improvements to urban and rural drainage systems.
- Structural retrofitting of bridges and culvert replacement.

Ports and airports, which serve as national logistics and emergency-operational hubs, require:

- Strengthening of jetties/quays, mooring facilities, warehouses, and dockyard drainage.
- Wind- and water-protection of power and communications systems.
- Improved airport airside drainage and strengthening of auxiliary systems.
- Enhanced backup power and continuity-of-operations capabilities.

***(5) Agriculture and Fisheries.*** These sectors experienced direct damage to productive assets, with fisheries facing immediate loss of vessels, engines, and fishing gear.
Priority measures for agriculture include:

- Drainage improvement and sediment removal.
- Erosion control on slopes and coastal lands.
- Improved farm-to-market access roads.

Priority measures for fisheries include:

- Full restoration and reinforcement of landing sites and mooring facilities.
- Financing and leasing schemes for the replacement of vessels and/or engines.
- Improved storage (including refrigeration), repair facilities, and community-level safe-mooring protocols.

Participatory community development plans should guide medium-term recovery, integrating resource management, livelihood diversification, and climate change adaptation. Inclusive processes must ensure participation from youth, women, and persons with disabilities, strengthening social cohesion and long-term community resilience. These steps also lay the foundation for a resilient blue economy.

*(6) Trade and Investment Infrastructure (Resilient SEZs)*

To support economic diversification and post-disaster recovery, resilient Special Economic Zones (SEZs) and industrial parks can serve as strategic enablers of reconstruction. In alignment with spatial risk management principles, new or upgraded zones should be located in lower-risk areas and designed with climate-resilient infrastructure, including redundant energy, water, and digital connectivity systems. Priority actions include:

- Developing serviced land with resilient utilities to reduce investor time-to-operation.
- Ensuring priority connectivity to ports, airports, and critical logistics corridors.
- Integrating resilience standards into zone infrastructure design and environmental controls.
- Aligning investment incentives with export performance, low-carbon adoption, and resilience compliance.

By embedding resilience criteria into industrial location and investment planning, SEZs can contribute to job creation, export diversification, agro-processing, and near-shoring investment, while reducing exposure of productive assets to future climate and disaster risks.

**D. Enhancing disaster preparedness for effective response and to "Build Forward Better" in recovery, rehabilitation, and reconstruction.**

**Strengthening Local Preparedness and Response Capacity.** Physical reconstruction must be complemented by improved preparedness and response capacity to prevent system-wide failure in future events. Melissa revealed insufficient redundancy in power, communications, water supply, transportation, and service facilities.

Priority actions for the resilient reconstruction period include:

- Updating and strengthening emergency response and service continuity of plans for critical facilities (hospitals, schools, water treatment plants, pumping stations).
- Improving redundancy in electricity, communications, and water systems, including phased introduction of distributed energy sources.

- Modernization and localization of the Early Warning System, such as strengthening the impact-based forecasting capabilities so that warning messages give an idea of the possible consequences and not only about the hazardous characteristics.
- Developing technical and operational frameworks for impact-based early warning systems (EWS) and integrating early-action protocols at the local level.
- Building shelter buildings with a multi-hazard approach at strategic locations to avoid the use of schools' infrastructure and therefore disrupting this service. Shelters by definition are spaces to be occupied under specific conditions and, ideally, for a relatively short period of time. This means that there is a good possibility for thinking of alternative uses of these spaces (e.g., community centers) so that people are familiar with their location and access routes.

## Building Long-Term Resilience

As in the preceding section on Resilient Reconstruction, this section is structured in alignment with the four priorities of the Sendai Framework for Disaster Risk Reduction. It presents a long-term (5–10 year) agenda for strengthening Jamaica's understanding of disaster risk, governance arrangements, investment strategies, and preparedness systems to reduce existing and future risk in an integrated manner.

### A. Understanding disaster risk

**National Risk Information Infrastructure.** Long-term resilience building (5–10 years) requires that the empirical insights obtained during the Resilient Reconstruction phase, particularly from forensic assessments, be consolidated into a national, multi-hazard understanding of risk, extending beyond the affected areas to all regions of Jamaica. The foundation of long-term resilience lies in strengthening risk-informed disaster risk management governance, grounded in reliable impact-based risk information.

Melissa clearly exposed cross-sectoral vulnerability factors, including:

- Widespread roof fragility in residential and public buildings.
- Coastal and inland flood, storm surge.
- Design limitations, corrosion, and aging across key elements of the power and water networks.
- Limited redundancy of the power network.
- flooding and landslide hazard risk to transport infrastructure.
- High exposure and vulnerability of schools and health facilities.
- Risky settlement patterns and land-use configurations.
- Location of productive assets in agriculture and fisheries (boats, engines, fields, storage sites) in high-hazard areas.

Understanding these factors at high spatial resolution and linking them to observed disaster impacts is essential for prioritizing reconstruction investments, revising design standards, adjusting land-use policies, and shaping livelihood recovery strategies. For this, the development and update of a national disaster database where disaggregated impacts are included, together with a systematic collection of wind speed, flood marks, damage data, and high-resolution risk mapping is needed.

To achieve this, Jamaica should establish a National Multi-Hazard Risk Information Platform that continuously integrates:

- Descriptive attributes for the structural vulnerability of assets.
- Identification of corridors of the road network and the electricity grid at high-risk.
- Water-system resilience analytics, including pressure and flood sensitivities.
- Resilience diagnostics of schools and health facilities.

- Coastal road erosion and overtopping models.
- Exposure assessments of agricultural and fisheries assets.

This platform would serve as the evidence base for national planning, building codes, land-use regulation, and infrastructure investment. For instance, the development of risk-informed land use plans must be grounded in the development of detailed multi-hazard risk assessments, so that land-use plans are informed not only from the hazard perspective (e.g., the hazard map for a given return period), but from the risk perspective (e.g., at least the feasible physical losses). Land-use planning recommendations should include the provisions and guidance to use certain types of building classes in mid- to high-risk areas and not focus only on restricting the occupation of certain spaces.

A fully functioning national risk information system becomes not merely an analytical tool but a decision-making infrastructure, enabling evidence-based regulation, investment allocation, and land-use planning. This will significantly strengthen Jamaica's predictive and adaptive capacity for future hazard events.

**B. Strengthening disaster risk governance to manage disaster risk.**

Institutional roles should be clearly defined. At the national level, ODPEM, STATIN, PIOJ, JPS, NWC, NWA, MOAF/RADA/Fisheries Division, coastal management bodies, the Met Service, and the UWI could jointly maintain the platform. At the parish level, Parish Disaster Coordinators and Municipal Corporations should contribute field data and access the platform for planning and emergency management. To ensure continuous data flow, Reconstruction Data Cells at both national and parish levels throughout the recovery process are recommended.

Long-term resilience requires strengthening the institutional arrangements highlighted by Melissa, particularly the coordination between central and local authorities and service providers, the application and enforcement of building and land-use regulations, the operational capacity of local DRM actors, and the mechanisms for community engagement.

Melissa also underscored the need to effectively operationalize and enforce Jamaica's recently updated building code, including strengthening inspection capacity, technical guidance, and mechanisms to upgrade or retrofit existing buildings at both national and local levels, and speeding up the administrative process to obtain construction permissions.

Key reforms should include:

- Clarifying and strengthening ODPEM's national coordination mandate and protocols, institutionalizing cross-sectoral priority-setting and decision-making processes.
- Establishing a systematic capacity development program for Municipal Corporations and Parish Disaster Coordinators covering debris management, rapid assessment, land-use adjustments, recovery planning, and EWS interface.
- Strengthening the national building regulatory framework by ensuring the effective implementation and enforcement of the recently updated building codes, supported by a robust, resource-backed inspection and compliance system across central and local levels.
- Strengthening engineering design standards for public infrastructure such as roads, drainage, and culverts, with explicit considerations of climate resilience.
- Equipping local authorities with the technical guidance, data access, and financial resources needed to implement risk-informed land-use planning.
- Institutionalizing participatory reconstruction processes to ensure inclusion of youth, women, and persons with disabilities.

- Creating formal mechanisms to mobilize volunteer groups and community organizations during the early recovery phase.

To ensure the effective operationalization of the "Build Forward Better" principle, it is recommended that the Government formally initiate resilience mainstreaming into all recovery and reconstruction frameworks. This involves assessing current capacities and establishing robust Governance and Compliance mechanisms that clearly define roles, responsibilities, and decision-making processes for resilient recovery and early reconstruction coordination.

Melissa also highlighted opportunities to further strengthen Jamaica's DRM financing strategy, particularly by expanding the strategic emphasis on risk-informed, ex-ante investments. To enhance preparedness for future low-frequency and high-intensity events, Jamaica may consider upgrading its current approach into a comprehensive DRM Finance Framework that integrates: dedicated Disaster Risk Reduction/resilience budget lines;

- Mandatory risk-screening within the Public Investment Management (PIM) system.
- Integration of climate finance with national resilience priorities.
- Coordinated planning of O&M and DRR investments.
- Hybrid financial instruments combining contingency funds, contingent credit lines, traditional and innovative insurance, and resilience bonds, designed through risk-layering approaches.
- Promoting the gradual integration of disaster- and climate-risk screening into major private and foreign direct investment (FDI) projects, aligned where feasible with the Public Investment Management (PIM) system. This can help strengthen investor confidence while reducing long-term economic and fiscal risk.

Upfront investments (e.g., roof retrofitting, infrastructure upgrade, investments for resilience in the road network, redundancy in power and water systems, weatherproofing small transport assets, and protection of productive assets) are among the most cost-effective public investments and should be prioritized across sectors.

To bridge the enforcement and capacity gap in infrastructure quality, the Government should seek to secure sufficient expert engineering services to provide technical oversight throughout the assessment, design, and execution phases.

To accelerate resilient reconstruction, the Government may also consider streamlining building permit procedures—particularly for small residential structures—while ensuring compliance with updated codes and hazard-specific technical requirements.

In line with climate-resilient urban development principles, Jamaica may also consider promoting compact and resilient community models—prioritizing safe siting, mixed land uses, walkability, and risk-sensitive public space design—particularly in rapidly growing peri-urban areas such as Montego Bay's informal expansion zones.

These reforms will shift Jamaica's DRM system from reactive to predictive, preventive, and integrated, aligning governance, financing, and implementation capacities for long-term resilience.

**C. Investing in disaster risk reduction for resilience.**

Long-term resilience investments (5–10 years) should systematically address the structural vulnerabilities revealed by Melissa, strengthening Jamaica's built environment, infrastructure, and productive systems at scale.

The long-term strategy should prioritize nationwide small-to-medium-scale retrofits. Risk-reducing investments include:

- Roof retrofits and structural strengthening.
- Hardening of critical infrastructure.
- Redesigning vulnerable road sections to meet modern climate-resilient engineering standards.
- Redundancy improvements in electricity and water systems.
- Climate-proofing of small transport infrastructure.
- Protection of agriculture and fisheries assets.

This approach enables broad-based resilience across housing, infrastructure, education, and health systems, and key productive sectors.

A key part of this strategy is to prioritize based on risk, using the national risk platform to pinpoint areas and assets with the greatest exposure and vulnerability. This includes locations prone to roof failures, coastal erosion hotspots, high-risk electricity corridors, outdated water treatment plants, flood-prone sections of roads, and fishing ports that are particularly exposed.

Long-term financing should combine domestic resources with climate finance (e.g., the Green Climate Fund, the Adaptation Fund, NDC implementation funds), as well as emerging international mechanisms such as the Fund for Responding to Loss and Damage. Because many resilience investments provide both DRR and climate-adaptation benefits, Jamaica can leverage multi-source financing to sustain and scale a national resilience investment program. Ensuring sustainability requires a combined hard and soft investment model: physical upgrades paired with training, maintenance capacity, and institutional strengthening.

**D. Enhancing disaster preparedness for effective response and to "Build Forward Better" in recovery, rehabilitation, and reconstruction.**

Strengthening preparedness and response capacity for the 2–10-year horizon is essential to ensure that Jamaica can maintain social and economic functionality during disasters, complementing physical resilience investments.

Melissa demonstrated that cascade failures (e.g., particularly the shutdown of water, health, education, and communication systems triggered by power loss) reveal a systemic weakness in continuity of operations. Therefore, long-term resilience must integrate Business Continuity Planning (BCP) principles into sector-wide and cross-sectoral policy frameworks. In practical terms, this requires prioritizing reliable backup power solutions that enable the rapid reactivation of water supply systems and other critical services, even on a temporary basis, until full grid functionality is restored. Ensuring operational continuity of essential services during the immediate post-disaster period is central to preventing cascading socio-economic disruption.

A central pillar of operational resilience is the development of Impact-Based Forecasting and Early Warning Systems (IBF and IB-EWS) and the institutionalization of Early Action. During Melissa, although warnings were disseminated, residents, authorities, and service providers lacked actionable, impact-based information. Future systems should integrate meteorological and hydrological data with vulnerability profiles to provide location-specific impact forecasting and trigger predefined action protocols.

For high-exposure livelihoods such as fisheries and agriculture, anticipatory action instruments (e.g., compensation for non-operational days and incentives for safe mooring) should be piloted and institutionalized.

In addition, operational resilience planning should extend to Jamaica's growing services economy, including ICT/BPO, logistics, professional services, and tourism. Ensuring redundant digital connectivity, backup power for ICT hubs, and business-continuity protocols that enable remote operations during disasters can help maintain services trade flows. Strengthening continuity in services exports enhances economic stability and reduces volatility in the aftermath of shocks.

## C. Sectoral Recommendations

Based on the cross-cutting priorities outlined in the previous section, this chapter provides sector-specific recommendations for recovery, reconstruction, and long-term resilience strengthening across key areas such as population/household, education, health, housing, culture, agriculture and agrifood systems, tourism, commerce, transport infrastructure, power, water and sewerage, and environment & natural resources/coastal & watershed management.

### Population and Household affected

Melissa's impacts interact directly with Jamaica's underlying socioeconomic structure, where poverty and food insecurity are more pronounced in rural and low-density parishes, inequality has widened, and a large share of households remains clustered in poor or vulnerable categories with limited capacity to absorb shocks. The concentration of severe impacts in predominantly rural western and south-western parishes is consistent with higher poverty incidence, greater reliance on public services, and livelihoods that are highly exposed to climate-related hazards. Livelihood losses among farmers, fisherfolk, and tourism workers heighten the risk of downward mobility into poverty, particularly among households already identified as vulnerable.

In this context, strengthening resilience for the affected population requires targeted interventions that prioritize rural and disaster-prone parishes, reinforce shock-responsive social protection mechanisms, and address food insecurity risks exacerbated by income and production losses. The scale of displacement and housing damage underscores the need to safeguard basic living conditions and ensure continuity of access to health, education, and social services, particularly for children, older people, and low-income households who rely most heavily on public provision.

Labor market disruptions affecting youth, women, and service-sector workers highlight the importance of supporting income continuity and rapid re-engagement in economic activity as part of recovery efforts. At the same time, the high prevalence of non-communicable diseases among older people, combined with ageing trends, reinforces the need to integrate health vulnerabilities into population resilience planning. Given the extensive coverage of social assistance programs, strengthening their capacity to respond rapidly to disaster-induced needs remains central to mitigating welfare losses.

Taken together, the direct and indirect impacts of Hurricane Melissa demonstrate that population resilience in Jamaica is shaped not only by the magnitude of physical damage but also by longstanding structural vulnerabilities related to poverty, inequality, labor market segmentation, demographic change, and multidimensional deprivation. Addressing these factors in an integrated manner is essential to support recovery, reduce future disaster impacts, and strengthen the resilience of the affected population.

- **Strengthening adaptive social protection to build population resilience**

Strengthening resilience for the affected population requires advancing adaptive social protection (ASP) as a core pillar of Jamaica's disaster risk management and recovery framework. Evidence from the

adaptive social protection literature shows that shocks disproportionately affect poorer and vulnerable households, not only because of higher exposure but also due to limited capacity to prepare for, cope with, and adapt to adverse events. These constraints often lead households to adopt negative coping strategies—such as cutting consumption, selling productive assets, or withdrawing children from school—that undermine long-term welfare, reinforce chronic vulnerability, and create poverty traps. In a context of increasing climate variability, the ability of households to "bounce back better" following shocks becomes central to both poverty reduction and resilience-building.

In addition, resilience planning should explicitly incorporate ageing and health-related vulnerabilities, which are increasingly shaping Jamaica's risk profile. With persons aged 65 and over accounting for 10.3 percent of the population and a high prevalence of non-communicable diseases among older adults, disasters pose heightened health risks, particularly during periods of service disruption and displacement. These risks are compounded in rural areas and among lower-income households, where reliance on public health facilities is highest, and health insurance coverage is lowest. Resilience measures should therefore prioritize the continuity of care during and after shocks, including sustained access to essential medications, follow-up for chronic conditions, and targeted support for older persons—especially those living alone or dependent on social pensions—whose capacity to cope with and recover from disasters is more limited.

Jamaica's socioeconomic profile following Hurricane Melissa reflects many of these dynamics. A large share of households is clustered in poor or vulnerable categories, with evidence of downward mobility into poverty aftershocks, particularly in rural and disaster-prone parishes. At the same time, the country possesses important institutional assets that position it well to advance adaptive social protection. Jamaica can be considered a regional pioneer in the production of high-frequency and multidimensional social statistics, supported by the regular implementation of surveys such as the biannual Jamaica Survey of Living Conditions and multiple rounds of the Jamaica Multiple Indicator Cluster Survey. More recently, the inclusion of decent work–related questions in Labor Force Surveys since 2024 further strengthens the capacity to identify labor-related vulnerabilities. While challenges remain in terms of sample size and response rates for some variables, this institutionalized data infrastructure provides a solid foundation for developing robust social baselines that identify vulnerable groups across parishes and population segments.

These statistical capacities are complemented by the breadth of Jamaica's social protection system. Social protection coverage is extensive: according to MICS 2022, 7 out of 10 persons lived in households that received social transfers or benefits in the previous three months. Coverage is especially high among vulnerable groups, with 6 out of every 10 households in the two lowest wealth quintiles reporting receipt of transfers, and 9 out of 10 children living in households benefiting from social assistance. The Programme of Advancement Through Health and Education (PATH), as the main non-contributory social assistance program, therefore represents a critical operational platform for responding to shocks.

Building on these strengths, adaptive social protection offers a pathway to link social assistance, disaster risk management, and climate adaptation more systematically. By leveraging existing data systems to identify exposure and vulnerability, and by using established social assistance programs such as PATH to deliver timely, scalable support in response to shocks, Jamaica can move beyond short-term coping toward recovery pathways that reduce future vulnerability. In line with the principle of "building back better," adaptive social protection can help ensure that disaster recovery does not reproduce pre-existing vulnerabilities but instead supports households in transitioning to more resilient and secure livelihoods in the face of recurrent climate-related risks.

- **Reducing gender-based and socioeconomic disparities to build post-disaster resilience**

Post-disaster resilience strategies in Jamaica should explicitly address gender-based and socioeconomic disparities that shape differentiated recovery outcomes. Evidence from disaster contexts shows that women tend to bear a disproportionate share of unpaid care and domestic work when basic services are disrupted, including responsibility for water access, food preparation, hygiene, caregiving, and household management. These expanded care burdens impose significant physical, emotional, and mental health strains, reduce women's capacity to engage in paid employment, and constrain their participation in post-disaster recovery and resilience-building activities (Oxfam, 2018).

An increase in unpaid care work following disasters can also limit women's involvement in community-level initiatives that are essential for building resilience, such as strengthening local prevention capacities, participating in emergency response networks, and exercising leadership roles in recovery planning. When women are overburdened with domestic and caregiving responsibilities, their perspectives and specific needs are less likely to be represented in recovery discussions and decision-making processes, despite their central role in household and community wellbeing. This exclusion risks weakening the effectiveness and inclusiveness of resilience interventions.

Labor market structures further amplify women's vulnerability to post-disaster shocks. Although women's labor force participation reached 63.3 percent in 2025, their employment remains concentrated in service- and caregiving-related sectors, including tourism, accommodation and food services, and arts and recreation. These sectors are highly sensitive to climate-related disruptions and are more likely to rely on fixed-term, seasonal, or otherwise non-permanent contracts. As a result, women employed in these activities face a higher probability of prolonged employment interruptions during the recovery process, limited access to job protection mechanisms, and greater income volatility at the household level. Disruptions to these sectors can therefore translate into extended income losses, reinforcing existing gender and socioeconomic inequalities and weakening household resilience.

These gendered labor market impacts intersect with income and location. In rural and low-income settings, where access to services is more limited, increased unpaid care demands during disasters may lead households to rely more heavily on children for domestic and subsistence tasks. In Jamaica, child labor affects an estimated 38,000 children aged 5–17 years, with a higher incidence in rural areas and activities including agriculture, domestic work, street vending, and the collection of water and firewood (International Labour Office [ILO], 2018; U.S. Department of Labor, 2024). Post-disaster disruptions to livelihoods and basic services can therefore heighten the risk of child labor and undermine children's education and long-term well-being.

In this context, post-disaster resilience policies should adopt a gender- and age-responsive approach that recognizes unpaid care work as a central dimension of disaster impact, safeguards women's ability to participate in recovery and community resilience activities, and ensures equitable access to support mechanisms. Integrating gender, income, contractual employment conditions, and location into recovery planning is essential to support women's economic re-engagement, strengthen community-level prevention and emergency response capacities, reduce secondary risks such as child labor, and promote inclusive and resilient recovery across parishes.

### Education

Hurricane Melissa caused extensive damage to the education sector, primarily through roof failure, which led to significant interior damage, loss of instructional materials, and prolonged disruptions to learning. Although roofs suffered widespread failure, the primary structural components, such as walls, columns, beams, and foundations, overall performed well, and some schools continued functioning as emergency shelters, indicating a satisfactory level of structural resilience. However, in schools where

roofs failed, interior flooding and damage to equipment were substantial, delaying the safe reopening of facilities.

The widespread use of school buildings as shelters required extended cleaning, sanitation, and safety checks, further postponing the return to normal educational activities. In addition, outages of water and electricity rendered many schools unable to meet safe reopening criteria, disrupting essential programs such as the School Feeding Programme and affecting children's nutrition and hygiene. Damage to textbooks, laboratory supplies, and ICT equipment further constrained learning continuity once classes resumed.

***Building of shelters with a multi-hazard approach at strategic locations to avoid the use of schools' infrastructure, and therefore disrupting this service.*** Shelters by definition are spaces to be occupied under specific conditions and, ideally, for a relatively short period of time. This means that there is a good possibility for thinking of alternative uses of these spaces (e.g., community centres) so that people are familiarized with their location and access routes.

Learning disruptions were compounded by the displacement of students and families, reduced teacher availability due to damaged homes or transport challenges, and weakened communication systems. In several parishes, temporary learning spaces—community centres, churches, or tent-based classrooms—were required to sustain instruction, and psychosocial stress among students and teachers increased the need for early mental-health and counselling support.

These multifaceted challenges highlight that strengthening the education sector requires not only improved physical infrastructure but also enhanced school management systems, shelter operations, WASH and ICT resilience, emergency planning, and mechanisms to sustain learning continuity in both formal and alternative learning environments. An integrated, cross-sector approach is therefore essential.

**1. Rehabilitation**

Rehabilitation efforts should prioritize the rapid and safe restoration of educational services through a sequenced approach that addresses (i) school safety and basic functionality, (ii) learning continuity, and (iii) operational capacity.

***(1) Ensuring school safety and minimum operational conditions.*** Immediate actions should include:

- Removal of debris on and around school grounds.
- Emergency roof repairs and temporary waterproofing to prevent further interior damage.
- Drainage, cleaning, and sanitation of flooded classrooms and facilities.
- Restoration of water, electricity, and essential utilities.
- Rapid replacement of essential furniture, instructional materials, and laboratory supplies.
- Securing and replacing damaged ICT equipment needed for teaching and administration.

For schools used as shelters, standardized checklists for safety inspection, sanitation, cleaning, and restoration of WASH services—implemented with support from community volunteers—can significantly accelerate the transition back to educational use.

***(2) Restoring learning continuity.*** Where classrooms remain unusable, temporary learning spaces (e.g., churches, community centres, tented classrooms) should be activated to prevent prolonged instructional loss. School administrators should prioritize student tracing to identify those displaced or at risk of dropout and to support rapid reintegration into formal learning.

To restart pedagogical activities, damaged learning materials must be replenished, and ICT-supported learning platforms restored. Schools should also identify vulnerable students needing targeted support once classes resume, with priority given to students preparing for high-stakes examinations such as the CSEC, given the time-sensitive nature of their learning needs.

***(3) Supporting school feeding, WASH, and essential services.*** Restarting the School Feeding Programme—critical for nutrition, attendance, and equity—requires urgent restoration of kitchen facilities, water, and electricity. Where service restoration is delayed, temporary measures such as rainwater harvesting systems, portable water filtration units, and temporary power solutions (e.g., portable solar and battery systems) may be deployed to ensure continuity of essential services.

***(4) Stabilizing staffing and school operations.*** MoEY and school administrators should rapidly assess teacher and staff availability, activate mechanisms for temporary reassignments or redeployment, and facilitate inter-school support arrangements to avoid instructional gaps. Transportation and communication constraints affecting staff should be mapped early to ensure safe and predictable school operations.

***(5) Psychosocial support and well-being.*** Hurricane Melissa highlighted that educational disruptions extend beyond physical damage to include emotional and social impacts on students, teachers, and, by extension communities. Psychosocial Support is therefore a critical component of rehabilitation as well as long-term resilience strategies that can be best implemented through the education sector. Rehabilitation should also include early psychosocial support (PSS) for students and staff affected by displacement, housing loss, or traumatic experiences. Schools should coordinate with MoH and local social services to provide counselling, group-based support activities, and referrals where needed. These can include School-based Counselling Units consisting of deployed trained counsellors to reopened schools and temporary learning spaces. Implementing structured group support activities (art therapy, peer circles, understanding and coping with post-traumatic stress) for students and teachers as information conduits for the wider community. Coordination with MoH and Social Services for referral mechanisms for specialized mental health care and teacher PSS training to equip them with basic skills to identify distress and provide initial support. While coordination can be led by the MoEY, support should be accessed through the MoH and Social Services, as well as local and international NGOs and community volunteers. In the medium-term recovery phase, engagement of parents and caregivers through workshops on stress management and child support would be beneficial. Digital platforms for PSS and mental health resources integrated into ICT systems may also be useful to facilitate monitoring and evaluation resources to track student attendance, dropout risk, and psychosocial indicators.

***(6) Coordination and implementation.*** Throughout the Rehabilitation phase, effective coordination among MoEY, ODPEM, the Ministry of Health, local authorities, school boards, and community organizations is essential to restore educational services within the shortest feasible time and to ensure that learning environments are safe, inclusive, and supportive.

**2. Resilient Reconstruction**

Resilient Reconstruction must go beyond restoring school facilities to their pre-disaster condition. Upgrading should follow Build Forward Better (BFB) principles and reflect the dual role of schools as learning environments and designated community shelters. This requires strengthening physical infrastructure, improving service redundancy, and ensuring that school systems can function under disaster conditions with minimal disruption.

***Roofing and Building Envelope Resilience.*** Hurricane Melissa confirmed that the primary point of failure in affected schools was the roofing system rather than the main structural frame. Roof failure

led to extensive interior flooding, loss of instructional materials, and prolonged closure of facilities. Strengthening roofing and building envelopes is therefore a central priority for reconstruction.

Key measures include:

- Improved fastening systems, standardized edge and ridge detailing, and reinforced joints and connections.
- Corrosion-resistant materials suited to Jamaica's climatic and coastal conditions.
- Upgraded wind-resistance specifications aligned with revised national standards.
- Reinforcement of windows, doors, vents, and other envelope components that contribute to internal pressurization and roof uplift.

Schools that serve as official emergency shelters should receive priority retrofitting under a dedicated roofing and envelope resilience program. In high-risk areas, transitioning to reinforced concrete slab roofs or hybrid systems may be appropriate. Improving moisture resistance of interior finishes and providing secure storage for sensitive materials—such as ICT equipment, laboratory supplies, and curriculum resources—will further reduce damage and accelerate reopening after future events.

***Lifeline Redundancy for Schools.*** Melissa showed that even structurally intact schools were unable to reopen without reliable water and electricity. Reconstruction should therefore integrate redundant lifeline systems capable of supporting minimum educational and shelter operations during and after disasters.

Priority investments include:

- Emergency solar-plus-battery systems capable of powering essential loads.
- Rainwater harvesting systems and water purification units to maintain minimum WASH standards.
- Strengthened internal electrical and water-distribution systems designed to withstand high winds and intermittent utility service.
- Protected placement and reinforcement of water tanks, pumps, electrical panels, and ICT hubs to avoid future flood or wind damage.

These measures not only support resilience during disasters but also contribute to long-term energy efficiency and climate mitigation objectives.

***Strengthening School Functionality, Administration, and Shelter Readiness.*** Resilient reconstruction should also enhance the operational and social functions of schools. Key priorities include:

- Upgrading kitchens and storage spaces to ensure continuity of the School Feeding Programme.
- Improving site drainage, perimeter fencing, and safe access routes.
- Protecting learning materials and ICT assets through secure, climate-resilient storage.
- Integrating climate- and disaster-resilient design standards into new construction and major retrofits.

Together, these improvements support a comprehensive BFB approach that strengthens the safety, functionality, and resilience of Jamaica's education system for both everyday learning and emergency conditions.

**3. Building Long-Term Resilience**

**A. Understanding disaster risk**

Hurricane Melissa demonstrated that risks to educational continuity arise from multiple, interrelated factors—not only building conditions but also school location, design, maintenance practices, shelter use, and dependencies on water, electricity, and ICT systems. Strengthening long-term resilience, therefore, requires a systematic and continuously updated School Resilience Assessment that integrates both physical and educational dimensions of risk.

- Roofing type, construction year, and material condition.
- Site characteristics including topography and wind exposure.
- Patterns of shelter use and associated loads.
- Dependency on water, sanitation, electricity, and ICT.
- Risks unique to the education sector, including learning continuity challenges, School Feeding Programme reliance, teacher availability, and digital learning vulnerability.

To support planning and accountability, Jamaica should modernize education data systems by integrating infrastructure information with key learning and operational datasets—creating a unified platform that allows MoEY, local authorities, and school leaders to track vulnerabilities, monitor service disruptions, and prioritize investments. Such a system would improve decision-making for both disaster preparedness and long-term sector planning.

A participatory risk-assessment approach—engaging teachers, parents, and students—can further embed a culture of resilience within school communities and ensure that risk information is widely understood, accepted, and translated into actionable preparedness measures.

**B. Strengthening disaster risk governance to manage disaster risk.**

Melissa demonstrated that roofing resilience, lifeline redundancy, shelter functions, WASH, and learning continuity form an integrated system rather than separate domains. Strengthening governance is therefore essential. MoEY should lead the development of a National School Resilience Framework that integrates:

- Risk assessments.
- Refurbishment and retrofitting priorities.
- Shelter standards.
- Education Continuity Plans (ECPs).

To institutionalize resilience across the sector, MoEY should also formalize a DRM governance structure within the ministry, ensuring that disaster risk management is embedded in school operations and decision-making. All school construction, rehabilitation, and equipment projects should systematically apply climate-resilient design and performance standards, aligned with national hazard profiles and shelter requirements.
Implementation of the Framework requires coordinated roles among MoEY, ODPEM, MoH, MSET, MEGJC / Climate Change Division, local authorities, and school communities.

Key governance measures include:

- Establishing an inter-ministerial coordination mechanism for roofing upgrades, lifeline redundancy, WASH, ICT resilience, shelter standards, and climate finance mobilization.

- Creating a digital asset inventory and inspection system for all schools, covering building characteristics, vulnerabilities, shelter functions, and maintenance histories.
- Designing a sustainable financing mechanism combining national budgets and climate finance sources (GCF, Adaptation Fund, NDC implementation financing).

Schools should also be positioned as resilient community hubs, supporting disaster preparedness training, community engagement, and climate adaptation activities. This strengthens both emergency response capacity and long-term community resilience.

**C. Investing in disaster risk reduction for resilience**

School resilience is a multidimensional system involving infrastructure, shelter operations, and educational continuity. To address these interdependencies, MoEY—working with ODPEM, MoH, MSET, MEGJC/CCD, and local authorities—should develop a National School Resilience Investment Plan that consolidates:

- Roofing and envelope strengthening.
- Lifeline redundancy.
- Shelter standards and upgrades.
- Digital learning resilience.
- Continuity-of-learning mechanisms.

Risk-based prioritization should guide investment sequencing, using factors such as hazard exposure (wind, flood, seismic), structural vulnerability, student population, and shelter demand. This ensures that limited resources achieve the highest impact and strengthens transparency and accountability.

Investments must include both structural ("hard") and operational ("soft") measures—training, standardized inspection, volunteer coordination—to ensure sustainability. Climate finance instruments should be strategically mobilized to support roofing upgrades, solar + battery systems, WASH improvements, and shelter retrofits.

These investments should ensure that educational services can continue even during extended utility outages, through resilient energy systems, digital learning capabilities, and robust operational contingency measures.

**D. Enhancing disaster preparedness for effective response and to "Build Forward Better" in recovery, rehabilitation, and reconstruction.**

Melissa demonstrated that disruptions in the education sector arise not only from physical damage but from multiple interconnected operational challenges. Preparedness must therefore include standardized emergency operating procedures for schools, covering:

- Closure and reopening criteria.
- Procedures for shelter activation and deactivation.
- Sanitation, safety, and inspection protocols.
- Coordination with community volunteers.
- Inter-school student transfers and teacher redeployment.

Comprehensive Education Continuity Plans should address the displacement of teachers and students, ICT losses, communication disruption, and nutrition support. Components include:

- Digital student-tracking systems.
- Supplementary learning support post-disaster.
- Continuity arrangements for School Feeding.

Given the frequent use of schools as shelters, their shelter functions must be upgraded in line with international humanitarian standards (e.g., Sphere Standards). This includes safe spaces, improved WASH facilities, partitions for privacy, accessible design, and reliable emergency power for lighting and communication.

While schools will continue to serve as critical shelters, Jamaica may also explore the phased development of purpose-built, multi-hazard resilient shelters in high-risk parishes. Such facilities would reduce the operational burden on schools and improve the quality and continuity of education following disasters.

Strengthening preparedness will also require deeper collaboration with universities, teacher-training institutions, and civil society organizations to enhance emergency planning, professional development, and community engagement. Such partnerships can support training for teachers and school leaders, improve public awareness, and promote innovations that strengthen the resilience of education services.

Strengthening preparedness will enable schools to function as safe temporary shelters during disasters while enabling faster resumption of educational activities.

### Health

Hurricane Melissa caused multifaceted impacts on the health sector, primarily triggered by roof failure and subsequent cascading effects. At Black River Hospital in St. Elizabeth, roof damage and flooding compromised medical equipment, forced the closure of multiple wards, and resulted in intermittent loss of electricity, water, and ICT services—reducing operations to the emergency department only. Patients were transferred to the Samaritan's Purse Emergency Field Hospital, increasing the burden on regional health services. In Trelawny, a Spanish EMT Mobile Hospital deployed by AECID provided outpatient and emergency care, helping sustain essential medical services.

These cases demonstrate that vulnerabilities in the health sector extend far beyond building structures. They reflect a combination of factors, including lifeline dependency, medical equipment protection, infection prevention and control (IPC), staffing availability, and coordination with external emergency medical teams (EMTs). Importantly, even where main structural components remained intact, failure of the roof—acting as a single point of failure—resulted in the shutdown of entire hospital functions. Melissa thus underscores that strengthening resilience in the health sector requires a comprehensive approach that includes structural reinforcement, health service continuity, redundancy of power and water systems, IPC capacity, and mechanisms for surge staffing and external support coordination.

In addition, the event revealed system-wide vulnerabilities linked to the decentralized delivery model of Jamaica's health services, where severe impacts in one or two Regional Health Authorities constrained national coordination and redistribution of care. The loss of paper-based medical records in several facilities also highlighted the importance of digital health systems for continuity of operations. Notably, facilities previously strengthened under the SMART Hospitals program experienced significantly less disruption, underscoring the value of resilient design and operational readiness.

**1. Rehabilitation**

The priority in the Rehabilitation phase is to rapidly re-establish the minimum conditions for safe medical service delivery, ensuring continuity of emergency and primary care. Key actions include:

- Clearing debris and securing access routes.
- Emergency repairs to roofs and building envelopes, followed by dehumidification and sanitation of flooded areas.
- Rapid procurement or redistribution of damaged medical equipment and supplies.
- Temporary restoration of power, water, and communications through generators, solar + battery backup systems, and emergency water distribution.
- Restoring essential WASH and IPC conditions necessary for safe clinical operations.

Maintaining continuity of care requires functional reallocation of services. Damaged hospitals may continue limited operations in priority areas such as emergency care, outpatient services, or maternal and child health, while transferring inpatient or specialized services to nearby hospitals or field hospitals. Parallel to this, the Ministry of Health (MoH) and Regional Health Authorities (RHAs) should assess staff availability, deploy surge personnel, and ensure adequate staffing levels for safe service delivery.

Re-establishing fundamental hospital conditions—disinfection, temporary restoration of ventilation, stabilization of medical waste management, and safe patient flows—is essential. Given the extensive loss of medical equipment and pharmaceuticals due to roof failure and flooding, rapid asset triage (damage assessment and prioritization for replacement) is vital to accelerating recovery.

Effective Rehabilitation requires coordinated action among MoH, RHAs, ODPEM, PAHO/WHO, and external EMTs under an integrated incident management approach, enabling fast development and adjustment of facility-level recovery plans.

**2. Resilient Reconstruction**

Field assessments indicate that while the primary structural elements of major health facilities performed relatively well, failures in roofs and building envelopes triggered flooding, equipment damage, and ward closures—ultimately leading to the operational shutdown of hospitals. These findings confirm that the roof and building envelope constitute a critical single point of failure in Jamaica's health system and must therefore be a top priority in reconstruction.

Resilient Reconstruction should include:

- Strengthening roof fastenings, edge detailing, and corrosion-resistant materials.
- Reinforcement of structural connections.
- Where appropriate, transitioning to reinforced concrete slab roofs to meet higher wind-resistance requirements.

These measures are essential to protect medical equipment, avoid flood-induced contamination, and prevent functional collapse during extreme events.

In addition, a structured triage process is required to determine whether each affected facility should be repaired, retrofitted, fully rebuilt, or—in exceptional cases—relocated. This assessment should consider:

- The hazard profile and long-term risk of the facility's location
- The degree and nature of structural and non-structural damage.
- The facility's role within the regional referral network and its contribution to continuity of care.

Such criteria will allow reconstruction investments to be prioritized where they produce the greatest resilience gains.

In parallel, improving lifeline redundancy is crucial. Melissa demonstrated how long-lasting disruptions to electricity, water, and communications can paralyze hospital operations even when buildings remain physically functional. Reconstruction should therefore prioritize:

- Installation of emergency solar + battery systems.
- Delineation of priority electricity supply lines.
- Improved water storage, rainwater harvesting, and onsite purification systems.
- Enhancement of hospital WASH systems.
- Strengthening ICT and communication redundancy.

The event also highlighted the vulnerability of paper-based medical records, which suffered extensive damage during roof failures and flooding. Reconstruction should therefore advance the progressive digitalization of medical records and the secure storage of health information systems to ensure continuity of patient care and institutional memory during future disasters.

Such measures directly support health service continuity and reduce cascading failures during future disasters.

**3. Building Long-Term Resilience**

**A. Understanding disaster risk**

Melissa showed that vulnerabilities in health facilities arise from multiple interacting factors: the integrity of roofs and envelopes, dependency on power and water systems, protection and environmental conditions for medical equipment, IPC capacity, patient circulation routes, staff availability, and reliable access to facilities. Long-term resilience requires a comprehensive framework for understanding these risks.

A systematic Health Facility Resilience Assessment should be established, drawing on tools such as the WHO Hospital Safety Index but adapted to Jamaica's infrastructure and hazard profile. This assessment should also evaluate the criticality of each facility within the regional referral network, identifying where functional disruption would have the greatest system-wide impact.
It should include:

- Roof and envelope specifications and condition.
- Degradation of building materials.
- Medical equipment vulnerability and storage conditions.
- Dependency on electricity, water, wastewater, and ICT systems.
- Vulnerabilities in health information systems and risks to clinical records and digital infrastructure.
- Vulnerabilities in key services (emergency, outpatient, inpatient care).
- Staff housing and commuting conditions.
- Access to safe transport routes during disasters.

To embed risk understanding in facility management, the dissemination of the results from risk assessments involving hospital staff, engineers, RHAs, and community representatives should be

institutionalized. This approach fosters a shared resilience culture and enhances preparedness and service continuity.

**B. Strengthening disaster risk governance to manage disaster risk.**

Melissa highlighted that health service continuity depends not only on buildings and equipment but also on coordination across MoH, RHAs, ODPEM, local authorities, lifeline providers (NWC, JPS), PAHO/WHO, and external EMTs. The response required simultaneous management of structural damage, utilities outages, staff shortages, patient transfers, and interactions with field hospitals—demonstrating the need for an integrated governance framework.

A National Health Resilience Governance Framework should be established, led by MoH and involving RHAs, ODPEM, NWC, JPS, local authorities, PAHO/WHO, and relevant partners. The framework should integrate:

- Health facility resilience assessments.
- Prioritization of retrofitting and investments.
- Standards for hospital use as shelters.
- Health Service Continuity Plans.
- Coordination protocols for external EMTs and field hospitals.
- Ppre-agreed restoration priorities with lifeline providers.
- Mechanisms for rapid mobilization of emergency fund to support immediate repairs and essential service continuity (optional).

Strengthening governance also requires the modernization of facility information systems. A Health Infrastructure Information System should consolidate data on facility characteristics, roof structures, degradation, medical equipment, backup power, water systems, IPC infrastructure, and evacuation routes. This enables evidence-based decision-making and accelerates disaster response and recovery processes.

In this context, it is recommended that the Ministry of Health and its Regional Offices implement robust information systems for the digitalization and management of health sector data. These systems should include variables related to the infrastructure and equipment of health institutions, as well as information on medical, support, and administrative personnel, and key service delivery statistics. The objective is to maintain updated and automated databases that ensure the availability of reliable information for multiple uses, particularly for the timely assessment of damages and losses following disasters of the magnitude of Hurricane Melissa. Positioning hospitals as resilient community hubs—supporting public health, community preparedness, and climate adaptation activities—can further strengthen ties between health facilities and surrounding communities, improving collective resilience.

**C. Investing in disaster risk reduction for resilience.**

Black River Hospital was the most severely impacted facility, affected not only by hurricane-force winds and rainfall but also by storm surge, which extensively damaged its infrastructure, equipment, furnishings, and medical records. With respect to storm surge impacts, the hospital's close proximity to the coastline made it particularly vulnerable. This location exposes the facility to potential damage even during events of lower intensity than Hurricane Melissa.

The Black River Health Centre, located almost directly opposite the hospital, faces a similar level of exposure and vulnerability. Consequently, it also sustained significant damage to its infrastructure and equipment as a result of the storm surge. As a result of these impacts, the Black River community

has effectively lost its public healthcare service capacity, directly affecting access to essential health services for the local population.

Given this situation, it is advisable to plan for the relocation of both the hospital and the health center to safer sites located farther from the coastline. In addition, it is recommended that a detailed vulnerability assessment be conducted for health institutions that were most affected, particularly those exposed to storm surge or flooding caused by river overflows or drainage system failures.

Because hospital resilience is determined by interdependent systems—including structural integrity, lifelines, IPC, equipment protection, access routes, and staffing—isolated investments cannot adequately address the systemic risks revealed by Hurricane Melissa. A Hospital Resilience Investment Plan, coordinated by the Ministry of Health and Regional Health Authorities in collaboration with ODPEM and PAHO/WHO, is therefore essential.

This plan should adopt a risk-based prioritization framework, using criteria such as structural vulnerability, service criticality, hazard exposure, and dependence on lifeline systems to guide the sequencing of investments. It should also apply a structured triage approach to determine whether facilities should be repaired, retrofitted, reconstructed, or—in exceptional cases—relocated, based on the level of damage, location-specific hazard risks, and each facility's role within the regional referral network.

Key investment areas include:

- Roof and envelope strengthening.
- Solar and battery emergency power systems.
- Enhanced WASH and IPC infrastructure.
- Protected medical equipment storage.
- Redundant ICT and communication systems.
- Improved flood protection and access routes.
- Strengthening the resilience of health information systems, including the digitalization and secure backup of medical records.

Combining national budget allocations with climate finance (GCF, Adaptation Fund, NDC implementation funding) will enable a sustained, multi-year investment program that transforms health facilities into reliable national resilience assets.

**D. Enhancing disaster preparedness for effective response and to "Build Forward Better" in recovery, rehabilitation, and reconstruction.**

Melissa demonstrated that health service continuity relies on flexible operations, integration with external support, and rapid reallocation of services. Strengthening preparedness requires institutionalizing Health Service Continuity Plans (health-sector BCPs) that define:

- Critical services to be maintained during disasters (e.g., emergency, outpatient, maternal care, surgery, IPC).
- Alternative service delivery arrangements.
- Essential backup power and water thresholds.
- Medical supplies and pharmaceutical stockpiles.
- Staff mobilization and surge capacity protocols.
- Regular simulation exercises and drills (including joint exercises with EMTs and lifeline providers) to validate and update Health Service Continuity Plans.

Given the important role played by international EMTs after Melissa, Jamaica should establish an Emergency Health Operations Framework that covers:

- Reception and integration of field hospitals.
- Coordination and command protocols with external EMTs.
- Patient referral pathways and reverse referral procedures.

Equally important is establishing pre-disaster agreements with NWC and JPS on priority restoration protocols for electricity, water, and communication systems based on facility criticality.

Together, these measures will strengthen the absorptive capacity of the health system, enabling hospitals to function not only as treatment facilities but also as essential safety nets for communities during disasters.

## Housing

### 1. Rehabilitation

Housing damage from Hurricane Melissa was characterized primarily by extensive destruction to roofs (cover and structures), which resulted in loss of habitability, internal water intrusion, and expanded asset damage. Field assessments indicate that, despite widespread roof failure, major structural components, such as walls, columns, beams, and foundations, did not experience the level of catastrophic damage initially anticipated (based on the category of the hurricane at the time of landfall). Because most structural elements (e.g., frames, trusses) remained intact, the large-scale provision of transitional shelters, typically required when structures become uninhabitable for several years) may not be necessary in this event. However, from a future preparedness perspective, maintaining pre-arranged transitional temporary housing supply options and coordination frameworks with international partners remains an important long-term resilience measure.

Many households began self-recovery within days or weeks of the event, procuring materials and reinstalling zinc roofing on their own. While these actions shortened displacement periods and supported early livelihood recovery, they also carry the risk of rebuilding vulnerabilities due to inadequate fastening patterns, insufficient fixings, or a lack of corrosion protection. To ensure safety and durability, technical guidance and material support are essential.

Early recovery efforts should therefore focus on enabling households to restore safe living conditions rapidly while ensuring that self-repairs meet minimum wind-resistance standards. Priority actions include providing roofing sheets, nails, screws, bracing elements, and standardized Safe Roof Repair Kits, along with practical on-site training and visual repair guidelines. Particular emphasis should be placed on simple, clearly illustrated standards for zinc roof repair (with explicit requisites on board thickness, fixing type and spacing, anchoring, and edge treatment) to minimize future roof failures.

Another major bottleneck observed on the ground was debris accumulation, especially large quantities of torn and fragmented zinc sheets obstructing residential areas and roadways. Delayed debris management slowed roof repair, infrastructure restoration, and the reopening of commercial activity, while also increasing health and safety risks. Rapid debris clearance (leveraging community volunteers, local organizations, and, where feasible, structured surge-support mechanisms) is essential for housing recovery. The broader need for a national volunteer mobilization mechanism is discussed later in the report.

**2. Resilient Reconstruction**

As emphasized earlier, the predominant driver of housing damage was the structural vulnerability of roofing systems and some specific elements. Resilient reconstruction must therefore go beyond reinstalling zinc roofs to their prior condition and instead address the structural vulnerabilities revealed by Melissa (i.e., roof assemblies, wall-to-column connections, anchoring, and the prevalence of non-engineered construction practices).

Strengthening the scientific and engineering understanding of zinc roof performance is essential. Field observations revealed highly heterogeneous damage patterns even within the same wind-intensity band, suggesting that roof performance depends not only on material type but also on fastening/attachment schemes, corrosion, edge detailing, roof pitch, and shielding from adjacent structures.

Priority engineering validation activities should include:

- Documentation of roof damage caused by hurricane Melissa by house typology and correlation with wind velocity measures to generate updated vulnerability curves for Jamaica.
- Wind-resistance testing of zinc roofing systems (wind-tunnel testing, connection strength assessments, pull-out tests).
- Verification of traditional fixing patterns used in Jamaica.
- Assessment of degradation (corrosion, fatigue, loosening of fixings) on structural performance.
- Modelling of wind-load distribution based on roof geometry and the surrounding environment.

The resulting evidence should guide reconstruction standards, repair guidelines, and future revisions of the Jamaica Building Code. Two pathways: i) gradual transition from zinc to higher-resistance roofing systems, and ii) adoption of improved zinc systems with enhanced attachment/fastening, thicker sheets, bracing, and corrosion treatments—form the technical foundation for “Build Forward Better” reconstruction.

These engineering assessments are essential not only for setting reconstruction standards but also for insurance pricing, targeting of retrofit subsidies, and the design of support schemes for low-income households.

Given the cultural and economic significance of zinc roofing in Jamaica, full replacement with alternative materials is neither feasible nor desirable. A more realistic approach involves combining i) phased retrofitting of existing homes and ii) mandatory enhanced roofing specifications for new construction and major renovations. This dual-track policy balances technical effectiveness with cultural acceptability and forms a core component of long-term resilience. It must be noted that these interventions must consider the multi-hazard context of Jamaica and perform well not only under wind solicitations but also under those created by strong ground motion.

**3. Building Long-Term Resilience**

**A. Understanding disaster risk**

Long-term resilience begins with establishing a national information system capable of capturing and updating housing risk at high resolution. Melissa revealed significant spatial heterogeneity in damage, highlighting the need for improved understanding of vulnerability by housing type, construction quality, roof characteristics, local topography, and socio-economic factors.

A comprehensive exposure and vulnerability model should be developed by integrating wind observation data, field damage assessments, housing typologies, micro-topography, building age and materials,

and socio-economic information. Zinc-specific fragility functions—considering parameters such as thickness, fastening, corrosion, roof pitch, and shielding—are essential for improving the accuracy of future loss modelling.

Understanding the spatial distribution and characteristics of diverse housing stock (including non-engineered and low-income settlements) would support better targeting of improvement programs, community-based interventions, and alignment with land-use plans. This is not intended as a critique of any specific communities but as a basis for fair, inclusive, and effective national policy.

These data and models should support:

- Prioritization of reconstruction investments.
- Parish-level zoning and land-use adjustments.
- Risk financing and insurance mechanisms.
- Targeting of national housing improvement programs.

To achieve this, relevant agencies and stakeholders (e.g., MLG/CD, ODPEM, Met Service, STATIN, and academia) should collaborate to establish standardized post-disaster damage data protocols, strengthen wind monitoring networks, and build a high-resolution national housing stock database. A National Housing Risk Information Platform operated through a distributed governance model, and with ODPEM as the central coordinator, would provide sustained, scientifically grounded inputs for long-term policy and investment decisions.

**B. Strengthening disaster risk governance to manage disaster risk.**

Improving enforcement of the Jamaica national building code regulatory framework is essential for long-term resilience. While Jamaica has recently updated Building Codes in 2023–2024, Melissa exposed gaps related to roof anchoring, corrosion protection, fastening patterns, and the prevalence of non-engineered construction, underscoring the need for stronger enforcement and the use of existing code provisions to support retrofitting of the existing building stock. These areas merit further review.

Effective enforcement requires strengthening local government capacity for permitting and inspection: staffing, training, standardized checklists, and digital systems. The Government of Jamaica is already aware of challenges related to diverse housing stock and informality; therefore, a balanced approach combining regulation, technical support, materials access, and progressive compliance is recommended.

Enhanced coordination among central ministries (MLG/CD, MHUD), local governments, and agencies responsible for housing, land-use, and DRM will help maintain coherence across policy frameworks.

**C. Investing in disaster risk reduction for resilience**

A sustained DRR investment program is essential for reducing long-term housing vulnerability. Key interventions include:

- Wind-resistant roofing programs.
- Subsidies for repairs and retrofits.
- Community-based housing improvement funds.
- Voluntary relocation from high-risk areas.
- Housing finance and insurance schemes.
- Nature-based buffers that reduce wind exposure.

Since Melissa revealed latent vulnerabilities even in undamaged areas, investments must target the national housing stock, and not only the damaged structures. A policy package combining subsidies, concessional loans, insurance incentives, and contractor certification can support large-scale, phased roof retrofitting prioritized by risk level.

Nature-based Solutions (NbS) for flood control, erosion management, and coastal resilience (particularly relevant for fisherfolk communities). By increasing investments in the implementation of these Eco-DRR solutions, localized protection areas can be created and mitigate the direct and indirect damages to the fisheries sector. These solutions have more applicability in the South of Jamaica since it is where most of the fisheries activity concentrates (over 80%).

The engagement of the private sector must be fostered to cover the financial needs for disaster risk reduction financing. To address fragmented private sector contributions, the Government should seek to connect local private actors with regional and global networks such as ARISE, with the objective of facilitating collaboration, resource mobilization, and coordinated private sector investment in resilient reconstruction initiatives.

**D. Enhancing disaster preparedness for effective response and to "Build Forward Better" in recovery, rehabilitation, and reconstruction.**

Preparedness at the household and community level must be institutionalized, linking roof reinforcement and basic home preparedness actions with Early Warning Systems, particularly future Impact-Based EWS (IB-EWS). Actions include:

- Reinforcement/retrofitting of vulnerable roofs.
- Training in safe repair techniques.
- Pre-positioning basic construction and repairing materials.
- Clear post-warning action protocols.

Building on recent global practice, Jamaica should strengthen the link between impact-based forecasting and anticipatory action, allowing predefined early measures (e.g., safeguarding productive assets, relocating vulnerable assets, or pre-positioning supplies).

Although transitional shelters were not widely required after Melissa, future higher-intensity events may generate greater displacement. Pre-arranged transitional housing options and deployment plans should therefore be integrated into preparedness systems and linked to the Impact-Based Early Warning System (EB-EWS) and Impact-Based Forecasts (IBF).

Debris management remains a critical element of preparedness. Melissa revealed the absence of a structured volunteer surge-support mechanism, with debris removal depending largely on household efforts. Strengthening community volunteer networks (supported by awareness campaigns, simple guidelines, and local organizational partnerships) can accelerate early recovery and reduce secondary risks after future events.

## Culture

### 1. Rehabilitation

Hurricane Melissa caused varying levels of damage across the cultural sector, including roof and envelope failures, water intrusion, and moisture-related damage to collections in museums, libraries, and heritage buildings. A key challenge during the early recovery was the absence of a comprehensive

baseline of cultural assets, which limited the ability to assess damages, prioritize interventions, and coordinate support.

Priority actions during the Rehabilitation phase include:

- Safety inspection and emergency stabilization of damaged facilities, including drying, dehumidification, and temporary roof repairs.
- Emergency stabilization of collections, including documentation and appropriate first-response handling.
- Cleaning, disinfection, and interim operational measures to enable partial or temporary reopening.
- Preparation of a rapid inventory to support prioritization, coordination, and resource allocation.

These measures are essential to restoring minimum functionality and ensuring continuity of cultural activities within affected communities.

**2. Resilient Reconstruction**

A central lesson from Melissa is the lack of a systematic cultural asset baseline, which hindered both damage assessment and medium-term recovery planning. Resilient Reconstruction should therefore focus on strengthening the structural and institutional foundations of the sector.
Key priorities include:

- Development of a national inventory of cultural assets, including museums, libraries, heritage buildings, cultural centers, and community spaces.
- Recording of physical, functional, and administrative attributes needed for rapid assessment and long-term conservation planning.
- Structural improvements based on BFB principles, including enhanced wind resistance, improved waterproofing, and upgraded environmental controls.
- Introduction of preservation equipment and secure storage systems to reduce vulnerability to future hazards.

These actions will address underlying weaknesses and reduce long-term disaster risks for cultural assets.

**3. Building Long-Term Resilience**

**A. Understanding disaster risk**

- Develop high-resolution risk maps for cultural assets, incorporating multiple hazards, such as strong winds, floods, and earthquakes.
- Establish a GIS-based cultural asset mapping system linked to a structured attribute database.
- Conduct vulnerability and assessments to support prioritization of investments based on evidence.

**B. Strengthening disaster risk governance to manage disaster risk**

- Clarify roles and coordination mechanisms among the Ministry of Culture, local governments, national heritage institutions, and ODPEM.
- Institutionalize DRM guidelines and emergency conservation protocols for cultural facilities.
- Promote co-management arrangements with community organizations and cultural institutions for shared stewardship of assets.

**C. Investing in disaster risk reduction for resilience**

- Prioritize preventive investments, including improved structural resilience, environmental controls, and archival storage conditions.
- Explore climate finance opportunities to support adaptation investments in cultural heritage.
- Enhance redundancy in power, climate control, and communications systems for key facilities.

**D. Enhancing disaster preparedness for effective response and to "Build Forward Better" in recovery, rehabilitation, and reconstruction**

- Develop business continuity plans (BCPs) tailored to cultural institutions, including pre-disaster protective actions for collections and facilities.
- Establish rapid-response cultural preservation teams for emergencies.
- Create hazard-triggered action timelines aligned with EWS to guide asset protection and evacuation procedures.

Together, these measures enable the cultural sector not only to withstand future disasters but also to safeguard the cultural identity, social cohesion, and creative economy that underpin Jamaica's long-term resilience.

## Agriculture and Agrifood Systems

Hurricane Melissa generated complex and cascading impacts across Jamaica's agriculture, fisheries, and broader agrifood systems. The event demonstrated that damages were not limited to crops or physical assets; rather, they propagated through the interconnected system of land, ecosystems, infrastructure, markets, and livelihoods. Heavy rainfall and strong winds led to flooding, soil erosion, blocked farm roads, partial damage to livestock facilities, and—most critically—the loss of boats, engines, and fishing gear among small-scale fishers, directly undermining productive capacity and household incomes in affected communities.

In the agriculture sector, impacts extended beyond immediate crop losses to include topsoil removal, impaired drainage, damage to agricultural infrastructure (farm roads, irrigation), and disruptions in market access. In the fisheries sector, the widespread destruction of vessels and gear resulted in acute livelihood disruptions, with additional ripple effects on post-harvest systems as damage to landing sites, ice supply, and cold-storage capacity compromised downstream processing and distribution. These impacts created instability in food supply, income generation, and local coastal economies.

Across the agrifood system, interruptions to transportation, electricity, and communications further slowed recovery, affected storage and processing operations, and contributed to price volatility and uneven food access—impacts that disproportionately affected vulnerable households. Indirect effects—including income losses, heightened food insecurity, and psychosocial stress—intensified the overall socioeconomic burden.

Melissa's most important lesson for the sector is that damages represent more than the "loss of production." They reflect deeper systemic vulnerabilities spanning ecosystems, infrastructure, livelihoods, and community resilience. Consequently, resilient recovery cannot aim merely to restore pre-disaster conditions; it requires a comprehensive approach that strengthens the disaster resilience of productive assets, enhances ecosystem services, improves connectivity and supply chain functionality, and builds the adaptive capacity of rural and coastal communities.

**1. Rehabilitation**

Impacts of Hurricane Melissa on agriculture and fisheries varied across regions. In agriculture, localized flooding led to crop rot, topsoil loss, blocked farm access roads, and minor structural damage to livestock and poultry facilities. In contrast, the fisheries sector experienced far more severe losses: many small-scale fishers lost boats, engines, and gear—core productive assets—resulting in an immediate and complete interruption of livelihoods. Alongside tourism workers, artisanal fishers emerged as one of the groups most acutely affected by Melissa due to the sudden loss of income-generating assets.

In addition to damage at the farm and household level, Melissa also disrupted essential supporting infrastructure. Irrigation and drainage systems, farm access roads, and several landing sites, ice plants, and cold-storage facilities experienced operational interruption, constraining the rapid resumption of production. Market and collection centers were affected by debris accumulation and utility outages, limiting farmers' and fishers' ability to restore post-harvest and marketing activities.

The primary objective of Rehabilitation is the rapid restoration of minimum functionality to sustain livelihoods and reestablish production. Priority actions include:

**Agriculture:**

- Drainage and clearing of flooded fields, removal of sediments, and safe disposal of spoiled crops.
- Emergency repairs to damaged irrigation and drainage infrastructure to enable field operations.
- Reopening of farm access roads obstructed by debris or fallen trees.
- Emergency repairs to damaged livestock and poultry facilities and restoration of basic WASH conditions.
- Distribution of emergency inputs (seedlings, fertilizer, basic irrigation supplies).
- Targeted support for livestock and aquaculture producers, including feed, veterinary supplies, and basic pond rehabilitation where relevant.
- Immediate coordination with export agencies and certification bodies to prevent prolonged disruption of agricultural and fisheries trade flows.

**Fisheries:**

- Provision of replacement fishing gear and basic operational supplies.
- Emergency repairs or temporary solutions to restore basic functionality at landing sites, ice plants, and cold-storage units, enabling safe handling and marketing of catch.
- Assistance with temporary access to landing sites and cold storage, where available.

**Agrifood Systems & Markets:**

- Debris removal and rapid reopening of marketplaces, aggregation points, and small processing facilities, including restoration of electricity and water where feasible.
- Temporary tariff relief or expedited customs procedures for essential recovery inputs such as greenhouse materials, irrigation equipment, and cold-storage components.

**Livelihood Protection:**

- Small emergency grants, vouchers, or microcredit for affected farmers and fishers to offset acute income disruptions.
- Mobilization of public–private partnerships (PPPs) to accelerate repairs to critical facilities such as irrigation schemes, landing sites, and small processing units.

Beyond material damage, the psychosocial stress caused by sudden livelihood interruption—especially among fishers who lost boats and engines—was significant. Rehabilitation should therefore also include:

- Psychosocial first aid and community support groups.
- Early engagement of farmers and fishers in participatory recovery planning to ensure their priorities shape recovery decisions.

Finally, early recovery should be viewed not only as a return to pre-disaster conditions but as an opportunity to introduce climate-smart practices—for example, improving drainage design, promoting more resilient crop varieties, and upgrading cold-chain equipment—thereby reducing future risk.
These combined measures support the rapid resumption of agricultural and fishing activities, stabilize local food supply chains, and reduce short-term livelihood risks.

**2. Resilient Reconstruction**

Hurricane Melissa demonstrated that damage within Jamaica's agriculture and fisheries sectors was not limited to the loss of crops and productive assets. Rather, they reflected deeper structural vulnerabilities within the interconnected system linking ecosystems, infrastructure, production, logistics, and rural livelihoods.

Resilient Reconstruction must therefore prioritize improvement-oriented measures that permanently address the weaknesses exposed by the event, rather than restore pre-disaster conditions.

The following recommendations are organized into Public Sector and Private Sector interventions, with sub-sections for Agriculture and Fisheries.

**I. Public Sector Interventions**

**Agriculture:** Melissa revealed that inadequate drainage, vulnerable rural roads, and weak livestock and agricultural facilities significantly delayed the resumption of production. Key medium-term measures include:

- Climate-resilient upgrading of rural access roads, including improved surfacing, enhanced drainage structures, and slope stabilization to withstand heavy rainfall and debris flows.
- Permanent enhancement of field drainage capacity in flood-prone areas by converting informal channels into engineered drainage systems.
- Strengthening of wind- and water-resistant standards for livestock shelters and agricultural buildings, ensuring alignment with updated hazard information.
- Reconstruction and upgrading of SPS and food safety laboratories, applying disaster-resilient design features to ensure continuity of national food safety functions.

These public-sector investments form the backbone of a more resilient and productive agri-food system.

**Fisheries:** Damage to small landing sites, mooring points, and cold-storage infrastructure disrupted both production and post-harvest supply chains. Priority reconstruction actions include:

- Rebuilding landing sites and fisheries infrastructure (piers, ramps, storage buildings) using hurricane- and storm-surge–resilient standards.
- Reconstruction and climate-resilient upgrading of ice plants and cold-storage facilities, incorporating redundant power systems (e.g., solar + battery) and corrosion-resistant specifications.

- Strengthening of mooring systems and protected storage areas to reduce loss of vessels and gear in extreme weather.

These measures help stabilize coastal livelihoods and reduce recurrent disaster-induced losses.

#### II. Private Sector Interventions

**Agriculture:** Many small-scale farmers lack the financial capacity to rebuild without targeted support. Priority reconstruction measures include:

- Matching grants for the replacement or upgrading of greenhouses, livestock shelters, and cold-storage units using resilient designs.
- Strengthening access to production inputs, including seedlings, fertilizers, and irrigation components, where post-disaster supply chains remain fragile.
- Concessional financing through DBJ and commercial banks to support medium-term recovery of productive assets.

**Fisheries.** For many artisanal fishers, Melissa resulted in the total loss of income-generating assets. Medium-term actions should include:

- Support for the replacement of small vessels, engines, and gear, using standardized models equipped with modern safety and navigation features.
- Upgrading of storage facilities and gear protection systems, including wind-resistant sheds and secure, elevated storage units.
- Strengthening of safety-at-sea training and dissemination of operational protocols for extreme weather preparedness.

Overall, resilient reconstruction in agriculture and fisheries must focus on permanently correcting the vulnerabilities exposed by Melissa, simultaneously upgrading public infrastructure and enabling private sector recovery.

By addressing systemic weaknesses—drainage, rural access, mooring systems, cold chains, and the resilience of productive assets—the sector will be better positioned to withstand future high-intensity events and support medium-term livelihood security.

### 3. Building Long-Term Resilience

#### A. Understanding disaster risk

Strengthening long-term resilience requires developing a high-resolution, integrated risk information system for agriculture and fisheries, grounded in both current and future climate conditions. Given that the Caribbean region is periodically affected by tropical depressions and hurricanes, the risk of these climatic events affecting Jamaica must be identified early and on time. Their potential impacts on productive assets and agricultural and fisheries economic flows must be correctly understood and systematically assessed.

The economic, social, food security, diversity, and vulnerability dimensions of Jamaica's agricultural sector justify its management through a strengthened, consolidated, and interconnected Agricultural Information System. Such a system is essential for managing risks to agricultural assets and economic flows and for supporting informed decision-making across preparedness, response, and recovery phases.

At the same time, Jamaica's fisheries sector—given its high exposure to storms and hurricanes and its reliance on highly mobile and coastal assets—requires sector-specific risk identification and monitoring arrangements. The risk of hurricanes and storms affecting fishing assets and fisheries economic flows must be identified early and promptly to minimize losses and ensure the continuity of fishing activities. Strengthening local oceanographic, climatological, geospatial, and fisheries statistical information systems is therefore crucial for effective fisheries risk management.

- Core elements of this integrated risk information system include.
- Crop-specific vulnerability maps for wind and flood hazards.
- Updated agricultural drainage capacity maps.
- Geospatial mapping of artisanal fishers' assets (boats, engines, gear storage).
- Coastal wave, storm surge, and inundation models.
- Watershed-scale erosion and sediment-transport assessments to inform upstream–downstream risk interactions.

In addition, the strengthening, articulation, and interconnection of oceanographic, climatological, geospatial, agricultural statistical, and continuous monitoring information systems are essential to minimize losses and damages through effective risk management and administration. For agriculture, this includes the generation of information on vulnerable agricultural zones, sectoral susceptibility maps, agro-productive zoning, land-use maps, production maps, asset baselines, and flows of production at risk. For fisheries, it requires rapid and timely access to oceanographic and climatic information, particularly during extreme events.

In the fisheries sector, real-time information on oceanographic and climatic variables during storms is a distinguishing and critical requirement. Such information enables the activation of operational protocols that can make a decisive difference in minimizing damage to fishing assets and reducing economic losses in production flows. Oceanographic and climatic data generated through a network of monitoring stations at strategic fishing sites are therefore a key factor for tracking fundamental variables and minimizing damage and losses.

In line with emerging climate-projection requirements, risk assessments should be updated to 2050, incorporating scenarios of water availability and changes in the frequency and intensity of hazards. This forward-looking approach is particularly relevant in the context of recurring extreme events affecting crops, livestock, fisheries, and associated value chains.

To support systematic planning, Jamaica should also establish a national agrifood asset registry, integrating farm assets, fisheries infrastructure, public facilities, and supply-chain nodes into a unified geospatial database. This registry should be linked to land-use planning, permitting processes, and public investment decision-making.

Given its frontline role, RADA's digital extension and data-collection systems should be upgraded to serve as a key operational interface for agriculture, enabling real-time field reporting, standardized damage assessments, and farmer profiling. In parallel, fisheries data systems should be strengthened to ensure timely reporting on asset exposure, damage, and recovery needs, supporting last-mile risk communication for fishers.

A strengthened and consolidated agricultural information system would support planning and decision-making in the short, medium, and long term, including the design of agricultural risk-minimization protocols, land-use policies, buffer zones, and investments in resilient infrastructure and other mitigation works. Complementarily, enhanced fisheries information systems would support the design and implementation of operational response protocols, asset protection measures, and continuity strategies specific to fishing activities.

Together, these datasets support:

- Improved impact-based early warning tailored to farmers and fishers.
- Climate-resilient food security strategies.
- Long-term planning for a climate-resilient Blue Economy.
- Investment prioritization for irrigation, drainage, fishery ports, mooring systems, and watershed rehabilitation.

Coastal wave and storm-surge modeling is especially critical for prioritizing investments in fishing ports, mooring systems, and coastal land-use planning in a context of rising sea levels and increasing climate variability, and represents a core risk assessment tool uniquely relevant to the fisheries sector.

### B. Strengthening disaster risk governance to manage disaster risk

Strengthening long-term resilience requires governance reforms that extend beyond formal DRM plans for agriculture and fisheries. While the Ministry of Agriculture, Fisheries and Mining (MoAF), RADA, the Fisheries Division, and local authorities play central roles in preparedness and response, Hurricane Melissa demonstrated that deeper structural vulnerabilities within agrifood and coastal systems require a more integrated and forward-looking governance approach.

Long-term resilience should therefore be anchored in policy alignment across DRM, climate change, and agrifood sector strategies, ensuring a shared objective of climate-resilient and low-carbon agrifood systems. This includes integrating agriculture and fisheries resilience into Integrated Coastal Zone Management (ICZM), Blue Economy, and territorial development frameworks, recognizing the interdependence of coastal ecosystems, rural production systems, and national food security.

#### Agricultural sector–specific governance measures

Within this governance framework, agricultural risk governance in Jamaica should be strengthened through the development of a national strategy for the large-scale implementation of agricultural insurance and other financial risk management instruments. Such a strategy would facilitate the timely restoration of production, replacement of affected assets, reestablishment of agricultural economic flows, and the safeguarding of national food security and sovereignty following climate-related shocks. It is advisable to align this agricultural insurance policy with the productive promotion policies of the Ministry of Agriculture, Fisheries, and Mining. In this regard, the delimitation of agro-productive zones according to levels of risk is essential for effective risk management and constitutes a key input for agricultural insurance design. Productive development policies should balance annual and permanent crop structures with spatial patterns of vulnerability, allowing for timely post-disaster productive reactivation.

The recurrence of climate-related hazards—including crops uprooted by strong winds, livestock activities affected by flooding, plantations damaged by landslides, and productivity losses associated with extreme pest and disease outbreaks—reinforces the need to massify agricultural insurance as part of an integrated risk management approach based on territorial zoning.

#### Fisheries sector–specific governance measures

For the fisheries sector, the accessibility and large-scale use of financial instruments for the protection of fisheries investments is essential to guarantee the sustainability of this economic activity. The use of fisheries insurance that protects fishing assets and the economic flows of fishers in the face of catastrophic events or climate-related disasters would facilitate the continuity of Jamaica's fishing

capacity and fish catch, while ensuring national food security, economic activity, and a minimum income for fishers.

The zoning of fishing activities according to disaster risk is essential for the effective articulation of fisheries insurance instruments aimed at protecting fishing assets and their associated economic flows. In this context, the governing body of Jamaica's fisheries policy should consider establishing a minimum level of access to fisheries insurance to guarantee the annual continuity of coverage.

It is recommended to conduct a fisheries insurance study to determine appropriate policy values and coverage levels, with the objective of ensuring greater accessibility for fishers. The articulation of efforts between the Government and the private sector is essential for the development of a national or regional fisheries insurance instrument for Jamaica or the wider Caribbean.

**Cross-sectoral governance and financial protection**

Governance reforms should also strengthen management standards for farm roads, irrigation systems, fishing ports, and mooring facilities—reflecting not only disaster resilience but also climate-proof productivity. Co-management frameworks with community organizations remain essential for sustaining these systems and ensuring local ownership.

To reinforce economic resilience across sectors, governance arrangements should incorporate risk-financing instruments—including CCRIF coverage, contingent credit, and parametric products—so that productive sectors such as agriculture and fisheries are explicitly integrated into national financial protection strategies. Complementary fiscal and regulatory measures, such as temporary duty waivers for resilient materials and investment incentives for climate-resilient agribusiness and fisheries upgrading, should also be institutionalized.

Finally, governance mechanisms should support mid-sized agrifood and fisheries value-chain enterprises, whose recovery is essential for market stability and employment. Public–private coordination platforms can guide standards, investment prioritization, and financing pathways for resilient processing, storage, cold-chain systems, landing sites, and market infrastructure.

Together, these governance reforms enable Jamaica to transition from reactive recovery toward a coherent, risk-informed system that embeds resilience across institutions, policies, value chains, and community-level management.

**C. Investing in disaster risk reduction for resilience**

Disaster risk reduction investments in agriculture and fisheries must be understood not merely as post-disaster measures, but as foundational components of Jamaica's long-term climate-resilient development. Melissa revealed that the sector's vulnerabilities arise from interconnected weaknesses across ecosystems, productive land, infrastructure, supply chains, and rural and coastal livelihoods. Investments should therefore target systemic resilience rather than isolated asset reconstruction.

**Agriculture.** Priority DRR investments in agriculture should strengthen both disaster resilience and the long-term transition toward climate-smart, productivity-enhancing agri-food systems.

*1. Climate- and disaster-resilient land and infrastructure*

- Upgrading field drainage systems and soil conservation measures in flood-prone areas to reduce waterlogging, erosion, and crop loss.

- Reinforcing rural access roads—surfacing, drainage improvements, and slope stabilization—to maintain market connectivity during extreme weather.
- Strengthening public irrigation infrastructure, including resilient intake structures, conveyance systems, and water storage.
- Integrating watershed management and source protection to reduce erosion, improve water availability, and stabilize agricultural production.

*2. Expansion of nature-based solutions (NbS) for protective functions*

- Promoting windbreaks, agroforestry systems, vegetative slope stabilization, and riverine buffer zones.
- Coordinating with coastal and watershed restoration initiatives, including mangrove rehabilitation where relevant to agricultural valleys and floodplains.

*3. Production diversification and systemic risk reduction*

- Diversifying production zones and cropping systems to reduce exposure to local climate shocks.
- Supporting the adoption of drought- and heat-tolerant varieties and diversified livelihood strategies.

*4. Structural resilience of agricultural facilities*

- Upgrading greenhouses, livestock housing, and agricultural buildings using Build Forward Better (BFB) and wind-resistant design standards.
- Incentivizing adoption through targeted grant schemes and concessional finance.

*5. Enabling private investment*

- Providing clear policy signals, de-risking instruments, and innovation support to stimulate private investment in low-carbon, climate-resilient agri-food enterprises.

**Fisheries.** Fisheries infrastructure and assets constitute core elements of Jamaica's Blue Economy. Their resilience is essential not only for disaster risk reduction but for long-term coastal development.

*1. Resilient port and landing-site infrastructure*

- Reconstructing landing sites, jetties, ramps, and fish-handling facilities using hurricane-, storm-surge-, and corrosion-resistant standards.
- Upgrading ice plants and cold-storage units with redundant power systems (e.g., solar + battery) to maintain post-harvest value chains during outages.

*2. Strengthened vessel resilience and safety-at-sea*

- Promoting durable small-vessel designs, long-life engines, and standardized navigation and safety equipment.
- Strengthening training and dissemination of weather risk protocols linked to improved forecasting.

*3. Improved mooring and asset-protection systems*

- Installing reinforced, modernized mooring systems and creating wind-resistant, elevated gear-storage facilities to reduce recurrent asset loss.

*4. Risk-transfer and continuity mechanisms*

- Expanding parametric fisheries insurance or similar mechanisms for rapid liquidity after a storm.
- Anticipatory action instruments can be better linked to EWS. A starting point for this can be targeting fisherfolk communities, ensuring that AA (for instance, in the form of cash disbursements) provides them with a compensatory amount for the days that they will not be able to work, but also serves as motivation to reduce their risk by following the advice and safely anchoring the boats.
- Utilizing concessional credit and guarantees to support replacement of vessels, engines, and cold-chain assets.

Collectively, these investments reduce disaster-related losses, stabilize rural and coastal livelihoods, enhance food security, and accelerate the structural transformation of Jamaica's agri-food and Blue Economy systems. By addressing vulnerabilities in drainage, irrigation, watershed integrity, mooring systems, cold chains, and productive assets, the sector will be better positioned to withstand future high-intensity events and adapt to a changing climate.

**D. Enhancing disaster preparedness for effective response and to "Build Forward Better" in recovery, rehabilitation, and reconstruction**

Preparedness in agriculture and fisheries must evolve from general emergency procedures into sector-specific Business Continuity Planning (BCP) that reduces asset loss, minimizes production downtime, and ensures rapid post-disaster recovery. Melissa showed that preparedness gaps—particularly at the farm, community, and port levels—significantly amplified livelihood impacts. Strengthening preparedness, therefore, requires improved early warning systems, operational protocols, and local coordination mechanisms.

**Agriculture.** Agriculture BCP should provide clear, actionable procedures tailored to farms of different scales and production types. Key elements include:

- Crop and harvest protection measures, including pre-storm harvesting, crop covering, and securing of seedling nurseries.
- Sheltering procedures for livestock and poultry, with standardized protocols to reduce injury, mortality, and contamination risks.
- Securing agricultural equipment, greenhouses, irrigation assets, and storage structures to prevent wind and water damage.
- Shutdown and protection protocols for irrigation and water-distribution systems, especially in flood-prone areas.

To support these actions, modernized early warning services should provide farm-level advisory products on weather, water availability, pests, and markets. Impact-based alerts—with clear operational triggers—enable farmers to take timely, sector-specific protective measures.

**Fisheries.** Fisheries preparedness must reduce storm-induced losses of vessels, engines, and gear—one of the most severe livelihood impacts observed after Melissa. A strengthened Fisheries BCP should include:

- Secure mooring protocols, including relocation procedures to protected sites before storms.
- Protection and elevated storage of engines and gear, reducing exposure to surge, debris, and theft.
- Pre-disaster stocking of essential operational supplies to enable rapid resumption of fishing activity.

- Safety inspections of landing sites and ports, ensuring structural stability and emergency functionality.

These measures should be closely linked to impact-based marine early warnings, including advisories on wave height, surge risk, and port safety conditions.

**Strengthening Community and Institutional Preparedness.** Preparedness must also operate at community and institutional levels. Two priorities are essential:

- Institutionalizing community-based disaster committees in farming and fishing communities, with clear mandates for preparedness, early warning dissemination, and recovery coordination.
- Establishing joint rapid assessment teams between RADA and the Fisheries Division to undertake fast, standardized evaluations of damages, livelihood impacts, and priority needs immediately after an event.

These measures improve the speed and accuracy of response operations and reduce the time required to restore production and income.

Collectively, through strengthened BCPs, improved early warning services, and organized community-level preparedness, the agriculture and fisheries sectors will be able to reduce asset losses, shorten recovery time, and contribute more effectively to the development of resilient agri-food systems and a sustainable Blue Economy.

## Tourism

Given its dominant contribution to GDP and employment, tourism represents both a pillar of Jamaica's economic resilience and a channel through which disasters can transmit widespread socioeconomic shocks. Jamaica's strong legal, institutional, fiscal, and municipal DRM frameworks provide a solid foundation to address these risks. Extending existing strengths toward tourism-specific risk analytics, localized governance mechanisms, resilient investment, and targeted worker protection would enhance the sector's capacity to withstand shocks while supporting a more inclusive and durable recovery.

### A. Understanding disaster risk

Tourism represents one of Jamaica's largest contributors to GDP when direct, indirect, and induced effects are considered, and it is also a major driver of employment, particularly in coastal and urban municipalities. At the same time, employment in the sector is characterized by high seasonality and short-term contractual arrangements, with a substantial share of workers engaged on temporary or informal terms. These features increase vulnerability to income shocks following disasters and make labor-market disruptions an important—yet often under-measured—component of disaster risk in the tourism sector (Muhummed, 2025).

Jamaica's full municipal engagement in Making Cities Resilient 2030 and the implementation of the Disaster Resilience Scorecard across all parishes provide a strong foundation for localized, multi-hazard risk assessment (UNDRR, 2025). This nationwide uptake demonstrates the country's commitment to locally grounded, measurable, and actionable resilience planning (United Nations in the Caribbean, 2025). Building on this base, Jamaica would benefit from complementing existing assessments with tourism- and labor-sensitive risk analytics.

A central element of this effort should be the institutionalization of a robust and continuously updated tourism baseline, explicitly designed to support post-disaster damage and loss assessments, consistent with DaLA practices. Beyond descriptive monitoring, the baseline should include:

- A systematic inventory of tourism assets, covering fixed infrastructure (accommodation facilities, ports, marinas, transport links, utilities), movable assets (equipment, furnishings), and critical services.
- Economic and labor information, including revenues, operating costs, wages, employment levels, and contract structures, enabling the estimation of both direct asset damages and indirect losses related to business interruption and employment disruption.

Maintaining this information ex ante would substantially improve the speed and accuracy of post-disaster assessments, allowing authorities to quantify not only physical damages but also economic and employment losses that affect household welfare and local recovery trajectories.

To operationalize this approach, the proposed baseline could integrate hazard exposure data with tourism asset inventories and employment density indicators, enabling authorities to anticipate spatially differentiated impacts on both capital and labor. This would strengthen preparedness, improve recovery sequencing, and support clearer expectations regarding reopening and job reactivation timelines in tourism-dependent destinations.

The Ministry of Tourism of Jamaica should engage proactively with private-sector stakeholders in developing and maintaining this baseline and associated analytical tools. This engagement should be underpinned by transparent communication on the analytical purpose and recovery relevance of the data, alongside clear guarantees on data protection, confidentiality, and restricted use, to safeguard commercially sensitive information and encourage sustained participation.

**B. Strengthening disaster risk governance to manage disaster risk**

- **Improving institutional coordination and empowering localized response capacity**

Jamaica's disaster risk governance framework—anchored in the Disaster Risk Management Law (2015) and reinforced by the National Policy on Disaster Risk Reduction Financing (2021)—provides a strong legal, institutional, fiscal, and municipal foundation for managing disaster risks across sectors. International assessments have highlighted Jamaica's leadership in integrating disaster risk reduction into public investment planning and local governance, supported by high budget execution rates and sustained political commitment (UNDRR, 2024; United Nations in the Caribbean, 2025).

Within this framework, governance effectiveness in the tourism sector would benefit from formalized coordination and operational clarity during emergency response and early recovery. In particular, formalizing the role of local tourism operators through Tourism-focused Community Emergency Response Teams (Tourism-CERTs) would strengthen bottom-up response capacity in major tourism hubs and resort clusters (OAS, 2022).

These teams—composed of licensed accommodation providers, tour operators, and tourism service firms—could be formally recognized within the national response structure coordinated by the Office of Disaster Preparedness and Emergency Management. Their primary function would be to provide rapid, standardized information on operational status, access constraints, and immediate workforce displacement, complementing technical damage assessments conducted by public authorities.

Governance arrangements should also facilitate systematic coordination between tourism authorities, disaster management institutions, and social protection agencies, ensuring that labor-market impacts

are addressed alongside infrastructure and service restoration. This coordination is particularly important in destinations with a high reliance on seasonal and short-term tourism employment, where delays in response can translate into prolonged income losses and slower local recovery.

Overall, Jamaica's strong legal, institutional, fiscal, and municipal DRM frameworks provide a solid foundation to address disaster risks in the tourism sector. Extending existing strengths toward tourism-specific governance mechanisms, localized response capacity, and coordination with labor-related institutions would enhance the sector's ability to withstand shocks while supporting a more inclusive and durable recovery (United Nations in the Caribbean, 2025).

**C. Investing in disaster risk reduction for resilience**

- **Reducing existing vulnerabilities and aligning incentives for risk-informed investment**

Jamaica's preventive investment profile—reflected in disaster risk reduction (DRR) expenditure equivalent to 1.12 percent of the total national budget in 2023 (UNDRR, 2024). Classified spending directed toward prospective risk management, consistently strong budget execution, and provides a solid basis for advancing more ambitious resilience investments in the tourism sector. Investment strategies should prioritize tourism-critical infrastructure in high-concentration destinations such as Montego Bay, where disruptions to infrastructure and essential services can rapidly generate cascading effects across supply chains and employment.

In this context, the establishment of a parametric insurance–linked grant mechanism for hotels that invest in combined nature-based and engineered coastal protection measures would meaningfully reduce asset-level risk while supporting faster business reopening and job recovery after disaster events. These asset-focused investments should be complemented by targeted measures to reduce employment volatility, including incentives for business continuity planning and workforce retention, to limit indirect disaster losses and strengthen the resilience of tourism-dependent communities.

**D. Enhancing disaster preparedness for effective response and to "Build Forward Better" in recovery, rehabilitation, and reconstruction**

- **Improving crisis management capacity, financial resilience, and inclusive recovery**

Jamaica's national contingency fund and its effective use of risk transfer instruments provide a strong fiscal backbone for disaster response and early recovery. However, given the employment structure of the tourism sector, recovery strategies should also explicitly address income and employment shocks affecting seasonal and short-term workers, who are often among the most exposed to prolonged disruptions following major disaster events.

In addition to supporting business recovery, the government should therefore explore the establishment of a dedicated, temporary relief mechanism for tourism workers affected by disasters, particularly those on short-term or seasonal contracts who lack access to social security or unemployment benefits. Such a mechanism could provide time-bound income support or emergency cash transfers, triggered by verified disaster impacts and informed by local damage and loss assessments, helping to stabilize livelihoods during recovery phases. Rapid, targeted surveys coordinated by the Ministry of Tourism should capture not only business functionality but also workforce impacts, thereby informing the timely deployment of relief and re-employment measures.

As part of a Build Forward Better recovery strategy, Jamaica could also consider the introduction of a voluntary "Resilience Certified" label for tourism accommodations, designed to build on and deepen existing national certification mechanisms. Drawing on emerging international initiatives such as the

Hotel Resilient Initiative (Khazai et al., 2018), this certification could promote enhanced operational resilience standards, including off-grid energy capacity (e.g., solar and battery systems), at least 72-hour water autonomy, and certified staff disaster response plans.

Importantly, this proposal would not start from zero. Jamaica already operates a "Corridor Certified" system, under which tourism properties are audited against health, safety, and emergency management criteria, including the existence of emergency plans and staff training. A Resilience Certified label could therefore function as an advanced or extended tier, explicitly focused on disaster resilience and continuity of operations, rather than replacing existing certification arrangements (Davis, G., 2021).

These standards could be further strengthened through AI-enabled digital tools that enhance preparedness, communication, and recovery coordination. For example, the "Safety Tips" application developed under Japan's national tourism safety framework provides multilingual, real-time hazard alerts and communication support for international visitors, illustrating how digital platforms can translate early warnings and damage and loss assessments into actionable guidance for tourists and operators (Japan National Tourism Organization, n.d.). Embedding similar digital functionalities within a resilience certification framework would help ensure that post-disaster reconstruction not only restores assets but also reduces future economic losses, improves visitor safety, and accelerates the reopening of tourism facilities, consistent with Sendai Framework priorities.

### Commerce

Jamaica would benefit significantly from the development of a robust and continuously updated baseline for the commerce sector, with applications that extend well beyond disaster assessments and risk management. While the baseline constructed for this assessment represents an important initial effort, it is likely to underestimate the true scale and value of commercial activity, particularly among small, informal, and micro-enterprises that are not fully captured in existing administrative records or third-party data sources. Strengthening this baseline will require closer and sustained collaboration between the Statistical Institute of Jamaica (STATIN), the Ministry of Industry, Investment and Commerce (MIIC), other relevant line ministries, and the private sector. This collaboration should begin with clearly communicating the purpose and practical uses of the baseline and continue through joint efforts to improve coverage, validate information, and ensure regular updates. Clear assurances regarding data confidentiality and appropriate use will be essential to foster private-sector participation and information sharing.

In parallel, government institutions should work closely with the private sector to design and implement rapid surveys aimed at assessing the operational status of commercial establishments during the recovery phase. Although low response rates often present challenges to data collection, these can be mitigated by ensuring that business owners understand the relevance and tangible benefits of providing timely information. Improved communication strategies and simplified survey instruments would significantly enhance data availability and quality, thereby supporting more effective recovery monitoring and evidence-based policy responses.

Finally, the government should explore mechanisms to support small and medium-sized commercial enterprises in accessing insurance and other risk-management instruments. Strengthening awareness and understanding of these financial tools among business owners is essential to enhancing the resilience of the commerce sector and reducing its vulnerability to future shocks.

### Transport Infrastructure

Hurricane Melissa caused comparatively limited impacts on the transport sector relative to housing, education, and health facilities. While limited structural damage was observed on primary roads or

bridges, the hurricane caused extensive disruption to Jamaica's roadway infrastructure. In total, 404 main roads were affected, spanning 3,424 kilometers. This disruption resulted from a combination of intense rainfall, prolonged flooding, coastal storm surges, and numerous landslides triggered by saturated slopes. Severe riverine overflow and compromised embankments undermined road surfaces, washed out retaining structures, and contributed to major blockages caused by fallen trees, silt, and debris. Along the southwestern coast, including the Black River area, storm surge resulted in localized shoulder erosion and pavement damage, highlighting the vulnerability of coastal transport corridors to wave action and coastal hazards.

Port and coastal infrastructure showed no structural damage to core port assets (e.g., quay walls, berths) within the scope of the assessment. Nevertheless, on the landside of the ports of Montego Bay, Falmouth, and Ocho Rios, several terminal buildings and warehouses experienced roof and envelope damage, which—while not halting port operations in their entirety —did affect the continuity of service and safety of terminal functions.

At airports, Norman Manley International Airport experienced some flooding, damaged signs, and damage to a small section of the roof, causing little disruption. On the other hand, Sangster International Airport in Montego Bay suffered major roof failures, flooding in passenger areas, and damage to boarding bridges. The main cargo warehouse, the maintenance building, the solar system, the AC cooling system, and other equipment also suffered damage. Runways and air traffic control systems, however, did not sustain significant structural damage.

**1. Rehabilitation**

In the weeks following Melissa, essential Rehabilitation measures had already been implemented across the transport network, including:

- Safety inspections of major roads and bridges.
- Clearance of fallen trees, silt deposits, and landslide debris.
- Drainage restoration to remove standing water from inundated road surfaces.
- First-level assessments of slope stability and flood-related risks.

While most road sections were fully operational at the time of field visits, localized pavement and shoulder failures caused by storm surge near Black River required ongoing temporary backfilling and surface repairs.

In ports and airports, authorities undertook early emergency actions including roof and envelope patching, cleaning and disinfection of flooded areas, and temporary restoration of electrical and communication systems. Port and airport operations continued, albeit with some limitations. Full repair of terminal roofs and restoration of damaged boarding bridges remain priority tasks already underway, but requiring further dedicated effort.

**2. Resilient Reconstruction**

Given the generally limited damage across the transport sector, Resilient Reconstruction does not require large-scale rebuilding but should instead focus on risk-informed, selective retrofitting to address localized vulnerabilities exposed by Melissa. However, given Jamaica's extensive road network with 5,000km of main roads and 15,000km of local and community roads, this will likely amount to hundreds of kilometers.

**Coastal and Inland Roads.** Localized damage observed along the Black River coastal corridor indicates exposure to storm surge, overtopping, erosion, and pavement undercutting. Roads located in elevated

and undulating terrain suffered from erosion from high velocity rainfall runoff and slope failures from saturated soils on steep slopes. Targeted interventions should include:

- Erosion control and shoreline protection.
- Improved surface and subsurface drainage.
- Slope and embankment stabilization.
- Pavement reinforcement for overtopping-prone segments.
- Extensive maintenance on high-risk sections of the road network.
- Improved designs and use of climate-resilient pavement layers and surfaces.
- Drainage system repairs and gully reinforcement.

These measures are small-to-medium-scale interventions but can significantly reduce disruption risks and maintain connectivity during extreme weather events. In areas such as the Black River coastal corridor, where damage has been both concentrated and recurrent, transport rehabilitation may be most effective when embedded within a broader territorial reconstruction strategy. Integrating road resilience measures into a comprehensive, risk-informed spatial recovery framework can help ensure that infrastructure investments contribute not only to connectivity but also to long-term "Build Forward Better" objectives at the local level.

**Port and Airport Terminals.** Although no catastrophic failures were recorded, Melissa revealed recurring vulnerabilities in:

- Terminal building and hangar roofs and building envelopes.
- Airport boarding bridges exposed to strong winds.
- Flooding of the airside.
- ICT systems supporting port and airport operations.

Recommended resilience measures include:

- Strengthening roof anchorage and edge detailing.
- Enhanced wind-resistance specifications for terminal envelopes.
- Waterproofing and improved drainage.
- Wind-resilience upgrades for boarding bridges.
- Redundancy in port and airport ICT and communication systems.

These measures, while modest in scale, provide substantial benefits for logistics continuity, passenger safety, and emergency response capacity.

In addition to structural improvements, strengthening operational continuity for border and logistics actors is essential. This includes enhancing Business Continuity Planning (BCP) for Customs, port and airport authorities, terminal operators, shipping lines, and freight forwarders, as well as ensuring redundancy in ICT systems and backup power for cargo processing platforms. Clear protocols for priority restoration of trade-critical corridors linking production zones, SEZs, and logistics hubs can further safeguard export and import continuity during disruptions.

### 3. Building Long-Term Resilience

#### A. Understanding disaster risk

Although Melissa's impact on transport infrastructure was limited, the localized failures along coastal and inland roads demonstrate heightened exposure to storm surge, erosion, landslides (soil saturation), overflowing aquifers, and overwash—hazards expected to intensify under climate change. Long-term

resilience requires updated, hazard-specific risk assessments for roads, bridges, ports, and airports, with an emphasis on:

- Identification of hazards to the transport infrastructure through modelling.
- Coastal erosion and shoreline retreat and protection.
- Pavement undermining and embankment fragility.
- River training and gully reinforcement.
- Overtopping and flooding frequency analyses.
- Identification of under-maintained sections of the road network.

Such assessments will guide prioritization of investments, identification of critical segments for retrofitting, and development of long-term bypass or rerouting strategies to maintain national connectivity. For this assessment, methodologies such as blue spot analysis[50] Prioritizing investments in more critical and vulnerable road sections is recommended.

**B. Strengthening disaster risk governance to manage disaster risk**

Strengthening transport resilience is not solely an engineering challenge. It requires an institutional framework that integrates land-use planning, coastal management, environmental policy, and infrastructure management.

Given the structural exposure of coastal roads, fishing ports, port access corridors, and low-lying airport areas, Jamaica would benefit from embedding climate-resilient Integrated Coastal Zone Management (ICZM), fluvial and pluvial flooding as a guiding framework for long-term transport planning. Under such a framework, the National Works Agency, Port Authority, Airports Authority, local governments, MEGJC (Environment & Climate Change), and ODPEM would coordinate on:

- Coastal land-use planning.
- Shoreline protection activities.
- Fluvial and pluvial runoff considerations for inland planning.
- Infrastructure maintenance and retrofitting.
- Emergency access planning.

Such multi-agency governance ensures that coastal and inland transport assets are managed as part of an interconnected socio-environmental system.

While large-scale reconstruction is unnecessary, Hurricane Melissa revealed several high-recurrence vulnerabilities that justify selective, phased resilience investments across the transport sector. The impacts observed—particularly the high exposure and structural fragility of the road network in coastal and slope-unstable areas—indicate the need to evaluate mitigation strategies for vulnerable transport corridors and to reflect reduced pavement service life in future life-cycle and maintenance planning. Priority investment areas include:

- Shoreline protection, drainage enhancement, pavement reinforcement, and, where technically and economically justified, realignment for vulnerable coastal and inland road segments exposed to storm surge, flooding, and slope instability.
- Performing backlogged maintenance of vulnerable sections of the road network, taking into account the accelerated deterioration observed following washouts and surface failures

[50] The blue spot analysis identifies road segments at high risk of disaster impacts. In the Dominican Republic, the Ministry of Public Works and Communications and the IDB used this method to help prioritize road investments and estimate weather-related damages and losses (Olaya González et al., 2022).

- Strengthened roofs and building envelopes for port and airport terminals to reduce service disruptions during extreme weather events.
- Wind-resilience upgrades for airport boarding bridges.
- Redundancy and protection of port and airport ICT, power, and telecommunications systems, including the provision of generators for critical functions and satellite communication systems to ensure continuity of operations during power network failures.

To address landslide-related disruptions, investments should be informed by geotechnical studies to identify areas with high susceptibility to slope instability, with priority given to stabilization and drainage works in these zones. Complementary measures should include improved vegetation management and shoulder clearance. Establishing and maintaining clear road shoulders—ideally at least three meters on each side where feasible—would reduce obstruction risks, limit pavement damage, and improve overall road safety.

Improving redundancy across the transport network is also essential. Targeted investments should address locations where the failure of a single component or access route could disrupt operations. In particular, the single sea-level road access to Norman Manley International Airport warrants further assessment to identify feasible redundancy options, including alternative access routes, elevation or protection of the existing roadway, or the upgrading of nearby airports to support emergency or diverted operations.

A similar redundancy-focused investment approach should be extended to road links providing access to other critical infrastructure, such as ports, fuel terminals, and emergency facilities, where service interruptions would have cascading economic and social impacts. Strengthening redundancy in access to critical transport assets reduces system fragility and limits single points of failure.

Given the systemic exposure of coastal transport assets to climate-driven hazards, transport-sector investments should be synchronized with climate-resilient ICZM programs, including:

- Mangrove restoration and dune reinforcement.
- Coastal erosion monitoring.
- Land-use regulation in high-risk zones.
- Setback policies for new infrastructure.
- Hybrid “gray–green” coastal protection measures.

A climate-resilient transport investment plan, leveraging national funds alongside climate finance sources (e.g., GCF, Adaptation Fund), would provide a multi-year, integrated framework for roads, ports, airports, and coastal protection.

### D. Enhancing disaster preparedness for effective response and to “Build Forward Better” in recovery, rehabilitation, and reconstruction

Because physical damage to transport infrastructure was limited and recovery was rapid, preparedness priorities center on operational continuity, not structural rebuilding. Strengthening transport-sector Business Continuity Planning (BCP) is therefore essential.

Ports and airports function as national trade lifelines, essential for both the inflow of recovery materials and the continuity of exports. Their operational continuity—through resilient utilities, ICT systems, and cargo-handling capabilities—is critical to the overall speed and effectiveness of national recovery.

Priorities include:

- Developing a priority route plan linked to storm surge, wind, landslide, and flood alerts.
- Establishing contingency operations for ports and airports to maintain logistics and passenger flows during disruptions.
- Strengthening business continuity planning for customs, port authorities, freight forwarders, and shipping lines.
- Ensuring redundant ICT and backup power systems to maintain continuous cargo clearance and trade processing.
- Defining priority restoration protocols for trade-critical corridors linking production zones, SEZs, ports, and airports.
- Pre-planned arrangements for emergency medical transport and relief logistics.
- Standardized emergency road clearance procedures involving local authorities, NWA, ODPEM, and private contractors.

Institutionalizing such BCP frameworks will enable the transport sector to ensure uninterrupted mobility, logistics, and emergency access during future disasters—strengthening Jamaica's systemic resilience.

## Power

Hurricane Melissa caused limited structural damage to power generation facilities; however, transmission and distribution (T&D) assets experienced extensive physical disruption. Field assessments showed widespread breakage and tilting of wooden poles along the main wind-impact corridors, along with numerous instances of conductor damage and line collapse. As a result, although generation capacity remained largely intact, Jamaica experienced widespread outages driven primarily by network-level failures, mostly caused by the collapse of poles because of inappropriate attachment to the ground, therefore highlighting the high vulnerability in the whole T&D system.

These outages produced significant cascade effects across the economy and society. Even in areas where buildings remained largely intact, water supply, telecommunications, medical services, cold storage, administrative functions, and commercial activity were severely impaired due to the loss of electricity. This underscores electricity's role as a critical lifeline infrastructure and demonstrates how T&D failure can become a major bottleneck for recovery.

Jamaica's electricity supply is characterized by a vertically integrated single-operator model, with the Jamaica Public Service Company (JPS) responsible for generation, transmission, distribution, and retail services islandwide. Since distribution assets are centrally managed rather than parish-based, restoration demands converge on JPS crews and stockpiles. When multiple regions are affected simultaneously, shortages in crews, materials, and surge capacity can slow the pace of recovery. The Government—through the Ministry of Science, Energy and Technology (MSET), the Office of Utilities Regulation (OUR), and ODPEM—oversees policy, regulation, and emergency coordination, but physical restoration (pole replacement, reconductoring) depends entirely on JPS. Under such conditions, the scale of damage caused by Melissa illuminated the limits of available surge capacity.

JPS has been actively restoring damaged poles and lines, and its efforts remain central to recovery. The objective of this section is therefore not to critique ongoing operations but to identify institutional and operational levers that can accelerate restoration and reduce outage duration.

### 1. Rehabilitation

Restoring electricity supply in the aftermath of Hurricane Melissa requires a combination of strategic prioritization and operational readiness. In addition to the priority restoration corridors described below,

several technical and logistical actions are needed to accelerate early recovery and reduce systemic risks.

***(1) Establishing clear priority restoration corridors.*** JPS, OUR, and ODPEM should continue to refine a jointly defined prioritization framework to ensure that transmission and distribution lines serving critical facilities such as hospitals, major road corridors, water treatment plants, and telecommunications hubs are restored first. While JPS typically determines priorities using technical criteria, disaster conditions may require a better alignment with national continuity-of-operations priorities.

***(2) Deploying temporary power solutions in hard-to-access areas.*** ODPEM and JPS should coordinate the strategic placement of mobile generators, temporary feeders, and—where feasible—mobile solar microgrids to maintain essential services. Critical facilities such as hospitals, water treatment plants, emergency shelters, and telecom towers should be capable of temporary islanding until full grid restoration is achieved.

***(3) Rapid damage and needs assessment.*** Damage assessment should follow a structured approach that includes field inspections of generation plants, transmission lines (including poles), substations, and distribution networks, prioritizing infrastructure of national importance. GIS and remote-sensing tools should be used to map damage patterns and support operational decision-making. A centralized data-sharing platform across utilities, government, and partners would improve situational awareness and accelerate restoration.

***(4) Emergency repairs and mutual-aid mobilization.*** JPS should maintain contingency agreements for emergency repair crews, including CARILEC mutual-aid support, to reinforce national capacity during large-scale events. Temporary generation assets should be deployed rapidly to stabilize critical nodes while grid repairs advance.

***(5) Public safety and communication.*** Early recovery requires strong communication with the public on electrical hazards, safe generator use, and reporting procedures for outages. Clear communication channels enable JPS and the government to manage risk and maintain public confidence during phased restoration.

***(6) Logistics and procurement readiness.*** Restoration efforts depend on timely access to poles, conductors, transformers, and other materials. Emergency procurement protocols—including streamlined customs procedures—should be activated to reduce delays. Coordination with the government and donors is essential for rapid resource mobilization.

***(7) Grid upgrading during replacement.*** Where feasible, destroyed poles and lines should be replaced with more resilient materials, such as concrete poles or insulated conductors, and ensure a proper attachment to the ground, to avoid reinstating pre-existing vulnerabilities. Documenting damages systematically is essential for insurance purposes and for informing future risk-reduction investments. In summary, early recovery depends not only on the speed of pole replacement but also on coordinated prioritization, rapid deployment of temporary power solutions, efficient logistics, and structured damage assessment. Melissa demonstrated that electricity outages create cascading and systemic risks affecting water supply, telecommunications, health services, and overall continuity of operations, making early restoration a foundation for resilient reconstruction.

**2. Resilient Reconstruction**

Hurricane Melissa demonstrated that Jamaica's primary energy-system vulnerabilities lie not in generation assets but across the T&D network. Failures were driven by limited wind resistance in wooden poles (mostly poor attachment to the ground), insufficient redundancy, inadequate sectionalizing

capacity, and a lack of reliable backup power at priority facilities. Resilient Reconstruction, therefore, requires a transition from piecemeal repairs to risk-informed redesign of the power system, guided by improved risk information, modernized engineering standards, and strengthened institutional coordination.

***(1) Institutional roles in resilient reconstruction.*** Given the multiple actors involved—JPS as operator, MSET as policy lead, OUR as regulator, ODPEM as the national disaster-coordination agency, and parish governments responsible for access and debris management—a clear division of responsibilities is essential. Broad roles may be summarized as follows:

- MSET: Develop a national "Power System Resilience Master Plan," aligning T&D investments with updated hazard maps, climate adaptation strategies, and spatial planning frameworks.
- JPS: Lead T&D hardening, modernization, and standardization—including the upgrade of poles, conductors, substations, and protection systems, supported by risk-informed asset replacement plans and improved sectionalizing technology.
- OUR: Establish regulatory and tariff mechanisms that incentivize long-term resilience investments and support system-wide modernization.
- ODPEM: Coordinate national prioritization of critical supply corridors and backup power needs, ensuring alignment with continuity-of-operations requirements.
- Parish governments: Facilitate access clearance, debris removal, and local operational support.

***(2) Risk-informed planning and zoning for energy infrastructure.*** Robust reconstruction requires updated, detailed hazard and exposure information. Hazard maps—particularly for wind, landslide, flooding, and storm surge—should be revised and integrated into decisions on the siting, elevation, and design of substations and key T&D corridors. Systematic integration of disaster risk management into all energy infrastructure investments is essential, ensuring that new and rebuilt assets avoid high-hazard zones where feasible.

***(3) Evidence-based assessment of asset vulnerability.*** Melissa revealed contrasting performance across pole materials and configurations: widespread failure in wooden poles but significantly better performance in concrete and composite poles. This underscores the need for technical evaluations, including:

- Comparative wind-resistance testing across pole materials and ages.
- Development of vulnerability functions using asset registries combined with field-damage observations.
- GIS-based identification of high-risk corridors for prioritized retrofitting.

These analyses will guide systematic replacement of high-risk components, improved corrosion resistance in coastal zones, and optimized conductor loading and configurations.

***(4) Grid modernization and upgrade.*** Reconstruction should aim for a more resilient and efficient grid, including:

- Improve the attachment of the poles, regardless of their material, to the ground. Minimum foundation depths, attachment materials, and detailing are to be defined.
- Upgrading poles, conductors, and substations to hurricane-resistant standards.
- Elevating or flood-proofing substations in surge-prone areas.
- Selective undergrounding in critical corridors.
- Standardizing equipment and voltage levels to improve maintainability and reduce failure rates.

Such measures reduce power outage frequency and duration and strengthen the resilience of essential services.

***(5) Decentralized and renewable energy integration.*** Melissa demonstrated the fragility of a highly centralized grid. Resilient reconstruction should therefore accelerate:

- Deployment of distributed generation for critical facilities (solar PV, wind, hybrid microgrids).
- Battery storage and hybrid backup systems enabling temporary islanding.
- Microgrids for remote communities with recurrent access challenges.

Distributed energy systems reduce recovery times and enhance energy security during extreme events.

***(6) Strengthening codes, standards, and capacity.*** Resilient Reconstruction requires improved enforcement of electrical and construction codes for energy assets. JPS, MSET, and OUR should jointly develop simplified technical manuals and provide structured training for contractors, utility personnel, and local authorities to ensure consistent application of standards. Community-level training on safe generator use, microgrid maintenance, and resilience practices will widen local capacity to withstand future events.

***(7) Community engagement and workforce development.*** Local communities should participate in planning and monitoring resilient energy investments. Workforce development programs focused on resilient construction, energy-system maintenance, and emergency response can increase local employment while improving long-term resilience.

***(8) Financial protection and risk-transfer mechanisms.*** To ensure predictable funding for reconstruction and system hardening, Jamaica should explore:

- Expanded insurance coverage for public and private energy assets.
- Dedicated disaster-resilience funds or surcharge mechanisms.
- Blended financing that leverages climate finance for T&D system modernization.

These instruments can reduce fiscal shocks and enable sustained investment in long-term resilience.

***(9) Overall direction of resilient reconstruction.*** These combined measures constitute permanent corrective actions for structural weaknesses revealed by Melissa—not simply a restoration of pre-disaster conditions. By enhancing wind resistance, redundancy, decentralization, and system reliability, Jamaica can reduce the scale, duration, and socioeconomic impacts of future outages and support a modern, climate-resilient energy sector.

**3. Building Long-Term Resilience**

**A. Understanding disaster risk**

Hurricane Melissa highlighted that system performance is influenced by multiple interacting factors: pole material and age, corrosion and foundation integrity, local terrain and topographic wind amplification, conductor loading, vegetation conditions, and exposure to storm surge and fluvial flooding. These findings point to the need for a comprehensive, national assessment framework that systematically captures how physical, environmental, and operational factors shape vulnerability.

Key elements include:

- Integrated databases of wind, terrain, and asset characteristics.
- Systematic post-disaster damage surveys.
- Material-specific wind-resistance testing.
- Development of T&D vulnerability functions.
- GIS identification of high-risk corridors.

Building on these components, Jamaica should establish a National Power System Resilience Information Platform that integrates JPS asset inventories, OUR regulatory information, Met Service hazard and climate observations, ODPEM disaster datasets, and academic modelling outputs. Such a platform would enable more precise risk profiling, support investment prioritization, guide modernization of engineering standards, and align long-term energy planning with land-use and fiscal decision-making.

In parallel, long-term resilience requires institutionalizing research, innovation, and advanced data management within the energy sector. This includes:

- Development of robust data architecture for disaster risk, asset performance histories, and event-level operational data.
- Support for applied research and pilot projects on innovative resilience solutions—such as resilient microgrids, distributed renewable-plus-storage systems, and climate-resistant materials for poles, foundations, and enclosures.
- Collaboration with universities, research centers, CARILEC, and international partners to evaluate emerging technologies and adaptation measures.

By embedding science, data, and innovation into routine system management, Jamaica can move from post-event diagnostics to a predictive, risk-intelligent model of energy system planning—ensuring that investments made in the coming years are fully aligned with future climate and hazard conditions.

### B. Strengthening disaster risk governance to manage disaster risk

Improving resilience requires regulatory and institutional reforms that translate scientific assessments into enforceable standards. Melissa revealed challenges related to wind resistance, pole maintenance, corrosion, vegetation management, and clearance zones. A systematic review of T&D design and material standards should therefore be undertaken, aligned with islandwide wind-load zones and embedded within updated national energy policies that explicitly integrate disaster risk reduction and climate adaptation.

Other governance measures include:

- Designation of priority supply lines.
- Establishment of minimum backup power requirements for critical facilities.
- Clear articulation of roles among government entities and the operator.
- Creation of regulatory and financial incentives that encourage resilience investments and the integration of distributed renewable energy systems.

Regulatory frameworks should allow OUR to support resilience investments through tariff mechanisms, while MSET incorporates disaster risk considerations into national energy planning. Local governments play a vital role in access clearance, supporting JPS and ODPEM during restoration operations.

In addition to regulatory reforms, strengthening day-to-day governance and operational readiness is essential to sustaining resilience gains. This includes institutionalizing preventive maintenance programs for transmission and distribution assets, promoting sector-wide technical standardization to improve interoperability and accelerate repairs, and reinforcing utility-level emergency preparedness through updated disaster response plans, business continuity planning, and incident command training—building on ongoing CARILEC–IDB initiatives. Governance systems should also incorporate stronger monitoring and accountability mechanisms for resilience investments, formal processes for post-event learning, and improved coordination between the energy, water, health, communications, and transport sectors to ensure coherent decision-making during emergencies. These measures help translate policy commitments into sustained operational resilience.

### C. Investing in disaster risk reduction for resilience

The prolonged outages following Melissa were largely driven by insufficient network redundancy. Long-term DRR investments should include:

- Redundant feeders for key corridors.
- Automated sectionalizing to isolate damaged segments.
- Dual-circuit reinforcement of priority lines.
- Distributed renewable energy and storage for essential services.
- Selective undergrounding and modernization of substations in high-risk areas, along with smart-grid technologies that improve real-time monitoring and system control.

Distributed systems—such as solar-plus-storage at shelters, water facilities, SMEs, and rural communities—support continuity of essential functions even before grid restoration. These investments also advance Jamaica's climate mitigation commitments (NDCs) and reduce dependence on imported fuels. Where applicable, nature-based solutions—such as mangrove restoration or watershed management—should complement hard infrastructure by reducing storm-surge and flooding risks for coastal energy assets. A comprehensive investment strategy led by MSET, coordinated with MEGJC/CCD, and enabled by regulatory and financing instruments, is recommended.

Retrofitting undamaged areas, such as upgrading poles' attachments, replacing wooden poles with stronger materials, reinforcing coastal assets, and upgrading conductor and pole configurations, will further reduce systemic risk.

### D. Enhancing disaster preparedness for effective response and to "Build Forward Better" in recovery, rehabilitation, and reconstruction

Melissa showed that restoration capacity is constrained not only by physical damage but also by limited surge resources (crews, equipment, materials). National-level preparedness should therefore support JPS through:

- Pre-arranged agreements to mobilize construction firms and heavy-equipment operators during disasters.
- Logistical arrangements with warehousing and transport companies for emergency movement of poles, transformers, and conductors.
- Rapid procurement frameworks with regional partners for T&D materials, including strengthened cooperation with CARILEC and CDEMA for mutual aid and technical support.

For critical facilities—hospitals, water plants, pumping stations, telecommunications hubs, data centers—backup power systems should be strengthened and standardized. Hybrid renewable backup systems or microgrids that can operate independently of the main grid can significantly enhance

emergency response capacity. Preparedness efforts should also ensure that vulnerable groups—low-income households, rural communities, and persons with limited access to backup energy sources—benefit from resilience measures.

At the parish level, preparedness should include improved tree-clearing protocols, access clearance, and support for restoration crews. Impact-based EWS for outage risk, coupled with public guidance on expected impacts and protective actions, would strengthen the link between warnings and community preparedness. Public awareness and education on safe energy use and outage preparedness should be expanded as part of broader community-resilience efforts.

Finally, Jamaica should continue leveraging international climate and disaster-risk finance to strengthen national readiness and support transformative energy-resilience investments.

## Water and Sewerage

Hurricane Melissa's impacts on the water sector were characterized less by structural damage to physical assets and more by service interruptions caused by widespread electricity outages. Field assessments reported only limited damage to major water infrastructure—treatment plants, pumping stations, elevated tanks, and trunk mains—yet many areas experienced prolonged loss of water supply, significantly affecting households, medical services, schools, and commercial activity. This represents a cascade effect in which vulnerabilities in the electricity sector directly trigger functional failures in water supply systems.

### 1. Rehabilitation

The highest priority in the Rehabilitation phase is the rapid restoration of water service. Core tasks include:

- Accelerated restoration of power to pumping stations and treatment plants.
- Re-pressurization of the distribution network.
- Mechanical and electrical checks at key facilities.
- Flushing of trunk and distribution mains.

Because water supply is highly dependent on electricity, coordination with JPS on priority power restoration and ODPEM's designation of critical facilities plays a decisive role in determining how quickly service can resume. Particular emphasis should be placed on restoring service to hospitals, shelters, schools, and major commercial districts—nodes where water service is directly linked to broader social and economic normalization. A Priority Water Restoration Plan for these facilities should therefore be prepared and applied.

It is important to note that physical damage within the network—leakages, bursts, joint failures—often becomes fully visible only after pressure is restored. During extended outages, unpressurized pipes mask underlying failures. Rehabilitation should therefore incorporate a structured sequence of field inspections, pressure testing, leak detection, and valve/connection checks once service begins to resume.

Water quality assessments can also only be carried out effectively after re-pressurization and flow restoration. With no flow during outages, sampling lacks representativeness. Post-restoration testing—covering residual chlorine, turbidity, and microbiological indicators at treatment plant outlets, trunk mains, and distribution extremities—is essential to verify the safety of the supplied water.

Overall, Rehabilitation in the water sector is driven less by physical repairs and more by a staged service-restoration process: power restoration → re-pressurization → inspection of network conditions → water quality assessment → phased resumption of supply. Melissa highlighted that vulnerabilities in water supply stem from systemic characteristics—energy dependence and network dynamics—rather than widespread structural failure. Efficient early restoration is therefore foundational for designing subsequent Resilient Reconstruction interventions.

**2. Resilient Reconstruction**

The predominant cause of water service disruption in Melissa was the loss of power to pumping and treatment facilities. As a result, Resilient Reconstruction focuses on diagnosing network damage once water service resumes, while simultaneously addressing the medium-term structural vulnerabilities revealed by the event. In this sense, the recommendations below constitute a logical pathway for strengthening resilience.

Jamaica's water sector involves several actors:

- NWC (National Water Commission): primary operator for urban and peri-urban water supply and sewerage, serving about 70 percent of the population.
- WRA (Water Resources Authority): source management and water quality monitoring.
- RWSL (Rural Water Supply Limited): small-system development in rural areas.
- MEGJC: national policy authority for water resources, supply, and sewerage.
- OUR: regulator responsible for tariffs and service levels.
- ODPEM: national emergency coordination, including cross-sector alignment with JPS for power restoration.

Given this institutional landscape, effective resilient reconstruction requires coordinated action across NWC (operations and restoration), JPS (power supply), WRA (water resources and quality), MEGJC (policy direction), OUR (regulatory support), and ODPEM (emergency coordination).

The main medium-term actions include:

- Rapid diagnostic assessments after service resumption. NWC should implement systematic pressure testing, flow monitoring, and DMA-based inspections to rapidly identify repair needs in affected areas. This process not only supports efficient restoration but also generates data needed for future prioritization.
- Reducing dependence on grid power. Melissa demonstrated that even structurally intact facilities can cease operation if power is lost. Reconstruction should therefore prioritize the installation of backup energy systems—solar-plus-storage or hybrid solutions—at key treatment plants and high-elevation pumping stations. Implementation should be led by NWC, supported by MEGJC (policy), OUR (tariff mechanisms), ODPEM (priority restoration coordination), and JPS (technical advice on grid integration).
- Addressing site-specific flood and coastal hazards. Some affected areas experienced flooding and sedimentation. Reconstruction should incorporate site-specific resilience measures such as elevation of equipment, waterproofing of electrical components, and corrosion-resistant specifications for facilities in low-lying or coastal zones. These improvements should be coordinated among NWC, MEGJC, OUR, and ODPEM, with local authorities supporting access and land-use considerations.
- Restoring and strengthening monitoring systems. Melissa disabled remote monitoring systems (SCADA, DMA sensors) due to power loss. Reconstruction should therefore restore priority DMAs, reinforce communications redundancy, and equip monitoring systems with independent

power sources. Improved situational awareness will enable more effective operational response in future events.

Overall, Resilient Reconstruction in the water sector centers on rapidly diagnosing post-event vulnerabilities and implementing medium-term measures to reduce energy dependence, strengthen hazard resilience, and improve network visibility. These actions apply to affected areas, distinct from the island-wide long-term resilience strategies presented in the next section.

**3. Building Long-Term Resilience**

Melissa exposed structural vulnerabilities in Jamaica's water supply systems that extend beyond the affected areas. These challenges—energy dependence, hazard exposure, aging infrastructure, hydraulic vulnerabilities—are system-wide and require island-wide resilience measures. The following long-term directions represent a policy and institutional framework to guide future investment and reform.

**A. Understanding disaster risk**

Melissa demonstrated that Jamaica's water systems are highly dependent on electricity. Even when treatment plants and pumping stations sustained little physical damage, outages resulted in the complete loss of service across multiple distribution zones. Other factors—including topography, corrosion, aging assets, flood exposure, and network pressure dynamics—also contribute to systemic risk. A nationwide Water Sector Risk Assessment Information Platform should therefore be established to support long-term resilience planning. This effort should integrate multiple data domains:

- Wind, flood, and storm surge hazards.
- Elevation, terrain, and site characteristics of water assets.
- Energy dependence and backup capacity.
- Asset age, corrosion, and condition.
- Pressure zones, leakage rates, and NRW patterns.
- NWC asset inventories, OUR regulatory data, MEGJC policy data, ODPEM hazard information.

Such a platform would enable informed decisions on future investments, system restructuring, water-source diversification, and asset relocation.

**B. Strengthening disaster risk governance to manage disaster risk**

Given the essential nature of water supply and its interaction with other sectors, governance reforms are necessary to achieve lasting resilience. These include:

- Integrated coordination between water-sector policy (MEGJC) and energy policy.
- Regulatory mechanisms for recognizing resilience investments in tariffs (OUR).
- ODPEM's formalization of priority restoration and supply zones.
- Strengthened local government roles in land-use and access management.
- Establishment of National Water Resilience Standards covering backup energy, siting criteria, flood-protection requirements, and supply-chain preparedness.

Because of the multi-agency nature of these reforms, a cross-sector resilience working group is recommended to institutionalize collaboration and ensure coherence between investment, regulation, and emergency planning.

**C. Investing in disaster risk reduction for resilience**

Island-wide DRR investments should include:

- Installation of backup power (solar-plus-storage) at critical facilities.
- Elevation, waterproofing, and corrosion protection for assets in high-risk zones.
- Replacement of aging and vulnerable pipelines.
- Advanced leakage and pressure-management programs (supporting NRW reduction).
- Reconfiguration of pressure zones to improve redundancy.
- Diversified access to multiple water sources.

These measures enhance not only disaster resilience but also everyday service quality, cost efficiency, and alignment with Vision 2030.

**D. Enhancing disaster preparedness for effective response and to "Build Forward Better" in recovery, rehabilitation, and reconstruction**

Preparedness in the water sector requires a business-continuity-oriented approach that integrates energy providers, local authorities, and emergency agencies. Key measures include:

- Pre-contingency operational planning, such as optimized elevated-tank operations, designated priority supply routes, pre-positioned water trucks, mobile pumps, and temporary treatment systems.
- Coordinated community information protocols and hygiene guidance during service interruptions, led jointly by NWC, ODPEM, and parish governments.
- Institutionalized cooperation frameworks for mobilizing NGOs, volunteer organizations, and international partners during water-supply emergencies.
- Strengthened rapid-assessment procedures—standardized inspection methods, improved access to facilities, and redundant communication systems.

These efforts will improve the speed and coherence of emergency response and reduce the socioeconomic impacts of future water-supply disruptions.

## Environment & Natural Resources / Coastal & Watershed Management

Melissa caused extensive damage to forest ecosystems across southern and northern regions of Jamaica, including widespread 'wind-burn', treefall, and canopy loss, caused by the hurricane's extreme winds and degradation of coastal and marine ecosystems such as mangroves, seagrass beds, and coral communities. These impacts were amplified in areas already affected by land-use change, deforestation, and other anthropogenic pressures that had weakened natural resilience.

Beyond physical destruction, the event disrupted critical ecosystem services—including soil retention, carbon sequestration, water regulation, coastline protection, and slope stability—thereby reducing natural buffers against storm surge, flooding, and erosion. Damage to ecosystems also affected livelihood systems tied to nature-based activities such as ecotourism, apiculture, and coastal resource use.

In steep terrain, the sudden loss of forest cover elevates the risk of soil erosion and slope instability during rainfall events, potentially increasing the likelihood of floods and landslides in the medium term. Along the coast, the weakening of mangrove and reef systems may temporarily reduce natural wave attenuation capacity, heightening exposure to future storm impacts.

These findings underscore that ecosystem degradation can diminish community resilience and contribute significantly to disaster risk, highlighting the importance of integrating environmental recovery and nature-based solutions into the broader reconstruction and resilience agenda.

**1. Rehabilitation**

Hurricane Melissa caused extensive damage to Jamaica's terrestrial and coastal ecosystems, including forests, wetlands, mangroves, coral reefs, and seagrass beds. Impacts were particularly severe across southern and western regions, where widespread treefall, canopy loss, erosion, and degradation of coastal vegetation were observed. These effects were amplified in areas already weakened by land-use change, deforestation, and other anthropogenic pressures that had reduced natural resilience.

During the Rehabilitation phase, priority actions focus on restoring minimum environmental functionality and preventing secondary risks:

- Safe removal of fallen trees and debris, particularly along roads, agricultural lands, and river corridors, to restore flow capacity and reduce flood risk.
- Emergency stabilization of erosion and sedimentation hotspots in coastal and riverine areas (e.g., temporary shoreline protection, clearing blocked channels).
- Short-term measures to maintain essential ecosystem services, including soil stabilization and encouraging natural regeneration of mangroves and riparian vegetation.
- Livelihood support for nature-dependent communities, such as ecotourism operators, apiculture groups, and coastal resource users affected by ecosystem degradation.

The aim of Rehabilitation is not ecological restoration per se, but the rapid recovery of essential protective and livelihood functions that underpin community resilience.

**2. Resilient Reconstruction**

Melissa demonstrated that ecosystem vulnerability interacts with land use, development patterns, and watershed conditions to amplify disaster impacts. Resilient Recovery must therefore focus on improvement-oriented reconstruction—strengthening ecosystems so they can maintain protective and livelihood functions under future climate extremes.

Priority measures include:

- Restoration and rehabilitation of coastal habitat, including mangroves, seagrass beds, and coral reefs, to rebuild natural coastal defense systems and enhance wave attenuation and shoreline stability. Beach replenishment and dune restoration utilizing native vegetation to restore eroded shorelines, which buffer storm surges and reduce coastal flooding.
- Strengthened watershed management, including reforestation, erosion control, and updated watershed plans to reduce and manage runoff, including waste runoff to prevent contamination of waterways and coastal habitats, sedimentation, and flood risk.
- Revisions to governance and land-use planning regulations, including Climate Resilient Integrated Coastal Zone Management (ICZM) to inform and regulate coastal setbacks, development controls in high-risk erosion and inundation zones, and expansion of protected areas to guide adaptive management.
- Integration of nature-based solutions (NbS)—such as living shorelines, vegetated buffers, and floodplain restoration—into hybrid infrastructure and recovery planning.
- Recovery and diversification of ecosystem-based livelihoods, supporting sustainable ecotourism, community forestry, and blue-economy initiatives.

These measures collectively ensure that ecosystems emerge from recovery stronger than before, enhancing Jamaica's long-term resilience to high-frequency and high-intensity events.

**3. Building Long-Term Resilience**

**A. Understanding disaster risk**

- Developing high-resolution ecosystem risk assessments, integrating exposure and vulnerability analyses for forests, mangroves, coral reefs, coastal erosion zones, and watershed systems.
- Climate-informed future risk modeling, including projections of sea-level rise, coastal wave energy, rainfall extremes, erosion processes, and landslide susceptibility.
- Institutionalizing post-event ecological assessments to track ecosystem trajectory and long-term recovery pathways.

**B. Strengthening disaster risk governance to manage disaster risk**

- Integrated governance frameworks across NEPA, MEGJC, Forestry Department, RADA, Fisheries Division, and local governments for coordinated coastal and watershed management.
- Mainstreaming DRM and climate risk into integrated coastal zone management, watershed plans, permitting, development review, and protected-area designation.
- Co-management arrangements with communities to support continuous monitoring, stewardship, and sustainable resource management.

**C. Investing in disaster risk reduction for resilience**

- NbS-based coastal protection investments, including mangrove restoration, coral rehabilitation, and shoreline re-naturalization.
- Long-term watershed and forest management investments, such as reforestation, soil conservation, and protection of water-source areas.
- Integration of ecosystems into infrastructure risk reduction, aligning NbS with transport networks, including road, drainage, and coastal infrastructure design.
- Support for resilient blue economy development, linking natural capital protection with sustainable economic advancement.

**D. Enhancing disaster preparedness for effective response and to "Build Forward Better" in recovery, rehabilitation, and reconstruction**

- Integration of ecosystem conditions into impact-based early warning systems, improving predictions of coastal flooding, landslides, and erosion.
- Establishment of rapid ecological assessment teams, enabling coordinated post-disaster monitoring by environmental agencies, academia, and local authorities.
- Preparedness measures for nature-dependent livelihoods, including BCPs and pre-disaster protective actions for fisherfolk, farmers, and ecotourism operators.
- Institutionalizing "Build Forward Better with Nature", including standards, technical guidelines, and financial incentives for NbS-centered reconstruction.

Together, these measures support Jamaica's environment and natural resources—particularly its coastal and water resources—not only to withstand future disasters, but also to preserve the ecological integrity, ecosystem services, and sustainable livelihoods that are the foundation of long-term national resilience. By investing in the protection, restoration, and sustainable management of these critical resources, Jamaica strengthens its adaptive capacity and ensures that communities remain safeguarded against environmental risks, thus securing both people and nature for generations to come.

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