

# REGIONAL OVERVIEW: IMPACT OF HURRICANES IRMA AND MARIA

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# SITUATION OVERVIEW

## Disclaimer:

This report aims to provide an overview of the impact of the hurricanes Irma and Maria in the Caribbean. For the purposes of this report, the focus is limited to the following seven countries: Anguilla, Antigua and Barbuda, The Bahamas, British Virgin Islands, Dominica, Sint Maarten, and Turks and Caicos Islands. All, except Sint Maarten, are Members of CARICOM. The depth of the report also reflects the limited availability of data, which in turn means that figures and information need to be updated in the future. The current data were based on the Post-Disaster Needs Assessments (PDNAs) conducted in Antigua and Barbuda and in Dominica and by other available sources. These are all listed in the Reference section.

Hurricane Irma first made landfall on the northeast Caribbean islands on 6 September. Antigua and Barbuda, Anguilla, Bahamas, British Virgin Islands, Cuba, Dominican Republic, Haiti, Puerto Rico, St Barthélemy, St. Martin, Sint Maarten, Turks and Caicos, and the US Virgin Islands were all affected. 169,000 people and 75,000 buildings were exposed to wind speeds higher than 252km/h. 5.5 million people lived in the areas where winds blew in excess of 120km/h. At least 134 people were reported dead.

Days later, hurricane Maria was the tenth most intense storm on record, causing catastrophic damage and at least 97 fatalities across the north-eastern Caribbean, including Antigua and Barbuda, Dominica, Puerto Rico, US Virgin Islands and Guadeloupe. Maria made landfall in Dominica on 19 September and in Puerto Rico on 20 September: it is considered to have been the worst natural hazard-induced disaster on record in Dominica, and caused catastrophic damages in Puerto Rico (ECHO 19/09/2017).

The majority of the population in the Caribbean was affected in some way by the Hurricanes. 39,000 children are in need of assistance across the region, more than a quarter of them are under five (UNICEF 18/10/2017).

Affected areas	Anguilla	Antigua and Barbuda	The Bahamas	British Virgin Islands	Dominica	Sint Maarten	Turks and Caicos Islands	Total
Population	15,000	81,000	391,000	30,000	71,000	33,000	34,000	655,000
People affected	N/A	2,000	N/A	N/A	66,920	33,000	N/A	>101,920
%	N/A	2.50%	N/A	N/A	92,9%	100%		15.5%
People in need	N/A	N/A	N/A	N/A	65,000	2,200		>67,200
People in shelters	N/A	420	3,065	279	2,900	73	60	>6,797
IDPs	N/A	1,413	3,065	279	N/A	73	60	>4,890

Fatalities	1	3	N/A	3	27	4	0	38
Children in need	4,800	N/A	N/A	N/A	19,800	N/A	N/A	39,000

## KEY FINDINGS

### OVERALL SCOPE AND SCALE OF THE IMPACT

Available data indicate that the total recovery needs for Dominica, Barbuda, and the British Virgin Islands<sup>1</sup> are estimated to be over USD 5 billion. This figure is expected to rise exponentially once needs assessments in other islands are concluded and become available.

The economy in most countries came to a halt with the destruction of roads, bridges, and public utility systems. In Dominica, for instance, the agriculture sector was devastated, with 100% loss of crops and substantial destruction to productive trees and death of livestock. Additionally, 90% of structures on the island are reported to have been damaged: approximately 62% of houses were heavily damaged and 15% destroyed. In Antigua and Barbuda, the combined value of destroyed assets and disruptions in the production of goods and services is equivalent to about 9% the country's GDP in 2016. Barbuda remains uninhabitable and permanent returns will not be possible until water and sanitation supplies are restored. In British Virgin Islands, tourism was severely affected, with approximately 95% of all coastal small properties on the northern and western section on the island of Tortola destroyed or reported severe damages.

Public services and transport activities in most of the territories were severely hampered, including secondary roads, which are critical to access arable land, remote locations and transport labour and agricultural products to markets and ports.

### WORST AFFECTED SECTORS

Housing and infrastructure<sup>2</sup> are most affected sectors across the region, with estimated costs for recovery of these sectors in Dominica and Antigua and Barbuda, of above USD 600 million and USD 109 million, respectively. In British Virgin Islands, the housing sector reported USD 910 million damages and infrastructure USD 296 million.

Housing is one of the most important and challenging areas for recovery as this provides shelter and security to the families, but also, often small businesses are home based and hence, housing has an important role in income generation for the families.

The productive sector has suffered total damages and losses of USD 2.7 billion in Dominica, British Virgin Islands, and Antigua and Barbuda, with tourism and

<sup>1</sup> The amounts mentioned hereafter are estimates based on the Post-Disaster Needs Assessments conducted in Dominica and Antigua and Barbuda, and the British Virgin Islands' Preliminary Impact Report. However, they have been analysed in order to extract trends that apply across the Eastern Caribbean region.

<sup>2</sup> Infrastructure includes: Roads and transports, ports and airports, water and sanitation infrastructure, electricity and telecoms.



commerce the most affected subsectors with damages and losses of USD 2.2 billion and USD 297 million respectively.

Recovery costs in the environment have been estimated at USD 6.8 million. Due to the high dependence of livelihoods on the environment, including coastal, marine, forests, wetlands, the destruction caused by the hurricanes has resulted in significant loss of livelihoods.

## WORST AFFECTED ISLANDS

The impact of the hurricanes has varied significantly across the Caribbean region, and the extent of it is still being quantified in many islands. As of today, the situation is as follows:

**Dominica:** Hurricane Maria resulted in total damage of USD 931 million and losses of USD 380 million. Most of the damages were sustained in the housing sector (38%), followed by transport (20%) and education (8%). The greatest losses were sustained in the agriculture sector (32%), followed by the tourism (19%) and transport sector (14%) (PDNA 2017).

**Antigua and Barbuda:** The total damages of the Irma/Maria events for Antigua and Barbuda comes to USD 136 million, while losses amount to approximately USD 19 million. Recovery needs are estimated at USD 222 million, of which housing recovery financial needs are USD 79 million, health USD 7 million, and education USD 6.3 million (PDNA 2017).

**Sint Maarten:** The physical damages in Sint Maarten are still being assessed but they are expected to be USD 1.8 billion (National Recovery Plan 2017).

**Anguilla:** Anguilla's GDP per capita in 2008 was USD 12,200 this is now rated as -400% by the Caribbean Catastrophe Risk Insurers as a direct result of Hurricane Irma (Government of Anguilla white paper October 2017).

**British Virgin Islands:** The total damage in the British Virgin Islands is estimated at around USD 3.6 billion. The most affected sector is the tourism - unlike the rest of the countries where housing is the most affected – with damage estimated at USD 2 billion. Damages for the housing sector are estimated at USD 910 million and infrastructure at USD 296 million (Preliminary impact report BVI government).

## KEY PRIORITIES

The key recovery priorities emerging across the region are the following:

- Housing: repair and reconstruction, building materials, revision of building standards and capacity building for safer and more resilient reconstruction.
- Infrastructure: repair and reconstruction to restore essential services (electricity and telecommunications), and removal of debris. Fuel for generators remain a major need to provide alternative electricity services.
- WASH: provision of safe drinking water and sanitation facilities remain a critical issue across the region, especially in Dominica and Antigua and Barbuda.
- Agriculture and Fisheries: seeds, tools – including fishing kits, other agricultural goods and livestock remain necessary to restart the production.
- Health: rehabilitation of hospitals, vector control programmes, health and dignity kits.
- Education: rehabilitation of buildings to allow school re-opening and provision of educational materials.
- Resumption of economic production, service delivery and access to goods and services remain a general issue.

- Restoration of government buildings to facilitate governance functions and decision-making processes.
- Strengthen and apply policies and programs that promote, guide, and support Build Back Better (BBB) in recovery, rehabilitation and reconstruction and ensure the reduction of risks and vulnerabilities.

## CHALLENGES FOR RECOVERY

Where data is available, the financial resources required for the recovery needs for a number of sectors have been quantified and they result in approximately: education (USD 99 million), electricity (USD 88 million), commerce (USD 33 million) and agriculture (USD 72 million). Given that agriculture and tourism are the two major sectors of the economy in most islands, it is expected that the physical destruction endured by in the infrastructure – particularly transport and utilities, and by agriculture and environment, will cause further economic losses in these two sectors with consequences in the overall economic and in the livelihoods of affected population. Particularly for a key sector as tourism, the damages inflicted by the hurricanes will most likely negatively impact the 2017/18 and 2018/19 tourism seasons. In the immediate aftermath, all education was interrupted in the islands; nevertheless, students are currently attending school where these have been reopened and deemed safe or in a different location when displaced such as in Antigua and Barbuda.

The economic and fiscal status of the impacted countries will also play an important role in the recovery process. In fact, as most Caribbean islands are categorized as middle/high income countries, with average GDP per capita is nearly USD 9,000, they are not eligible for ODA and have no access to concessional financing. This, coupled with high debt ratios, limited fiscal space and possible economic slowdown due to the devastation caused by the hurricanes, will restrain the domestic availability of financial resources for recovery. Additional external factors as the heavy dependence on imports, particularly for construction materials, will also make the recovery process more costly and difficult and dependent on the recovery of neighbouring islands in the region, which are key to supply lines and transport links.

The destruction caused by the hurricanes to roads and utilities as electrical lines and telecommunications is also challenging the delivery of the interventions themselves and the reach of remote communities.

## INFORMATION GAPS

There are serious data gaps across the Caribbean region. Information is missing across the different sectors as well as regarding the total number of affected populations per country and territory. The only large scale and multisector assessments that is officially available are the Post Disaster Needs Assessments conducted in Antigua and Barbuda and Dominica. Other assessments have been undertaken but the results are not yet available.

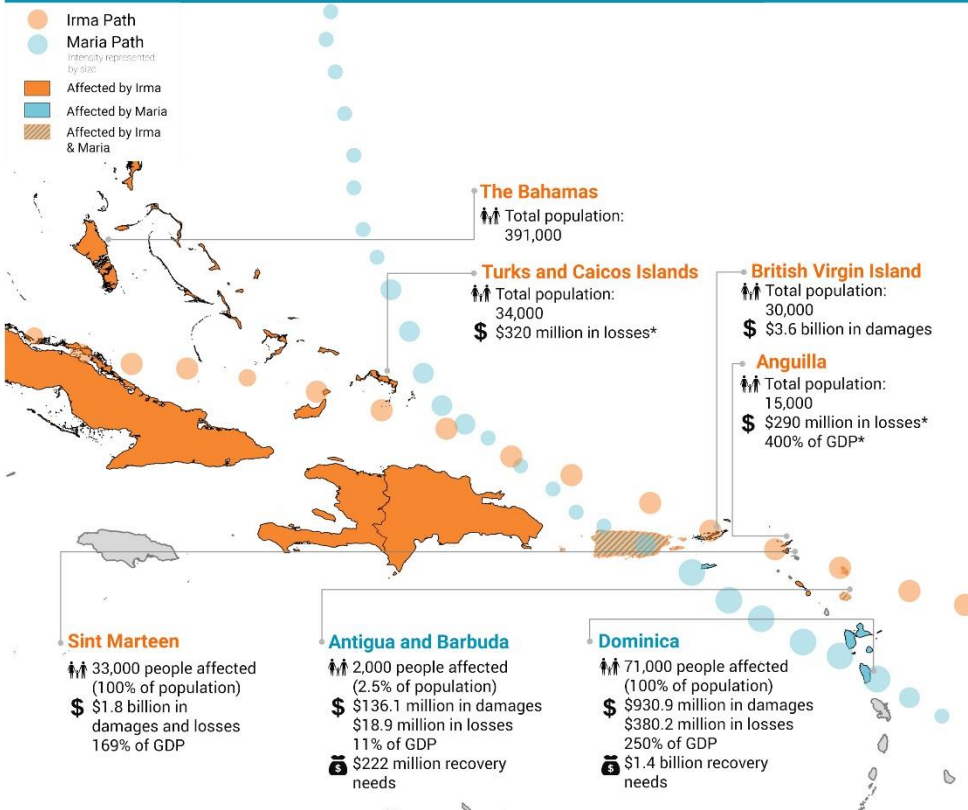
Information gaps have been further heightened by lack of logistical and communication access to many islands that has been problematic, causing delays to assessments, analysis, and the development of response strategies.

**Definitions:**

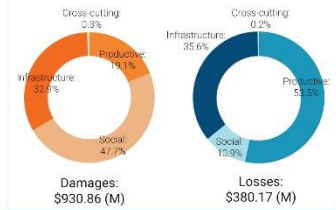
In the context of PDNA, damages refer to the total or partial destruction of infrastructure and physical assets. Losses refers to the changes in economic flows arising from the disaster. These changes in flows continue until the achievement of full economic recovery and reconstruction, in some cases lasting for several years. (PDNA Methodology is a joint United Nations Development Group, World Bank and European Union methodology).

When considering the data coming from the CEDIM FDA analysis 'losses' are considered to include 'damages'. More specifically, according to the CEDIM methodology, various types of losses are distinguished into direct and indirect losses. Direct losses result from the physical impact of the hazardous event, whereas indirect losses are induced by the event but occur in space or time - outside the event. Depending on whether losses can be expressed in monetary values, both types of losses are further classified into tangible and intangible losses.





### Damages and losses per sector in Dominica:



### Damages and losses per sector in Antigua and Barbuda:



### Total estimated damages and losses:

**\$5.99 billion\*\***

### Total estimated recovery needs:

**\$2.97 billion\*\***

### Breakdown of sectors:

**Productive sector:** Agriculture, Fisheries, Forestry, Commerce & Micro Business and Tourism.  
**Social sector:** Housing, Education, Health and Culture.  
**Infrastructure sector:** Transport, Electricity, Water & Sanitation, Telecommunication, Airports and Ports.  
**Cross-Cutting:** Disaster Risk Management, Environment, Gender and Governance.

Date created: 13/11/2017

Data source: PDNA Dominica 2017, PDNA Antigua and Barbuda 2017, Sint Maarten National Recovery Plan 2017, CEDIM 2017, NHC NOAA and BVI Government 2017.

\*The data is drawn from the CEDIM Forensic Disaster Analysis Report for Hurricane Irma that uses different methodology than the PDNA.

\*\*These estimates are based on available data from PDNAs. The actual damages, losses and recovery needs are estimated to be much higher once the whole region is taken into consideration.

CRISIS IMPACT	Sectoral Impact Legend												
	WASH	HEALTH	FOOD	HOUSING	LIVELIHOOD	PROTECTION	EDUCATION	INFRASTRUCTURE	COMMUNICATIONS	AGRICULTURE	ENVIRONMENT	ECONOMY	
Antigua and Barbuda	X	X	X	X	X		X	X		X	X	X	
Dominica	X	X	X	X	X	X	X	X	X	X	X	X	
British Virgin Islands	X	X	X	X		X	X	X			X	X	
Sint Maarten	X	X	X	X			X	X	X		X	X	
Anguilla	X	X	X	X	X		X	X			X	X	
Turks and Caicos Islands	X	X	X	X		X	X	X	X			X	
The Bahamas		X			X			X				X	

# RECOMMENDATIONS FOR RECOVERY

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The following recommendations have been extracted from Post-Disaster Needs Assessments conducted in Dominica and Antigua and Barbuda following Hurricanes Irma and Maria. Although the effects and response are context specific and tailored each territories' affected populations' needs, these recommendations could be helpful in guiding the response in other territories.

Sources: PDNA Dominica November 2017, PDNA Antigua & Barbuda Executive Summary, Sint Maarten National Recovery Plan Interim Report October 2017, British Virgin Islands Preliminary Impact Report

## INFRASTRUCTURE

- To the extent possible due to geography and terrain conditions, power system network should be undergrounded during the restoration efforts, as opposed to simply repairing/rebuilding overhead lines. This is the most critical measure to enhance resilience power systems. The investment costs are set to be significantly higher, yet they would offset by the long-term benefits.
- The resilience of hydraulic structures needs to be improved to accommodate debris flows to the extent possible and to design for overtopping especially in narrow gullies. For bridges, concrete girder construction is preferred as more resilient to debris impact than steel; a minimum 12 m span and 2+ m clearance will reduce the risk of blockage by trees and moderate boulders; and parapets should minimize obstruction to overtopping flows. For culverts, wide box design or small bridges should be a minimum for small rivers and be designed to accommodate overtopping at the structure with extensive protection from erosion down and up stream. Increased use of lined side drains and, in areas subjected to high surface runoff or overtopping, use of concrete pavement will improve the resilience of the road structure in hilly terrain.
- Flooding risks are best mitigated with an understanding of the hydrological features of a given site. Steep terrain combined with bridge construction that does not allow for adequate clearance for washed down debris to clear, generates an environment where flooding can be sudden and dangerous. The good mitigation against this risk, if a location close to a riverbank is chosen, is to build at an elevation above the riverbank where severe flooding will not rise.
- Develop and implement a debris and waste management plan to include off-island disposal of hurricane debris. Include consideration for deploying equipment such as wood chippers and metal compactors to reduce waste for disposal and facilitate transportation. Develop a plan for off island disposal to include, perhaps, selling recovered material such as metals to international recyclers. Work with agriculture to recycle naturally derived wood chips as ground cover. Consider the potential to recycle concrete from demolished structures
- Road infrastructure programs should progressively improve the resilience of major routes and highly vulnerable assets to ensure that transport connectivity can be restored quickly after future events.
- Disaster risk mapping and community consultation is encouraged in settlements located in high-risk floodplains to identify any needs for partial or substantial relocation. A communication strategy should aim to improve the adoption of vehicle insurance cover for natural hazards.

- Rehabilitate transportation infrastructure including port facilities and secondary road network. A marine survey should be undertaken to assess the impact of the storm on navigation channels and docking facilities. Navigation aids may need to be repositioned and dredging may be required to accommodate vessels. Jetty and pier facilities may need rehabilitation and improvement to accommodate traffic. Portside storage and cargo handling facilities should be assessed and rehabilitated to accommodate the increased flow of materials and goods.
- While most of forests recover naturally, there may be the need to replant in areas where quicker forest regeneration is required, e.g: to protect human settlements or infrastructure from erosion.
- Consider alternative airports or ports, even though not economically viable, as an alternative point of entry for aid and assistance after natural catastrophes.
- The large amount of debris due to destruction caused by the hurricanes can present itself as an opportunity for the territories. Debris may include valuable material such as concrete, steel, car wrecks and timber, as well as organics for composting. Processing of waste of all types should be evaluated as a source of income from recycling, as well as waste-to-energy incineration.

## TELECOMMUNICATIONS

- Training should be offered to persons interested in becoming amateur radio operators with the goal of having a licensed amateur radio operator in every community with an emergency shelter. Emergency shelters and emergency operations centers should be equipped with amateur radio and/or a satellite phone so that contact may be quickly established during or after a storm.
- Having temporary Cell on Wheels (COWs) mobile cellular towers ready to deploy in the event of a disaster would speed up recovery and improve resilience by providing temporary mobile coverage.
- Greater consideration of natural hazards in the placement of their infrastructure and support structures. In addition to replacing hardware, ICT institutions should be strengthened.

## HOUSING

- The process for rebuilding the majority of the housing stock to higher standards of resilience requires an integrated multifaceted approach. Policy and planning measures, physical preventive and adaptive measures, and capacity building at the community level are entry points for building resilience in the sector. The revision and enforcement of the building codes, to tie provisions in the planning and design stage to the construction phase, is important.
- Training in the improved building practices for disaster-resilience house construction needs to be provided for firms, suppliers and homeowners involved in the reconstruction effort. Providing training for all involved in the reconstruction efforts (homeowners, builders, carpenters) in the application of disaster resilient construction techniques is important, along with producing guidance documents illustrating proper construction techniques.

- For roof structures, the use of graded and treated timbers, use of bracing and hurricane ties, the spacing of fixings and use of screws, connections to the wall frame and adequate overall roof structure and slope are critical factors.
- Better construction techniques can go far in mitigating disaster risks; even when properties have survived storm with non-concrete roofs intact, engineering suggestions commonly mentioned for roofs are thicker purlins and screwed down, rather than nailed, galvanized steel.
- Developing a risk-based approach and integrating planning for natural disasters into the development of the housing sector is a medium-term priority. Mechanisms to encourage community participation are important. For the most vulnerable and seriously damaged areas, community consultation on disaster-risk mitigation plans and relocation options should be initiated before reconstruction progresses.
- Coordination of the housing reconstruction program is critical in reaching all vulnerable households. Critical elements to be considered include regional allocation of funding, clear eligibility and targeting criteria, and availability of insurance compensation.
- Provide construction supervision by engineers and architects and provide training and mentoring services for the formal and informal sectors.
- Recovery after storms can occur faster and be more successful if community members can make decisions about, and lead, the repair. Communities who have homes that have been damaged can be best served if they are allowed and assisted to rebuild. House-owners should be included in building process itself. This can avoid tensions or conflict in future.
- Additional and more long-term support should be considered for those affected communities with perennial crops.
- Stakeholders should encourage the design and implementation of market-based transfers in areas where markets are properly functioning, food is available and subsistence farmers that live off their own production and sale of crafts to tourists.
- Cash-based interventions can be accompanied by nutrition-awareness campaigns, and/or combined with in-kind food distributions in areas where markets are not yet stable or food is unavailable.

## AGRICULTURE

- Context-specific livelihood support should be given to fishermen and farmers, including distribution of fishing kits and agricultural inputs.
- Develop production instruments that encourage use of crop rotations and diverse cropping systems combined with zero to minimal tillage practices followed by proper fertilization and irrigation.
- Encourage land management practices through “green incentives” and appropriate policies that decrease agro-ecosystem disturbance, improves soil fertility, increases organic inputs and plant cover, etc.
- Explore the use of high nature value farming indicators as an overall management strategy and monitoring tool for agricultural production through participatory approaches. These will include management programmes that limit deforestation, increase organic matter storage in cultivated soils and reduce current erosion.
- Develop production programmes that combine nutrient-efficient crops as well as efficient fertilization practices. Fertiliser management strategies need to take into account both production and environmental imperatives.

## FISHERIES

- In order to minimizing fish loss and reducing deleterious impacts to the ecosystem in future storms, fish harvesting safeguards which encourage use of biodegradable panels in pots to diminish ghost fishing should be developed.
- Promote fuel efficient engines which also have less negative impacts on the marine environment;
- Improve safety-at-sea of fisherfolk by providing increased training and safety-at-sea equipment. Additionally, build safe harbours, boat hauling equipment and boat shelters.
- Encourage research and development of the aquaculture sector in order to provide potential contribution to food security while reducing exploitation pressures on marine species.
- Opportunities for plant propagation techniques should be considered in the early recovery phase.

## FOOD SECURITY

- Applicable to other sectors, but specially for food security, is the importance of taking into account the resilience capacity of people and their own desire to help their communities, the design and implementation of recovery strategies should be people-oriented, and undertaking a multi-sectorial approach, involving government, multi-lateral institutions and civil society.
- Strengthen the targeting process for food assistance to those identified as vulnerable to food insecurity in areas with the highest damage. Following damage to subsistence agriculture, fisheries or non-permanent agriculture and tourism livelihoods, it is important to fine-tune the identification of areas with vulnerable populations in order to better streamline recovery strategies.
- In order to provide opportunities to rehabilitate livelihoods and strengthen coping mechanisms, unconditional assistance can be accompanied by food for asset activities and agriculture based livelihood support programmes.

## EDUCATION

- It is highly recommended for all planned activities to ensure uninterrupted education services. This calls for both the structural and non-structural aspects of the education system to be resilient to shocks.
- Repair and reopen schools and provide housing for teachers and visiting educational professionals. Rehabilitation and reconstruction should include consideration for improved disaster resilience in new construction and retrofitting existing structures. Schools should be reopened as soon as practical to accommodate returning families and minimize family separation.
- Review the educational system and structure and review the existing institutional arrangements at central and local levels to respond more effectively to multi-hazards. This would require reviewing and revisiting existing policies and guidelines.
- Strengthening systemic capacity to deal effectively with post-disaster response, recovery and reconstruction: These would include mechanism to address the immediate needs as well as to ensure that education building and systems, meet higher standards and levels



of safety. Should be adequate provisioning of human resources and technical capacity at the national and district levels to ensure safety and quality at all phases.

- Building back better: All new education, and partially new, institutions should be resilient to future disasters (building with safe and adequately sized staircases, proper exists, furnishing and equipment such as to minimize potential harm to school occupants, and ensure the provision of minimum enabling conditions for enhanced learning, as basic WASH facilities, among others).
- Interventions in non-structural aspects: curriculum and textbooks to ensure that teachers and students internalize safety issues and can act in times of need. This also requires strengthened disaster preparedness and response at the school and community level.
- Consider implementing a resilience plan designed to identify issues as well as mitigation strategies to further implement sustainability measures during the recovery and redevelopment in the education, culture, youth and sport sector.

## HEALTH

- Permanent reconstruction to the facilities should incorporate PAHO Smart Hospitals standards for resilience, and low energy and water consumption. Roofs for health centers should be designed to withstand 700-year return period wind speed (159 mph 3-second gust 700-yr) in accordance with OECS Building Code 2015 and roofs for the Princess Margaret Hospital should be designed to withstand 1700-year return period winds (172 mph 3-second gust).
- Remote facilities that may become inaccessible should be self-sustainable with back-up power supply, water storage, telecommunication, and adequate stocks to continue services. It is recommended that a structural analysis is done before construction of flat reinforced concrete roofs to ensure that the building will not be compromised in the event of an earthquake.

## WASH

- Consolidate quick actions to restore water and sanitation services and solid waste collection and disposal as the basis for complete rehabilitation and reconstruction activities.
- Design and reconstruct water, sanitation and solid waste facilities based on whole project life cycle cost and risk-informed programming approaches.
- Adopt a community water safety approach to planning and implementation of reconstruction activities, with special focus on reinforcement of intake basins, use of flood resistant pipelines and storage tanks, and protection of water sources.
- Develop water and sanitation planning design and reconstruction unit, and empower communities to better prepare and respond to disasters.
- Build on local knowledge in community to improve integrated water and sanitation management, monitoring and reporting systems.
- Adopt new and environmentally friendly technologies to develop high yield aquifers in adverse topography and geology, to dispersed and remote populations.
- Establishing a more cost-effective and resilient system of waste collection and disposal including transfer and storage facilities.

- The water distribution network must become hurricane resistant. Additionally, it is important to build capacity to monitor and measure water quality at various points along the distribution network.

## TOURISM

- For privately owned tourism businesses, governments should create an enabling environment by assisting with access to financing, providing fiscal incentives to the sector, and providing resources. A way to speed up the rebuilding could be by giving loan guarantees to the most established private sector participants, allowing the private sector to lend with less risk exposure, and therefore with lower interest rates.
- For the hotel sector, there are two elements in the Build Back Better component: Quality of construction, and the location of the property. This also applies to some tourist attraction with fixed properties.
- A roll out of a marketing and public relations campaign is needed to inform international stakeholders about the progress of tourist destinations. This represents the return on investment of the business recovery effort.

## PROTECTION

- Livelihood recovery interventions, including grants or cash for work programs, will exponentially help with the loss of assets, crops, increased reproductive and community work which affects income and food security.
- Provide psychosocial support and counselling, particularly for boys and men and at the community level. Capacity building and psychosocial support against Gender Based Violence victims is also recommended as the causes for violence are prevalent: loss of employment, shelters not designed with gender considerations and an increase in drug and alcohol abuse.
- Institute grants that target elderly persons, as a majority of those that are still in shelters are elders.

## SOCIAL PROTECTION MECHANISMS

- Introduce mechanisms to lift households further above the poverty line than pre-disaster levels and ensure their improved resilience through participation in more productive activities, higher income earning opportunities, climate resilient livelihoods and mitigate negative coping mechanisms when disasters strike. A productive inclusion program to the non-indigent poor is a way to start achieving these objectives.
- Adopt contingency financing mechanisms for safety nets in order to provide immediate resources for rapid scale-up of the safety net. Similar mechanisms exist in other contexts, i.e.: Mexico's FONDEN facilitation of rapid scale up the Temporary Employment Program, or through a revolving fund model. Even though contingency financing exists through the CCRIF, these are not sufficiently linked to financing for safety net scale-up.
- Consider providing housing reconstruction grants/subsidies and interim assistance for low-income families. In addition to other considerations, it is likely that few properties

were insured, particularly in lower income brackets. Special assistance may be required to support the recovery of single parent households, particularly those headed by women. Special needs may include child and geriatric care, income and nutritional support.

- Anticipating and addressing the rise in unemployment should be considered. Measures should be taken in the near-term to accommodate displaced workers, as well as the development of programs that will integrate persons seeking employment as part of the economic recovery of the territories.
- Consider providing re-training opportunities. Retraining can provide some displaced workers with new skills that are in greater demand, which can reduce their earnings losses. I.e. retraining hotel staff to fill construction jobs, or perhaps into more technically oriented fields such as education, law enforcement, telecommunication, aviation and healthcare, which can support recovery initiatives in other sectors as well.

## DISASTER RISK MANAGEMENT CAPACITY

- Updating legislative frameworks in response to a changing environment and context approval of draft policies and bills is a significant part of any DRR strategy, as DRR requires the redefinition of roles, responsibilities and mandates of several agencies. These updates will guide the update of national disaster plans.
- Increasing the capacity of the private sectors to respond to disasters. Private sector actors should take the necessary measures to reduce the likelihood and impact of hydro meteorological events by strengthening the capacity of employees to respond in a timely manner.
- Strengthening community capacity to prepare for and respond to disasters is one of the most valuable ways of ensuring that communities and countries are well equipped for limiting the potentially adverse effects that disasters can bring. This includes strengthening the existing village council network through ongoing training in DRR and enhancing response capacity through simulation exercising.
- Enhancing Early Warning System Networks, with real time inputs from monitoring devices. Emphasis should also be placed on the response component so community members know how to react and where to go once a warning message has been received.
- Developing a Climate Resilient Recovery Authority. The severe damages caused by Hurricane Maria in Dominica require dedicated and specialized agencies that help implement recovery interventions in an efficient and effective manner while at the same time strengthening national development capacities.
- Development of a Relief Tracking System.
- Enhance disaster preparedness and crisis response capacity by improving communication. Communication between affected communities and government authorities should be enhanced to ensure that government authorities are continuously informed about situation on the ground. This flow of information in both directions will help to better adopt and respond to a crisis.
- Reliable seismic hydrological, meteorological and climate data are of utmost importance for planning and designing investments that are resilient to the impacts of climate change.
- Under the auspices of Build Back Better, the reconstruction requires to also adapt to the bigger and stronger hurricanes.

- Dedicated public awareness programme on DRR is needed with an emphasis on the most vulnerable.

Conduct a Post Incident Analysis and assess national preparedness and response activities in light of the disaster. Use the findings to adjust policies and procedures for national disaster response and preparedness. Review and modify legislation to accommodate and improve institutional and operational capacities and strengthen the Disaster Risk Management Framework at national and local level.

## ANGUILLA

**Priority needs:** Housing, WASH, Infrastructure (electricity)

**Absolute estimated economic losses:** 290 million USD (FDA CEDIM 2017)

On 5 September 2017 Hurricane Irma hit Anguilla as a Category 5 with winds of 298 km/h. One fatality was reported (ECHO 10/10/2017). One person was reported dead and almost 5,000 children were affected by the impact of the Hurricane.

The government aims to have critical sector services such as tourism, health, and education functional over the next six months.

**Constraints on response and recovery:** The airport runway and most roads leading to the airport have been cleared, and air traffic has resumed. The majority of primary and secondary roads have been cleared of debris and other obstructions. Shortage of fuel is a concern. However, Anguilla will require financial assistance from the UK government, as Anguilla's administering power, in the short to medium term. In June 2017, Barbuda graduated to a high-income country and is now largely ineligible for concessional financing and official development assistance, due to revenue per capita exceeding the criteria set (UN ECOSOC 24/10/2017).

**Education:** All six primary schools and the secondary school were badly damaged. Schools reopened 1 October. Education was disrupted for thousands of children, but as of 25 October all children had returned to school in temporary buildings. The aim of the government is to have the rebuilt schools ready for the start of the 2018/2019 academic year (OCHA 25/10/2017; Government of Anguilla white paper October 2017).

**Food:** Livelihoods have been severely affected as the tourism industry – which the economy is highly dependent on – has been severely affected. Food shortages were an initial concern.

**Health:** The only hospital on the island, Princess Alexandra, is operational and providing regular health services. However the hospital needs modernization/expansion to be fit for purpose and meet the needs of the population (Government of Anguilla white paper October 2017).

**Housing:** 90% of Anguilla's housing stock was severely damaged. Structural assessments are ongoing for damaged houses (Government of Anguilla white paper October 2017).

**Infrastructure:** 42% of structures were damaged. Around 90% of government buildings were substantially damaged and critical government functions (police and national emergency operations) were temporarily affected. Electricity distribution - the Anguilla Electricity Company (Anglec), which is majority owned by the government, suffered extensive damage to its transmission and distribution network. Over 1,500 electrical poles fell, with many destroyed. It was estimated in October that it will take up to six months to fully restore electricity throughout the island. (OCHA 13/10/2017; Government of Anguilla white paper October 2017).

**Livelihoods:** Tourism is the single most economic driver for the island, as well as the largest principal and secondary employer, as Anguilla has moved away from

subsistence farming, salt production and lobster fishing. The damage inflicted by Irma will negatively impact the 2017/18 and 2018/19 tourism season, further affecting Anguilla's economy.

**Protection:** 4,800 children were affected. Given the destruction of schools, there are child protection concerns.

**WASH:** Access to potable water is of concern as the disruption in electricity affected desalination of seawater, as Anguilla has no surface water and its underground supplies are not reliable (Government of Anguilla white paper October 2017).

## ANTIGUA AND BARBUDA

**Priority needs:** Rebuilding of houses, public building, commercial structures and touristic structures, water and electricity infrastructure, and education.

Estimated damages USD 136.1 million and losses USD 18.9 million. Estimated recovery needs USD 222.2 million (PDNA 2017).

Hurricane Irma destroyed 95% of all properties (public and private) on Barbuda. Antigua, out of the path of the eye, experienced tropical storm force winds with gusts recorded of up to 96 k/h. When it was feared Hurricanes Jose and Maria would strike Barbuda again, all 2,000 residents were evacuated to Antigua (The Guardian 29/10/2017). Hurricane Maria (also a category 5 storm) did not make landfall on Antigua, but the island affected experienced tropical storm force winds and associated rainfall.

**Constraints on response and recovery:** As transportation infrastructure was damaged there are higher operational costs, including additional staff, transportation to and from Barbuda (PDNA 2017).

**Education:** On Barbuda, four educational structures suffered damage. The day-care center was destroyed. The kindergarten suffered roof damage and will require renovation and repair. The primary school lost 6 of 12 buildings, and all roofs were lost. The secondary school experienced damage from flying debris and lost three wooden outbuildings (PDNA 2017). All 410 Barbudan children have been temporarily integrated into Antiguan schools (OCHA 13/10/2017; UNICEF 18/10/2017). On Antigua, the Antigua State College reported structural damage to one of its buildings (PDNA 2017).

**Environment:** Ecological damage is significant but temporary. Wave and storm surge resulted in the breach of the sand bar protecting Codrington lagoon. Strong winds stripped mangroves and other vegetation of their foliage, and storm surge and sea spray contaminated soils, impacting the terrestrial vegetation and livestock forage. Deposition and accumulation of debris and solid waste in ecosystems will need to be removed, especially in mangroves (PDNA 2017).

**Agriculture and Fisheries:** The impact on agriculture includes destruction of standing crops, agricultural infrastructure, a 250-acre coconut plantation, agricultural equipment, machinery and processing facilities. Similarly for fisheries, fishing kits and boats have been destroyed (OCHA 13/10/2017). Environmental damage, particularly in Barbuda, may impact lobster production over the next six months. 37 fishing vessels in Barbuda, 69% of the island's fishing fleet, sustained damage, including destruction of their hull or engine. Some 2,177 fish traps from Antigua and Barbuda combined sustained damage. The damage to fisheries facilities was valued at a total of USD 66,000. The losses in livestock in Barbuda (comprised of goats, sheep, pigs and poultry) is estimated at USD 95,222 and damage to infrastructure at USD 53,000 (including fencing, henhouses, garden beds, irrigation, etc.) (PDNA 2017).



**Health:** The health facility on Barbuda is currently being repaired to be able to provide basic services as soon as possible. The facility suffered major roof and associated interior damage. The water supply was contaminated, and the emergency generator damaged (PDNA 2017).

**Housing:** Major damage was sustained. 642 of an estimated 670 houses on Barbuda are estimated to have suffered some degree of damage. 45% of housing in Barbuda is estimated to be uninhabitable, with 28% requiring complete replacement. Some damage was reported from Antigua (roof loss) (PDNA 2017). Most evacuees are living with friends and family on Antigua, and 207 in government-run shelters in technical colleges, churches and a cricket stadium on Antigua. With government assistance people have returned to Barbuda for a few days at a time to start the clean-up. Rebuilding has been complicated by most people not having home insurance (The Guardian 29/10/2017; UNICEF 18/10/2017). Nevertheless, debris removal efforts have considerably advanced, with coordination of the government and participation of the local population. Permanent returns will remain a challenge until water and sanitation supply is restored (OCHA 13/10/2017).

**Infrastructure:** Barbuda had no water, electricity, and communications for weeks. There was an urgent need to repair and coordinate support at ports, airports and warehouse facilities (OCHA 13/10/2017).

The electricity generation and distribution network on Barbuda was severely damaged. Transmission lines were lost, and all generators require replacement. Supporting infrastructure such as buildings and storage areas require rehabilitation (PDNA 2017).

**Roads:** damage related primarily to the crushed limestone road network including 117 km of roadway in Antigua and 8 km of the Barbuda network. 58 km of damaged and vulnerable roadway also needs resurfacing in Antigua and 8 km in Barbuda. This includes the rehabilitation of a bridge/seawall structure on Antigua. Barbuda's only gas station was structurally damaged. The entire vehicle stock in Barbuda is assumed to be at least partially damaged (PDNA 2017).

**Sea:** The main cargo and ferry port south of Codrington on Barbuda suffered significant damage. Sand sedimentation has restricted the size of vessels able to use the facility. The Port of St John's suffered physical damage along the western end.

**Air:** Codrington airport experienced significant damage forcing its closure to commercial traffic. The terminal building requires extensive roof and interior repairs, and the security fence needs replacement. The runway required rehabilitation (PDNA 2017).

**Livelihoods:** For every 100 households in Barbuda, 84 individuals are financially dependent on fishing (Seafood Source 20/10/2017). The hurricane has also already affected the country's economy with airport closures and people cancelling holidays to Antigua under the belief that it, too, had been destroyed by the hurricane (The Guardian 29/10/2017).

**WASH:** All water sources on Barbuda were damaged. Surface pollutants and saltwater intrusion contaminated groundwater. Rainwater harvesting systems were damaged and cisterns contaminated with debris. The public desalination plant was flooded, damaging the building and electronic control systems. Distribution infrastructure such as pipes, valves and fencing requires repair or replacement. A regular water-testing program is required to protect human health (PDNA 2017). Agencies have warned of the long-term requirement of bottled waters in schools (OCHA 13/10/2017).

## THE BAHAMAS

**Priority needs:** WASH, Housing, Protection, Health

Islands of the south Bahamas sustained minor damage, including Crooked Island, Inagua, Mayaguana, with more severe damage in Ragged Island and Acklins Island (Local News 29/09/2017). After mandatory evacuation of the affected islands, about 1,000 evacuees have returned, except to Ragged Island. Displaced population was in Nassau.

**Constraints on response and recovery:** Airports have reopened, and flight services resumed.

**Health:** Clinics in Ragged and Acklins Island sustained damage, though not severe.

**Infrastructure:** Houses and government buildings (including schools, police stations, clinic and post office) in Ragged Island were, destroyed or severely damaged. Power poles were down, affecting electricity and communications. In Acklins island, homes and small businesses in Salina Point was destroyed or damaged due to the hurricane or following storm surge. Crooked Island received little damage to infrastructure, with a number of sea walls that were under construction impacted. Grand Bahamas has limited property damage. Power, electricity and water services and have been restored (Local News 29/09/2017; Local News 13/09/2017).

**Livelihoods:** The Bahamas' major tourism centres were minimally impacted and are open as usual (Local News 29/09/2017).

(OCHA 06/09/2017, USAID 07/09/2017, OCHA 15/09/2017, Local News 18/09/2017)

## BRITISH VIRGIN ISLANDS

**Priority Needs:** WASH, Food, NFIs, and Infrastructure (electricity)

Total estimated damages amount to 3.6 billion USD.

Three people were confirmed dead; the 125 people were injured. Reports indicate that the entire population of around 30,000 people was affected and a significant portion was temporarily displaced. There was widespread damage to homes, businesses, infrastructure and marine vessels. Logistical difficulties made it difficult to deliver supplies to the British Virgin Islands. The entire population experienced the loss of electricity, water, and access to communication for a period immediately following the impact from Hurricane Irma. To date, only portions of Road Town, Tortola; The Valley, Virgin Gorda and The Settlement, Anegada have seen these services restored. Although all communities across the Territory were affected, the areas most significantly affected include Huntums Ghut, Cane Garden Bay, Long Look/ Fat Hogs Bay, Jost Van Dyke, Northern Ridge and Coastal communities on Tortola; and North Sound Virgin Gorda (Preliminary impact report BVI government).

Although the expatriation data has not yet been compiled, approximately 10% of the population has left the Territory through the T.B Lettsome International Airport, some were repatriated by their employers or a family member and many children have been relocated to the US mainland or Caribbean countries to continue schooling. This has resulted in separation of family units (Preliminary impact report BVI government).

**Constraints on response and recovery:** The airport has reopened and is operational, but the tower has been damaged, with flights carrying emergency relief arriving only as 18 September. Ferries are operational despite most harbours having been severely damaged. Communication systems were impacted. Roads were severely damaged. Heavy equipment operators were deployed to clear roads to at

least single lane traffic. Transportation is limited as a majority of vehicles were damaged.

Communications with Anegada continues to be challenging. A multi-sector team, including representatives from DDM and Virgin Gorda, visited the island on 27 September to conduct a reconnaissance of the island (Preliminary impact report BVI government).

In Jost van Dyke, there is limited communications and residents are challenged with sending or receiving messages (Preliminary impact report BVI government).

**Education:** Schools have been damaged or destroyed. Thousands of children have had their education disrupted. School buildings used as shelters are now being vacated and repairs are being concentrated on ensuring that community centers can house those that have to be moved (Preliminary impact report BVI government).

**Health:** 60% of health structures were affected. Peebles Hospital (Tortola) was partially operational and providing regular services after having suffered minor damage. Iris O'Neal Clinic (Virgin Gorda) suffered minor damage. The Pan American Health Organization (PAHO) has reported space constraints due to damage, and coordination critical in receiving larger medical shipments.

In Jost van Dyke, the only health clinic on the island, which also has accommodation for the nurse, was significantly damaged. The nurse is now housed in the pharmacy space in the clinic. The building is not secured; and there is a serious vector issue with standing water and mosquitoes (Preliminary impact report BVI government).

**Housing:** Non-formal emergency shelters, as well as formal emergency shelters either lost their roof and windows or were affected by other damage caused by the hurricane. A total of 28 shelters (emergency and improvised non-formal) were open across the Territory, housing a remaining two hundred and nineteen (219) displaced persons who sought shelter (Preliminary impact report BVI government).

In Anegada, Efforts have started to restore the community centre as a shelter by checking the generator and cleaning the facility. Once the work at the community centre has been finalized, it will be re-established as a shelter so that the eight shelterees currently using the school can be relocated (Preliminary impact report BVI government).

In Jon van Dyke, the number of families and individuals homeless is concerning. Residential homes, visitor accommodation properties and restaurants on East End, White Bay, Little Harbour and Great Harbour were significantly impacted. Approximately 80 family homes were completely destroyed accounting for 66% of all household units affected (Preliminary impact report BVI government).

**Infrastructure:** Preliminary assessments indicated 60–80% of buildings throughout the territory damaged or destroyed, including critical facilities, homes, and businesses. In the north of the island, 90% of houses were destroyed. Infrastructure for electricity generation, transmission, and distribution was severely damaged across islands. With reconstruction efforts under way, on 2 November the government stopped all reconstruction works on buildings, trying to ensure that rebuilding was undertaken in a sustainable and proper manner (Government 02/11/2017).

In Anegada, work to restore electricity throughout the island continues. It is estimated that power has been restored to approximately 40% of the Settlement (Preliminary impact report BVI government).

In Jon van Dyke, there is still no infrastructure, no working water plant, and no electricity. The ferry service which connects Jost Van Dyke with Tortola and the US Virgin Islands is not functioning due to damage incurred (Preliminary impact report BVI government).

**Livelihoods:** Poultry farms have been totally wiped out causing the death of the birds by the fallen debris. It is expected that there has been significant impact to other livestock especially those that were caged resulting in farms being completely wiped out. The tourism sector and financial services, which are key to the country's economy, have also been heavily affected. This will have implications for their future livelihoods (Preliminary impact report BVI government).

**Protection:** Authorities declared a state of emergency and a 22:00 curfew is still in place. 9,500 children have been affected by the storm. After damage to the prison and the escape of 142 prisoners, 30 remained at large as of 19 September.

There are concerns throughout communities about the anecdotal effects caused by Hurricane Irma; such as depression, PTSD and violence (Preliminary impact report BVI government).

The two elderly homes, one on Tortola and one on Virgin Gorda were significantly impacted leaving the 30 senior citizens and staff affected (Preliminary impact report BVI government).

**WASH:** The piped water supply was not functioning due to the lack of electricity. There was a limited stock of safe water available prior to Irma. Some cisterns are reported contaminated.

Both desalination plants on Virgin Gorda were destroyed. Water production was restored to Virgin Gorda following the successful connection to of the water mains to electrical power. Water storage systems remain intact but require assessment (Preliminary impact report BVI government).

In Anegada, work to restore water throughout the island continues (Preliminary impact report BVI government).

In Jon van Dyke, waste management and vector control issues are emerging (Preliminary impact report BVI government).

Other sources: [CDEMA 06/09/2017](#), [OCHA 08/09/2017](#), [IPS News 15/09/2017](#), [UNICEF 09/09/2017](#), [OCHA 10/09/2017](#), [OCHA 15/09/2017](#), [PAHO 14/09/2017](#), [UNICEF 14/09/2017](#), [CDEMA 14/09/2017](#), [CDEMA 18/09/2017](#), [The Guardian 16/09/2017](#)

## DOMINICA

**Priority needs:** Food distribution, subsidised sales of necessities, housing, rehabilitation of damaged housing, education, rehabilitation of health centres, and livelihood (agricultural) assistance.

Estimated damages USD 931 million and losses USD 380 million. Estimated recovery needs are almost USD 1.4 billion (PDNA 2017).

As of 16 October, 57 people had been confirmed dead and 18 missing after Hurricane Maria (IRIN 16/10/2017). As of 16 November more than 6,000 buildings were assessed, as part of the Building Damage Assessment by 100 women and men who are currently covering the whole territory of Dominica, organized into 27 teams composed of three to four persons each. Thus far, slightly less than one third of surveys show that no-to-little damage occurred, whereas more than two-thirds reveal damage has been extensive and significant. High number of houses tagged as red, cannot be inhabited anymore (UNDP). The hurricane destroyed entire crops, and disrupted power and water supplies (OCHA 26/09/2017). 19,800 children have been affected (UNICEF 18/10/2017).

More than a month into the disaster, food, water, electricity, tarpaulins, and building repair materials remain the most urgent needs for 62,920 people (ECHO 12/10/2017). Damages and losses are estimated to amount at about USD 1,3 billion, 224% of 2016 GDP (PDNA 2017).

As of end of October, it is estimated that over 17,000 persons have left the country (PDNA 2017). Of this many are children, and persons aged 17–49. This is particularly concerning for the 3,000-strong Kalinago community, whose viability is at stake. Many families with children might move or stay abroad, following a pre-storm pattern of Kalinagos leaving Dominica for better opportunities elsewhere (IRIN 16/10/2017; UNICEF 08/10/2017). A plan to support returns, or find alternative solutions for people sheltering in collective centres inside schools, is urgently required. 43% of these people are vulnerable, 26% being elderly people, 15% single female-headed households, and 11% people with chronic illness (OCHA 19/10/2017).

**Constraints on response and recovery:** Humanitarian cargo requires 48 hours' notice to prepare handling and reception at the main entry points in Dominica: Roseau Sea Port, Canefield Airport and Douglas-Charles/Melville Hall Airport. Dispatch of humanitarian cargo from the sea port in Roseau requires 24 hours-notice to enable preparation of cargo. Lack of regular commercial flights requires ongoing UNHAS humanitarian air service from Antigua (OCHA 26/10/2017). Government assessment of damages and recovery needs were hampered by a loss of IT system support, and other services were impacted by the delays in restoration of power and water and by building damages. Transport service providers were impacted by uninsured damages and losses far exceeding their income, and the financing costs needed to re-establish operations (PDNA 2017). In Roseau damage to road infrastructure, reduced the capacity in DSWMC to collect solid waste and a lack of available private contractors is restricting the recovery service countrywide. (PDNA 2017). Import duties and VAT have been lifted for six months on commercial and non-commercial food items, and specific construction materials. Environmental and custom duties remain in place (OCHA 19/10/2017). The lack of feed, shelter and water is resulting in increased losses of livestock every day (OCHA 26/10/2017; PDNA 2017). Heavy rains during 15 -19 October caused flash floods and highlighted the urgent need for debris and solid waste management and more extensive repairs of water and sewage systems (OCHA 19/10/2017; OCHA 26/10/2017).

The government has announced tax exemptions for six months on food and construction material imports, in-kind grants of roofing materials to assist residents to rebuild their homes, and will maintain the temporary shelters while communities continue to rebuild. To help finance home rehabilitation, the government announced voluntary advances on government salaries and on non-contributory pension payments from the Social Security Fund. The government's decision to establish a consumer protection agency is aimed at preventing price gouging by wholesalers and retailers (PDNA 2017).

Banks and credit unions have resumed services to enable transactions, and plan to minimise the storm's impact on banks' credit portfolios. The National Bank of Dominica (NBD) announced a three-month loan moratorium, which would relieve financing constraints during a transition. Substantial private insurance pay-out is expected to facilitate the repair and reconstruction of private housing and structures, tempering the risk of an increase in non-performing loans (NPLs) in the bank's mortgage portfolios. (PDNA 2017)

Dominica was still in the recovery phase following Tropical Storm Erika, which hit the island on 27 August 2015, killing more than 24 people, leaving nearly 600 homeless and wreaked damage totalling more than one billion dollars. Almost 2,800 individuals considered vulnerable prior to Maria will fall below the poverty line. Dominica faces many challenges caused by repetitive disasters making recovery a complex and difficult process. The lack of a solid institutional and coordination mechanism for recovery has further compounded this issue, leaving some past recovery processes still incomplete (PDNA 2017).



**Communications:** The interruption of telecommunication services had a significant negative human impact: Dominica was almost cut off from the outside world for three days, and communities within Dominica were isolated from one another. Information for critical relief and rescue activities was delivered via a few satellite phones and a sparse amateur radio network. Only five of 15 mobile phone masts survived the hurricane. Digicel and Flow, the major network operators, have restored services in Roseau area. The more urban south of Dominica is more affected than the north, due to its greater dependency on mobile network connectivity (ETC 29/10/2017; PDNA 2017). As of mid-November, media outlets have still not fully recovered. Two towers of the island's public broadcaster, Dominica Broadcasting Cooperation (DBS) are not operational, leaving areas of the island with limited radio signal.

**Education:** As of mid-November, 36% of all schools (around 48 primary and secondary schools) have reopened. All primary schools were closed until 18 October. Classes have resumed with a reduced schedule (OCHA 09/11/2017). School leaders, teachers, and students are coping with the disruption in a variety of ways, including resuming classes in temporary structures and, for some students, traveling to neighbouring islands to continue their education. The destruction of houses and displacement of families has had a severe negative impact on the learning environment at home (PDNA 2017).

**Environmental impact:** 80–90% of environmental resources are estimated to be significantly affected, particularly forests. Only a few trees in small and very protected pockets retained their leaves. It is estimated that approximately 20 trees of commercial species and dimensions per acre were blown over or destroyed. Additional to the losses in timber are the damages to the environmental services the forest provides. The scenic value of the dense forest cover is one of the main attractions for the tourist industry. Another important aspect of the forest cover is erosion control and the provision of clean potable water. All the above environmental services were compromised. While in time the forest will recover naturally there may be the need to replant in areas where a quicker forest regeneration is required, for example to protect human settlements or infrastructure from erosion (PDNA 2017).

**Food:** Households whose livelihoods were affected by the hurricane are having difficulty coping with the loss of income needed to cover food and other basic needs. According to WFP, 24,000 people are severe or borderline food insecure as a result of the hurricane. Several interviewed households whose main source of income is agriculture, tourism, or fishing, indicated that their only source of food is the humanitarian assistance (PDNA 2017).

The need for replanting is urgent. The storm also severely damaged farm housing, irrigation infrastructure, feeder roads, livestock production, forest reserves, and fishing boats. Self-sufficiency is a priority to speed up the recovery process: the country currently depends on shipments of food relief from regional and international stakeholders. Fast-growing food crops were identified as the priority, including seeds for tomatoes, eggplants, pumpkins, sweet pepper, spinach, lettuce, cabbage, and kale. Four major sites have been identified as strategic areas for replanting interventions: Roseau, the Northeast, the Southeast and Portsmouth. The Portsmouth community, located in the south of the island, is particularly important as it enables the hospital food supply (FAO 25/10/2017; OECS 13/10/2017).

Food distribution continues to be a priority across the country, as access to and availability of food in markets remains limited. Major supermarkets and some small shops have re-established operations in urban centres. In rural areas, most shops remain closed or face shortages. Larger to medium importers are facing short-term pipeline breaks of certain staple foods (OCHA 14/10/2017). Wholesalers have experienced

an average reduction of 50% in their trade volumes. Retailers have limited to no stocks of tubers, vegetables, fruits, flour, rice, and chicken (PDNA 2017).

Collective centres are in need of cooking gas, particularly for those who face prolonged displacement as their homes have been destroyed (OCHA 19/10/2017). Food distribution continues to be necessary in settlements across the country where access to and availability of food in markets remains limited (OCHA 19/10/2017).

**Health:** The main Princess Margaret Hospital, in Roseau sustained severe damage with 15% of its buildings destroyed; 53% remained functional. Moderate or severe damage to more than half of all health centres is exacerbated by the disruption of access, electricity, water and waste management. All health workers were personally impacted. Initial support came from outside and critical patients were evacuated. Central Medical Stores lost the majority of medical supplies due to water damage but most medications were spared. Fluoroscopy, portable x-ray and all blood bank equipment was lost. Five weeks post Maria no elective surgery is being done and services have shrunk. Primary health services continue to be offered in buildings with only emergency repairs or in alternate premises. Short-term recovery needs include restoration of services to health facilities, repair of damage, replacement of equipment and identifying temporary facilities for use during reconstruction. Focus is on the hospital, Type 3 centers and hard-to-access areas. (PDNA 2017).

**Housing:** A reported 90% of structures on the island have been damaged: approximately 62% of houses were heavily damaged and 15% destroyed, making up more than 16,000 houses (OCHA 20/10/2017; IOM DTM 19/10/2017; OCHA 26/10/2017; Humanity road 20/09/2017). The most affected parishes, in terms of percentage of damage, are St. Peter, St. Andrew, and St. David, located in the eastern part of the country (UNOSAT 18/10/2017). 90% of the Kalinago community, who are among the country's most vulnerable people, had their houses destroyed (UNICEF 08/10/2017). All available public buildings are being used as shelters, with very limited availability of roofing materials (IPS 20/09/2017). A rapid site verification in early October identified 108 occupied collective centres housing 2,911 individuals (IOM 17/10/2017). Many buildings serving as shelters lost roofs, so tarpaulins and other roofing materials are a very urgent need (Humanity road 20/09/2017).

2,900 people are living in shelters in Dominica (UNICEF 18/10/2017). 1,862 people are sheltered in 63 collective centres, 53% of which are schools (IOM DTM 19/10/2017). Many people are spending the night in shelters and their days trying to clear debris from their houses and save their belongings (IOM 10/10/2017).

**Infrastructure:** Damaged stopped electricity supplies following Hurricane Maria. At least 75% of the network is down, although part may be recoverable; 80-90% of inspected transformers are badly damaged and cannot be repaired. Damage to generation sites vary from moderate to severe. Specifically, at Fond Cole, there is damage to buildings and three generation units must be inspected and repaired (enclosures were lost). Sugar Loaf also suffered some building as well as equipment damage. Trafalgar experienced only minor damage to the building structure, and Laudat is intact (PDNA 2017). Electricity has been restored in most parts of Roseau, though many areas are relying on generators. The Dominica Electrical Services Company (DOMLEC) is repairing electrical lines, prioritising public infrastructure and commercial businesses before residential areas. Burning debris in the vicinity of electrical poles is hindering the repair of lines (OCHA 14/10/2017).

Diesel-storage and diesel-importing facilities did not suffer any damage; therefore, fuel supply is expected to proceed smoothly (PDNA 2017).

Roads were covered by substantial amounts of debris, and a number of landslides or embankment failures occurred. At river crossings, strong flash flooding carried substantial boulder debris and high-water flows filled floodplains. In valleys and steep

gullies, especially in the south and west, some structures are blocked and covered by 1–2m of floodwater, and debris deposits of 1–4m depth filled the riverbeds, forcing rivers to change course and cause erosion. Road surfaces, especially on improved roads with lined surface drainage, are generally undamaged, but more extensive damage has occurred on the less improved road networks. At least six of the island's bridges were severely damaged (PDNA 2017).

At the port of Woodridge Bay, all sheds lost their roofs. The security fencing was compromised, windows in the main office building were blown out, the maintenance shed destroyed, and electrical equipment and electronics damaged. In Roseau, the ferry terminal was severely damaged: all electronic equipment, furniture, and vendor shops were affected. There was a 1 to 2 m. layer of debris as a result of the flooding. In Portsmouth, the cargo shed had similar damage, although the main pier remained intact. Security fencing has been compromised. The Cabrits cruise ship berth has been badly damaged, with the walkway of the pier destroyed, and the terminal building having lost most of its roof (PDNA 2017).

Five of the eleven police stations were significantly damaged. Officers from two had to be relocated. There was moderate damage to vehicles. Five out of the eight Fire and Ambulance stations suffered damage, with four classed as significant damage. All the seismic stations across the island have been reported as completely damaged with the hydro meteorological stations across the island experiencing moderate damage (PDNA 2017).

**Agriculture:** Livelihoods have been severely impacted. Access to agricultural fields, and the clearing of fields from debris from the hurricane and of destroyed crops, remains a problem in rural areas (OCHA 19/10/2017; IRIN 16/10/2017; PDNA 2017). 45% of cattle, 65% of pigs, 50% of small ruminants, 90% of broiler chickens, 90% layers, 50% rabbits, and 25% bee hives in the country were lost. The lack of feed, shelter and water is resulting in increased losses every day (OCHA 26/10/2017; PDNA 2017). An estimated 65% of coconut trees, 80% of cocoa trees and 80% of citrus trees have been damaged (PDNA 2017).

Farming families in Kalinago are among the worst affected, because they are primarily subsistence farmers who also depend on the sale of crafts to tourists – both sectors have been severely impacted. People living in collective shelters report a lack of livelihoods.

**Protection:** Women head 39% of households in Dominica. Many women, particularly elderly heads of households, did not have home insurance because they were living in family homes built by their parents. These women indicated they were unable to move out of the collective shelters because they did not have access to housing material or knowledge of where to source the material. Their main concern was being able to pay for the labour needed to assist them in rebuilding (PDNA 2017)

Women and men interviewed indicate a reported increase in mental health needs and psychosocial need, especially for men and boys who reportedly have not been employing healthy coping techniques. There has been an increase in drug and alcohol usage, which reflects much of the experience during the aftermath of Tropical Storm Erika (PDNA 2017)

There have been no reports of GBV. Some concerns regarding the behaviour exhibited by emergency security forces serving in the country (openly soliciting young women) have been reported. No official cases were reported (PDNA 2017)

Several signals of post-trauma were observed in children, families and among teachers in the school communities (PDNA 2017).

Elderly persons make up the majority of persons still in shelters (PDNA 2017)

**WASH:** Emergency repairs to water networks have restored access to 70% of the population (OCHA 09/11/2017). Water treatment and water trucking is still required to support peri-urban and rural areas, and to ensure the availability of water at collective centres, schools, and health facilities. The 41 water supply areas were damaged: 16 heavily and 21 moderately. Production and distribution pipelines were damaged or washed away; intake systems were blocked with sand; and debris, storage tanks, pumps, physical structures and access roads were damaged (PDNA 2017). The disruption of water and sanitation services has impacted livelihoods and disrupted production, manufacturing and tourism activities. The limited access to water supply has changed habits and consumption patterns among the affected population (PDNA 2017). Extensive rehabilitation is required to repair the damage and to increase resilience in the future. (OCHA 19/10/2017; OCHA 26/10/2017).

Damage to the Roseau wastewater treatment plant affected 5,190 households and included lift stations, fore mains, manholes, interceptor pipes, sewer lines, three major bridge crossings, gravity mains and about 3,000 service connections. The Canefield and Jimmit sewage systems were blocked by flood debris. On-site septic tank systems and latrines have been damaged (PDNA 2017).

In solid waste management, the already inadequate infrastructure suffered further damage and the service has been interrupted. Two collection trucks were damaged and many private contractors stopped collecting waste. The DSWMC administrative facilities and roof of the office building were heavily damaged and the disposal site severely damaged. Irregular service has been established in Roseau but damage to road infrastructure, reduced capacity in DSWMC and a lack of available private contractors is restricting the recovery service countrywide. (PDNA 2017). The burning of uncollected solid waste presents a health threat. The large volume of solid waste combined with very poor drainage systems contribute to an increased risk of vector-borne diseases. The aesthetic impacts could have a medium or long term impact on tourism (PDNA 2017).

## SINT MAARTEN

**Priority needs:** WASH, Protection, Infrastructure

Absolute estimated economic losses: USD 1,8 billion (Sint Maarten Recovery Plan)

The eye of Hurricane Irma passed over the island of Saint Martin/Sint Maarten on 6 September 2017. On Sint Maarten, the loss of life was limited to 4 persons and dozens of injuries. The island was devastated, with all residents from Sint Maarten reportedly affected. In preparation for Hurricane Maria, evacuation centres and shelters were prepared (National Recovery Plan 2017; OCHA 06/09/2017, OCHA 10/09/2017. UNICEF 15/09/17, OCHA 15/09/2017).

**Constraints on response and recovery:** The airport remains closed except for the use of military planes. Fuel stations are closed. The general conditions of roads are good for transportation of relief items. 65% of vehicles on the island are estimated to be damaged. A more detailed assessment is necessary to determine the scope of the housing solution necessary for the recovery.

**Communication:** Service has been restored to approximately 65% of the island, though coverage remains spotty. The two major telecommunication companies, the TELEM Group and UTS, suffered significant damage to their mobile telecommunication infrastructure and distribution networks. Of note is the destruction of towers thought to be hurricane-resistant. Shared location of communication equipment is common; hence the loss of a single tower can affect multiple operators.

Remote sites, if not damaged, were temporarily out of service due to the loss of power. (National Recovery Plan 2017).

All main radio stations are back on the air. Radio stations sustained damage to transmission networks but a few also sustained physical damage to production and broadcast locations. The government's emergency station remains out of service. The post headquarters is damaged including collapsed main walls and they were looted. The postal service is not yet restored (National Recovery Plan 2017).

**Education:** 95% of the primary schools can resume pre-exam and exam classes, six primary schools can resume all classes and three schools (CBA, Sundial, and SML) are seeking alternative spaces. The Ministry of Education has initiated temporary repairs with the aid of Dutch aid workers and military engineers. Most schools have electricity and water (was: 70% electricity, 45% water). Sufficient teachers are available to hold pre-exam and exam classes. 30% of teachers' homes suffered serious damage, 50 teachers require temporary housing. 15% of teachers left the island (comment: preliminary estimates), and 20% of the teachers that left are willing to return to Sint Maarten once conditions improve. Preliminary numbers estimate that 450 students left the island.

Government (including inspectorates) and Stichting Early Childhood Development Association (SECDA) assessed childcare facilities. The team surveyed 30-day care facilities in the districts Philipsburg, Sucker Garden, Dutch Quarter, Cay Hill, South Reward, St. Peters, Colebay and Simpson bay. According to the latest available census data, 84.2% of 1,073 children (0-4 years old) attend pre-school five days a week. Out of 30 centres assessed, with an estimated capacity 700 children, all 30 suffered damage of varying degrees; 14 centres are ready to operate; five centres are non-operational (National Recovery Plan 2017).

**Environment:** Sint Maarten's environment will need years to recover. Most large trees, some with historical and cultural significance, were toppled. Landscapes were defoliated, though some growth is slowly returning to the island. Bird nesting sites monitored by the Nature Foundation for the Brown Pelican, Sint Maarten's National Bird, have been decimated and recovery will take some time. The Nature Foundation estimates that 90% of the island's mature mangroves have been destroyed. Estimated fuel spilled in the Simpson Bay Lagoon exceeds 100,000 gallons, and an estimated 120 vessels must be salvaged as soon as possible because of the risk of oil spills in lagoon and in the Oyster Pond wetlands. Run-off from hills has impacted the quality of the water at beaches. Beaches have been eroded. Although coral reef assessments have not yet been carried out, damage is expected to be extensive and significant (National Recovery Plan 2017).

**Food:** Major food wholesalers and retailers were impacted by the storm and several were looted in the aftermath. Three of the largest supermarkets are out of service. Smaller outlets and the remaining supermarkets are open for business. The return of cargo operations ensures a supply of goods to these outlets. Looting and the loss of inventory delayed resumption of services, as did delays in the restoration of utilities. Clean-up of the surrounding areas remains a concern as is security considering the looting and sporadic breakings (National Recovery Plan 2017).

**Health:** The Sint Maarten Medical Center was damaged but is functioning after temporary repairs to the roof, although there are some issues with access to water. General practitioners and pharmacies have re-opened, albeit with limited hours. Dialysis patients were evacuated along with other critical care patients due to the situation at the hospital (National Recovery Plan 2017). Cases of acute diarrhoea have been reported. Surveillance of infectious diseases is ongoing.

**Housing:** According to the initial assessments, over 11,000 people have damage to their homes requiring significant reconstruction or repair. The Sint Maarten Housing



Development Foundation reports that 2,200 persons have registered for housing. There are no persons in shelters. Residents without homes have started temporary repairs or found shelter with family or friends. A temporary solution for the homeless is being prepared by the Dutch military. About 5,000 individuals need temporary shelter and 3,000 houses require immediate repair for occupation.

**Infrastructure:** Based on information derived from various damage assessment reports, 90% of the infrastructure on the island was damaged by the storm (National Recovery Plan 2017).

Windward Island Airways (Winair) is still completing the damage assessment of its physical facilities. Aircraft were repositioned to escape the storm, but the headquarters and technical (hangar) buildings are very badly damaged. The airline has decided to permanently relocate its main offices to the Philipsburg area. Temporary repairs to the technical building are being carried out to be able to meet maintenance requirements for the aircraft. Despite projected loss of air carrier frequency to the island, several airlines have indicated their intention to return to a limited schedule as of October (JetBlue, mid-October and KLM at the end of October). Spirit and Caribbean Airlines are willing to commence service immediately. American Airlines and Delta suspended flights but may resume in Q4.

The public transportation system consisting of privately owned mini-buses is under assessment. Recovery will be dependent on the speed upon which private owners can carry out repair, which depends on the speed of the insurance claim and payment process. In the interim, transportation is available. The Dutch St. Maarten Taxi Association report that 75% of their taxi drivers were affected by hurricane Irma. This may impact tourism from cruises (National Recovery Plan 2017).

**WASH:** Water services are not functioning. All desalinisation installations are functional, but until the piping system is restored, alternative distribution is needed. Water quality needs to be assured for the people of Sint Maarten. Initial assessments show that both the tanks and the distribution network are compromised (National Recovery Plan 2017).

The Pond Island landfill, already at capacity prior to the storm, will likely grow thus increasing the amount of solid waste that is not safely disposed of (National Recovery Plan 2017).

Sources: [OCHA 06/09/2017](#), [OCHA 10/09/2017](#), [UNICEF 15/09/17](#), [OCHA 15/09/2017](#)

## TURKS AND CAICOS ISLANDS

**Priority needs:** Food, Water, Infrastructure (electricity and communication)

Absolute estimated economic losses: USD 320 million (FDA CEDIM 2017)

No fatalities were reported. Some islands remain without utilities and communication following severe damage to infrastructure. Shortage of food and water continues to be of concern. St. Lucia has agreed to host prisoners from the island, after the prison was damaged.

**Constraints on response and recovery:** The Providenciales Airport was flooded for three days, but has now reopened.

**Infrastructure:** By 5 November, about 85% of hotels have reopened (International Media 05/11/2017). Severe damage to major government buildings, schools, churches and community centres were reported immediately after the hurricanes hit. 70% of houses on South Caicos, 70% of houses on Providenciales Island, and 50% on Grand Turk Island were damaged.

**Health:** All hospitals are currently functional. 60% of health facilities were damaged. The hospital in Grand Turk suffered roof damage and only primary services were initially being offered.

**WASH:** Some areas of the public water system were restored and water has begun to reach the population, yet there is a concern regarding lack of potable water in the immediate short term, while water stations are repaired. There was no running water in South Caicos and Grand Turk.

**Housing:** There is a lack of shelter facilities. 150 people are in shelters in Providenciales.

**Protection:** 10,000 children were affected. According to the governor, 6,570 people are vulnerable and required protection support. There are also an estimated 20,000 undocumented and stranded migrants. In addition, in South Caicos there are a number of Haitian and Dominican Republic nationals. These families are vulnerable and reported having no access to cash.

**Education:** By 11 October, 13 of the 15 schools in the country had reopened (UNICEF 11/10/2017).

Sources: [OCHA 06/09/2017](#), [OCHA 08/09/2017](#), [UNICEF 09/09/2017](#), [OCHA 10/09/2017](#), [OCHA 15/09/2017](#), [PAHO 14/07/09](#), [UNICEF 15/09/17](#)

## REFERENCES

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Hurricane Irma preliminary impact report – British Virgin Islands, Government of British Virgin Islands, October 2017

Dominica - Post Disaster Needs Assessment, Government of Dominica and partners, November 2017

Caribbean - Hurricane MARIA-Daily Flash 17, DG ECHO, 19 September 2017

Sint Maarten National Recovery Plan Interim Report, Sint Maarten Government, October 2017

Eastern Caribbean Humanitarian Situation Report No.10, UNICEF, 18 October 2017

Antigua and Barbuda Post Disaster Needs Assessment, Government of Antigua and Barbuda and partners, November 2017

British Virgin Islands' Preliminary Impact Report, National Emergency Operations Center, November 2017

Hurricane Irma report 1, CEDIM Forensic Disaster Analysis Group (FDA), 8 September 2017

ECOSOC/6873, Economic and Social Council, 24 October 2017

Anguilla & Hurricane Irma Recovery, Resilience and Prosperity, Government of Anguilla, October 2017

Caribbean Situation Report No. 9, UNOCHA, September 2017

Caribbean Situation Report No. 10, UNOCHA, October 2017

Caribbean Situation Report No. 11, UNOCHA, October 2017

Caribbean Situation Report No. 12, UNOCHA, October 2017

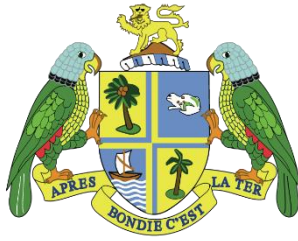
Eastern Caribbean Situation Report no.8, UNICEF, October 2017

Eastern Caribbean Situation Report no.9, UNICEF, October 2017

Eastern Caribbean Situation Report no.10, UNICEF, October 2017

Hurricane damage to fisheries in Antigua and Barbuda, Sea food source, October 2017  
Antigua and Barbuda, Hurricane Irma aid relief, The guardian, October 2017  
The Bahamas works to get back on track after Hurricanes Irma and Maria, Local news, September 2019  
Construction Stop Notice, Government of British Virgin Islands, November 2017  
Hurricane Irma Situation Report 1, CDEMA, September – October 2017  
Hurricane Irma Situation Report2, CDEMA, September – October 2017  
Hurricane Irma Situation Report 3, CDEMA, September – October 2017  
Hurricane Irma Situation Report 4, CDEMA, September – October 2017  
Hurricane Irma Situation Report 5, CDEMA, September – October 2017  
Hurricane Irma Situation Report 6, CDEMA, September – October 2017  
Hurricane Irma Situation Report 7, CDEMA, September – October 2017  
Hurricane Irma Situation Report 8, CDEMA, September – October 2017  
Hurricane Irma Situation Report 9, CDEMA, September – October 2017  
Hurricane Maria Situation Report 1, CDEMA, September – October 2017  
Hurricane Maria Situation Report 2, CDEMA, September – October 2017  
Hurricane Maria Situation Report 3, CDEMA, September – October 2017  
Hurricane Maria Situation Report 4, CDEMA, September – October 2017  
Hurricane Maria Situation Report 5, CDEMA, September – October 2017  
Hurricane Maria Situation Report 6, CDEMA, September – October 2017  
Hurricane Maria Situation Report 7, CDEMA, September – October 2017  
Hurricane Maria Situation Report 8, CDEMA, September – October 2017  
Hurricane Irma, Regional Sitrep 1, UN OCHA, September 2017  
Hurricane Irma, Regional Sitrep 2, UN OCHA, September 2017  
Hurricane Irma, Regional Sitrep 3, UN OCHA, September 2017  
Hurricane Irma, Regional Sitrep 4, UN OCHA, September 2017  
Hurricane Irma, Regional Sitrep 5, UN OCHA, September 2017  
Hurricane Irma, Regional Sitrep 6, UN OCHA, September 2017  
Irma update, PAHO, September 2017  
Dominica Hurricane snapshot, UN OCHA, September 2017  
Dominica Hurricane Maria snapshot No.7, UN OCHA, October 2017  
Dominica Hurricane Maria snapshot No.8, UN OCHA, October 2017  
HIP Plan, Latin America and the Caribbean, YNICEF  
Hurricane hit Dominica holds fast now, IRIN, October 2017  
Serving communities, ETC, October 2017





ANNEX:

**DOMINICA POST-DISASTER  
NEEDS ASSESSMENT AND  
RECOVERY STRATEGY  
– A SNAPSHOT**



## i. Hurricane induced Damages & Losses by Sector & Macro-Economic Impact

The passage of Hurricane Maria on September 18, 2017 was catastrophic for the infrastructure, economy and people of the Commonwealth of Dominica. A Post Disaster Needs Assessment, undertaken with the UN System, EU and WB, examined the cumulative impacts across sectors and concluded that damages to productive infrastructure exceeded \$930 million USD and an additional \$380 million in economic activity was lost. Combined, these costs represent well over 200% of the country's nominal GDP.

**Table 1- Total Damage and Loss (US\$ Millions)**

	<b>DAMAGES (USD Millions)</b>	<b>LOSSES (USD Millions)</b>	<b>Total (USD Millions)</b>
<b>PRODUCTIVE SECTOR</b>	<b>178</b>	<b>202</b>	<b>380</b>
Agriculture		124	
Fisheries	55		180
Forestry	2	1	3
Commerce and Micro Business	30		30
Tourism	70	7	77
	20	71	91
<b>SOCIAL SECTOR</b>	<b>444</b>	<b>42</b>	<b>486</b>
Housing	354		
Education		29	382
Health	74	3	77
Culture	11		
		7	18
	5	3	8
<b>INFRASTRUCTURE SECTOR</b>	<b>306</b>	<b>135</b>	<b>441</b>
Transport	182		
Electricity		53	235
Water and Sanitation	33	33	66
Telecommunication	24	40	64
Airports and Port	48	8	56
	19	3	22
<b>CROSS-CUTTING</b>			
Disaster Risk Management	3	1	4
Environment	3	1	4
Gender			-
			-
	<b>931</b>	<b>380</b>	<b>1,311</b>

Housing and transportation bore the brunt of the destruction. An estimated 28, 217 houses were affected, with damages amounting to the equivalent of 67% of GDP, while transport infrastructure suffered damage equal to another 35% of national output. Together, these sectors accounted for nearly 60% of all damage reported. School buildings and medical facilities were also heavily impacted and these effects

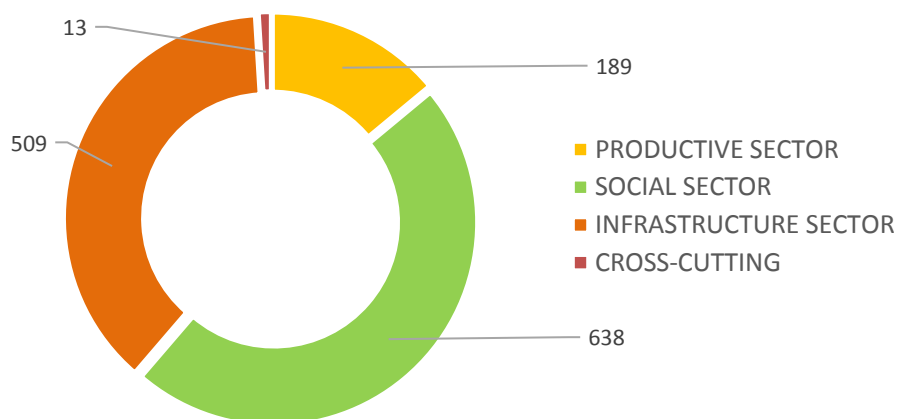
accounted for the bulk of the reported damage in those sectors. These damages significantly affected quality of life across the island, compromising people’s access to safe shelter and significantly constraining access to arable land and transportation of goods and services. On the other hand, the agricultural and tourism sectors suffered substantial economic losses equivalent to 24% and 13% of GDP, respectively. This represents a substantial impact on livelihoods, as the sector accounts for over one fifth of the labor market.

These combined impacts have the potential to exacerbate existing social challenges. If ongoing response efforts are not supported by comprehensive recovery and rebuilding interventions, the population living in poverty could return to the levels of the early 2000s, potentially leaving an estimated 33% of the population facing severe or borderline food insecurity. Under less optimistic scenarios, without sustained support, poverty levels could rise above 60%, with all the attendant adverse impacts on health, educational attainment and citizen security. Structural, gender-based inequalities could also be worsened as many women with the existing burden of care for children and grandchildren will face additional, disproportionate challenges in recovery.

## ii. Recovery Needs & Strategy

According to the PDNA, the recovery process will require an estimated \$1.3 billion US dollars for the rehabilitation of all socio-economic sectors. To be successful, the recovery strategy for Dominica will be multi-faceted and people-centered, focusing on rebuilding resilient infrastructure, creating sustainable livelihoods, particularly for the most vulnerable, and reducing vulnerabilities by integrating disaster risk reduction into national planning systems.

**Figure 1 - Total Recovery Needs by Sector (USD Millions)**



### Social Sector

The social sector recovery requirements are the largest at a total of \$638 million US dollars. The most significant needs are in housing, education and healthcare. A climate resilient housing recovery strategy, focused on reconstruction, repairs and retrofitting of houses for structural resilience, industry-wide training for construction professionals and the informal sector, and developing housing standards and policies that support climate-resilient construction practices will be required. This framework will also be integrated into the recovery of critical social sector buildings, including schools and medical facilities.

The national social protection mechanisms will be strengthened to address immediate needs among the most vulnerable groups and to prevent further adverse impacts on quality of life. The national institutional framework for social recovery will be enhanced to support quick responses to future hazards and reduce disaster impacts.

### Infrastructure Sector

Approximately 40% of the recovery need comes from the infrastructure sector in which transport systems, ports and utilities will need combined investment of \$509 million. The strategy for these activities will focus on lessons learned from previous disaster and on reducing vulnerabilities to climate-related risks. Efforts to build back better following Tropical Storm Erika in 2015 created more resilient structures that withstood Hurricane Maria and demonstrated the importance of rigorous standards in the recovery process. Recognising this, transport infrastructure will be replaced in a step-wise fashion, with priority focus on key assets and access routes and strong emphasis on best practice in material selection and resilient construction techniques. Emphasis also needs to be placed on the ports of entry, which are key to the sustainability of the tourism industry.

Recovery in the energy sector will focus on resilience of the transmission and distribution network and improved access to clean, affordably energy. In keeping with Dominica's Nationally Determined Contributions, the recovery strategy will involve major investments in renewable energy as part of the medium-term strategy to lower emissions and reduce vulnerability to external shocks.

### Productive Sector

The productive sector will require investment of approximately \$189 million USD for its recovery. The strategy for this sector will involve gender-responsive livelihoods programmes that focus on empowering men and women through national and community-level training in key sectors, including agriculture and tourism, and by supporting the creation of value chains that reduce food insecurity among vulnerable groups. Tourism and MSMEs will also require direct support for repair and replacement of capital and environmental assets as well as capacity building and comprehensive public education for disaster risk reduction.

### iii. Recovery Priorities (short, medium, long-term)

The recovery needs can be categorized along a time horizon illustrated in Table 2.

**Table 2- Inter-Temporal Recovery Needs by Sub-Sector (US\$ Millions)**

<i>Sector</i>	<b>Short-Term (&lt;1 year) US\$ Millions</b>	<b>Medium-Term (1-3 years) US\$ Millions</b>	<b>Long-Term (3-5 years) US\$ Millions</b>	<b>TOTAL USD Millions</b>
Agriculture	53.8	18.5	16.2	88.5
Fisheries	2.0	0.5	-	2.5
Forestry	12.0	2.1	0.7	14.9
Commerce and Micro Business	71.0	2.2	0.2	73.0
Tourism	2.0	8.1	16.0	26.2
Housing	17.8	501.5	0.5	519.8
Education	2.0	9.3	82.9	94.2
Health	16.4	1.4	4.4	22.1
Culture	3.5	0.7	0.4	4.7
Transport	106.1	123.7	72.2	301.9
Electricity	43.6	37.0	-	80.7
Water and Sanitation	25.2	23.9	7.2	56.3
Telecommunication	12.3	24.3	11.2	47.8
Airports and Port	13.6	5.1	4.0	22.7
Disaster Risk Management	0.1	5.4	4.7	10.2

Environment	1.3	-	0.5	1.8
Gender	0.5	0.2	0.1	0.6
<b>TOTAL</b>	<b>383.2</b>	<b>764.0</b>	<b>221.2</b>	<b>1,367.7</b>

Given the massive scale of the needs, prioritization is critical and the GoD has developed a programme to front load activities in housing, transport infrastructure, education, water and sanitation, agriculture and healthcare.

### **Resilient Infrastructure**

The initial stages of the infrastructure recovery will involve rehabilitation of key damaged bridges and culverts, slope stabilization and restoration of river capacity to prevent damage to downstream infrastructure, re-routing of main access roads and rehabilitation of tourism-related ports as urgent priorities. Detailed surveys and designs for bridge and road replacements will also be undertaken. Over the medium-term, major infrastructural work will then be required to upgrade and replace key bridges to resilient standards and to undertake major road repairs. The infrastructural work will also include major repairs and rehabilitation of water supply systems and short and medium-term operational support to restore water and sanitation services.

### **Energy Access**

The energy sector recovery will involve two pillars. The urgent restoration of service through repairs to the electricity generation systems and rebuilding the electricity transmission and distribution network will be the most urgent priorities. Immediate underground rebuilding of the distribution network in Roseau and Portsmouth has been proposed as a means of reducing vulnerability of the network. Additional assessments for further undergrounding of the T&D network will be undertaken. The medium-term strategy will focus on the continued integration of renewable energy sources, including geothermal, into the energy mix and demand-side management programmes to reduce the percentage of household incomes spent on energy.

### **Housing**

The first phase of the housing recovery will involve building damage assessments, which are already underway, to build on the existing estimates and determine the full extent of damage. Simultaneously, destroyed homes will be demolished and removed. Revised building standards will then be employed during the execution of major repairs to damaged homes and rebuilding of destroyed houses. This work will be complemented by a training programmes and communications strategies, encouraging widespread understanding of and adherence to the building standards. Over the long-term, housing recovery will focus on the development and implementation of a comprehensive building code for the construction sector, zoning plan of high risk areas and community based disaster risk reduction program for the housing sector

### **Social Infrastructure**

The national social safety net will need to be strengthened quickly to prevent further declines in the quality of life. Investments in school meals system expansion and improvements to the targeting mechanisms for direct food assistance will be required as well as welfare extensions and emergency employment for the most affected. Over the medium and long-term, the social safety system will be enhanced to ensure it can scale quickly to respond to hazards in the future and support reduced vulnerability among at-risk groups.

In the healthcare system, the key priorities relate to repairs to health care facilities and restoring service delivery. In particular, the work will focus on integrating “smart” systems into the hospital infrastructure and reducing the vulnerability of the healthcare system. Within the education sector, immediate interventions will involve major repairs

to damaged schools and rebuilding of destroyed educational facilities Over the medium and long-term, training in and integration of DRR practices will support the sustainability of the recovery in these areas.

### **Agriculture, Fisheries and Forestry**

The recovery strategy for agriculture will focus in the short-term on interventions to support quick restoration of livelihoods, including restoring damaged infrastructure for crops and buildings, distribution of seeds and planting materials and debris removal. Over the medium term, the strategy will involve improving institutional capacities to support the integration of climate smart agricultural practices, including improved water management, the integration of renewable energy and mainstreaming of DRR.

Short-term recovery in Fisheries will require reinstating fisherfolk livelihoods through repair and replacement of fishing vessels and the provision of equipment, while over the medium-term, the reinstatement of public facilities will be required. In the forestry sub-sector, recovery will involve salvage and rehabilitation efforts as well as debris-clearing and restoration of infrastructure at eco-tourism sites. Over the medium term, reforestation, new legislation for management of national parks, capacity building and public education will be critical for recovery.

### **Disaster Risk Reduction**

DRR is at the center of the strategy and is integrated in the sector-level activities. In addition, specific national-level interventions will entail outfitting response personnel with the equipment, training and IT systems to respond effectively to natural hazards. Legislative and policy updating of the existing disaster management plans, including sector-level strategies will be prioritized. Critical hydro-meteorological data collection systems will also be strengthened, feeding into a robust national early warning system that will support both national and community-level resilience. Capacity in the private sector will be enhanced through DRM training, development of a relief tracking system and an extensive public awareness campaign.

## **iv. Specific issues/challenges regarding implementing recovery**

The major challenges that may be encountered during the recovery process are summarized in the following table.

<b>CHALLENGE</b>	<b>RISK TYPE</b>	<b>DESCRIPTION</b>	<b>MITIGATION ACTION</b>
<b>CLIMATE-RELATED RISKS REMAIN</b>	Environmental	Recovery efforts related to Tropical Storm Erika in 2015 were still ongoing when Dominica was affected by Hurricane Maria. Another near-term extreme weather event could undermine the current proposed recovery efforts	<p>Activities related to restoring river capacity, repairing drainage systems, debris removal and access should be front-loaded</p> <p>All infrastructure and building repairs and rebuilding efforts should mainstream climate-resilient materials and practices and activities should prioritize vulnerable groups.</p> <p>Livelihoods should be rebuilt using climate resilient approaches, particularly in the agricultural sector.</p>



<b>RUGGED TERRAIN</b>	Operational	Dominica’s rugged topography could create logistical challenges for the rapid commencement of numerous, major infrastructural projects, including housing re-construction and transport network repair	<p>Prioritization of major transport routes during the debris clearing programme</p> <p>In-country logistics and coordination support to ensure activities are planned and coordinated effectively</p>
<b>NATIONAL CAPACITY</b>	Organizational	Given the magnitude and complexity of the recovery needs, local capacity and available skill sets may be insufficient	<p>Establishment of a new time-bound Reconstruction Agency (CREAD)</p> <p>Provision of additional capacity to line ministries</p> <p>Encourage return of talented members of the diaspora</p> <p>Capacity building over the medium term for DRR and recovery</p>

## v. Institutional arrangements for recovery

To support effective and transparent management of the recovery strategy, a new entity will be created with a four-year mandate to lead the reconstruction efforts. The Climate-Resilient Execution Agency for Dominica (CREAD) will be tasked with the overall coordination of the reconstruction process and fast-tracking the execution of projects, assuming accountability for the achievement of the results and functioning as focal point for external partners. CREAD will assess capacity gaps within the public administration and facilitate the recruitment of additional expertise to address them. It will conduct gap analysis to identify additional funding requirements, and ensure proper monitoring and evaluation of results.

CREAD will be overseen by a Supervisory Board, comprising the Office of the Prime Minister, relevant line ministries and donors. The new agency will be managed by an experienced, business-oriented CEO with support from an Executive Management Team and a Policy Advisory Board. A Public Financial Management platform will be established to support comprehensive accounting and reporting and a universal data tracking system deployed to support transparent public access to project activities.