



Executive Summary

On September 6, 2017, Hurricane Irma hit the Islands of Barbuda and Antigua with catastrophic effects. Hurricane Irma made landfall as a category 5 storm (Saffir-Simpson scale), generating winds in excess of 180 miles per hour (mph) or 290 kilometers per hour (km/h). The storm's eye passed directly over Barbuda exposing the island to the extraordinary eye wall winds for more than three hours. This was accompanied with a significant storm surge of 5 to 11 feet (ft), which resulted in flooding reported to reach some 600 meters (m) or 0.37 miles inland. While out of the path of the eye, Antigua, located approximately 29 miles to the south of Barbuda, experienced tropical storm force winds. Compounding the situation, on September 18, Hurricane Maria (also a category 5 storm) affected the island of Antigua. Although Hurricane Maria did not make landfall, Antigua was exposed to the north-eastern quadrant of storm and experienced again tropical storm force winds and associated rainfall.

On 13 September, the Government of Antigua and Barbuda requested support from the World Bank Group to develop an assessment of the damage and needs. A parallel request was made to the European Union (EU). In response, a joint United Nations (UN), EU, World Bank, Caribbean Development Bank (CDB) and Eastern Caribbean Central Bank (ECCB) mission visited Antigua and Barbuda from September 26-October 7. The mission aimed to support the Government in undertaking a recovery needs assessment, based on the characterization of the effects and impacts of the disaster.

The recovery needs assessment concludes that the total damage¹ of the hurricanes Irma and Maria for Antigua and Barbuda comes to EC\$ 367.5 million (US\$ 136.1 million), while losses² amount to approximately EC\$ 51.2 million (US\$ 18.9 million). Recovery needs³ amount to EC\$ 600.1 million (US\$ 222.2 million).

¹ Damage are defined as affected (damaged or destroyed) physical assets.

² Losses are defined as changes in economic flows resulting from the disaster (e.g. loss of income, higher operational costs, exceptional expenditures resulting from the need to address immediate effects of a disaster etc.).

³ Recovery needs are calculated on the basis of the PDNA results for disaster effects and disaster impacts. Recovery needs are determined by factoring in the reconstruction of damaged infrastructure and physical assets; the resumption of production, service delivery and access to goods and services; the restoration of governance and decision making processes; and the reduction of risks.

2 Hurricane Irma Recovery Needs Assessment: A Report by the Government of Antigua and Barbuda

Table 1: Summary of Hurricane Irma effects on Antigua and Barbuda

Sector	Disaster Effects (US\$)				Disaster Effects (EC\$)			Recovery Needs	
	Damage	Losses	Total	%	Damage	Losses	Total	EC\$	US\$
Infrastructure									
Transport	16,166,400	318,500	16,484,900	10.17%	43,649,340	860,040	44,509,380	78,459,340	29,059,015
Electricity	3,304,300	259,100	3,563,400	2.20%	8,921,739	699,600	9,621,339	22,275,000	8,250,000
Water & Sanitation	291,900	0	291,900	0.18%	788,000	0	788,000	938,000	347,407
Telecom	702,400	37,000	739,400	0.46%	1,896,440	100,000	1,996,440	1,896,440	702,385
Social									
Housing	49,805,600	2,405,900	52,211,500	32.22%	134,475,168	6,496,050	140,971,218	214,968,745	79,618,054
Health	1,784,300	65,200	1,849,500	1.14%	4,817,620	175,987	4,993,607	19,817,620	7,339,859
Education	2,626,296	261,251	2,887,548	1.27%	7,091,000	705,379	7,796,379	17,163,131	6,356,715
Productive									
Tourism	59,038,700	13,567,430	672,606,12	49.62%	159,404,478	36,632,062	196,036,540	188,268,275	69,728,991
Agriculture	148,100	370,400	518,500	0.32%	400,000	1,000,000	1,400,000	700,000	259,259
Fisheries	301,900	159,300	461,200	0.28%	815,000	430,000	1,245,000	1,000,000	370,370
Cross-cutting									
Governance	797,500	753,800	1,551,300	0.96%	2,153,151	2,035,240	4,188,391	6,159,850	2,281,426
Culture	1,152,700	764,300	1,917,000	1.18%	3,112,308	2,063,500	5,175,808	3,990,808	1,478,077
Environment	-	-	-	-	-	-	-	13,500,000	5,000,000
DRM	-	-	-	-	-	-	-	31,000,000	11,481,481
Total	136,120,090	18,962,170	155,082,260	100%	367,524,244	51,197,858	418,722,102	600,137,208	222,273,040

1 US\$ = 2.7 EC\$

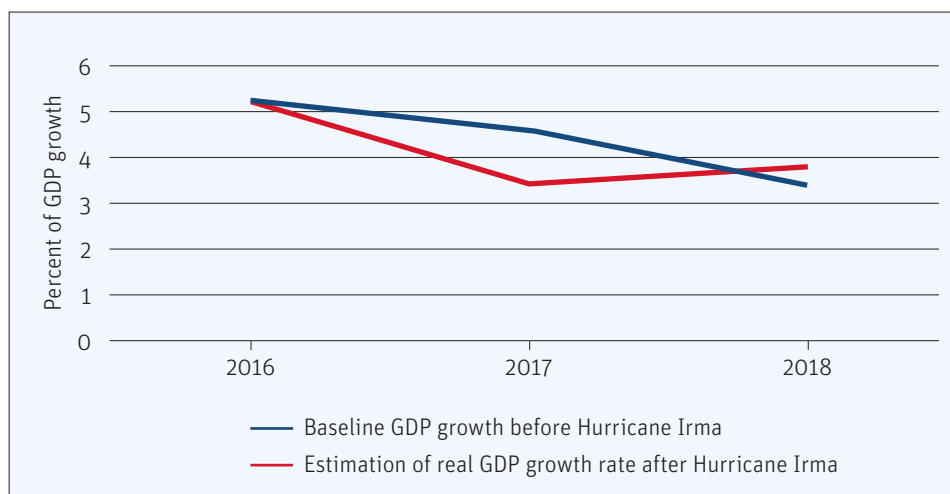


Macroeconomic impacts

The combined value of destroyed assets and disruptions in the production of goods and services is equivalent to about 9 percent of the country’s gross domestic product (GDP, current terms) in 2016. The effect of the storms on Antigua and Barbuda’s real GDP growth rate is estimated to be minus 1.1 percentage points in 2017. In other words, while GDP growth for 2017 was estimated at 4.6 percent, a post-storm estimate now anticipates a 3.5 percent GDP growth rate.

Hurricanes Irma and Maria will, therefore, have a significant negative impact in the short term on the overall performance of the national economy and likewise quality of life for the people of Antigua and Barbuda.

Figure 1: Hurricane Irma impact on Antigua and Barbuda GDP



Source: World Bank, ECCB, CDB

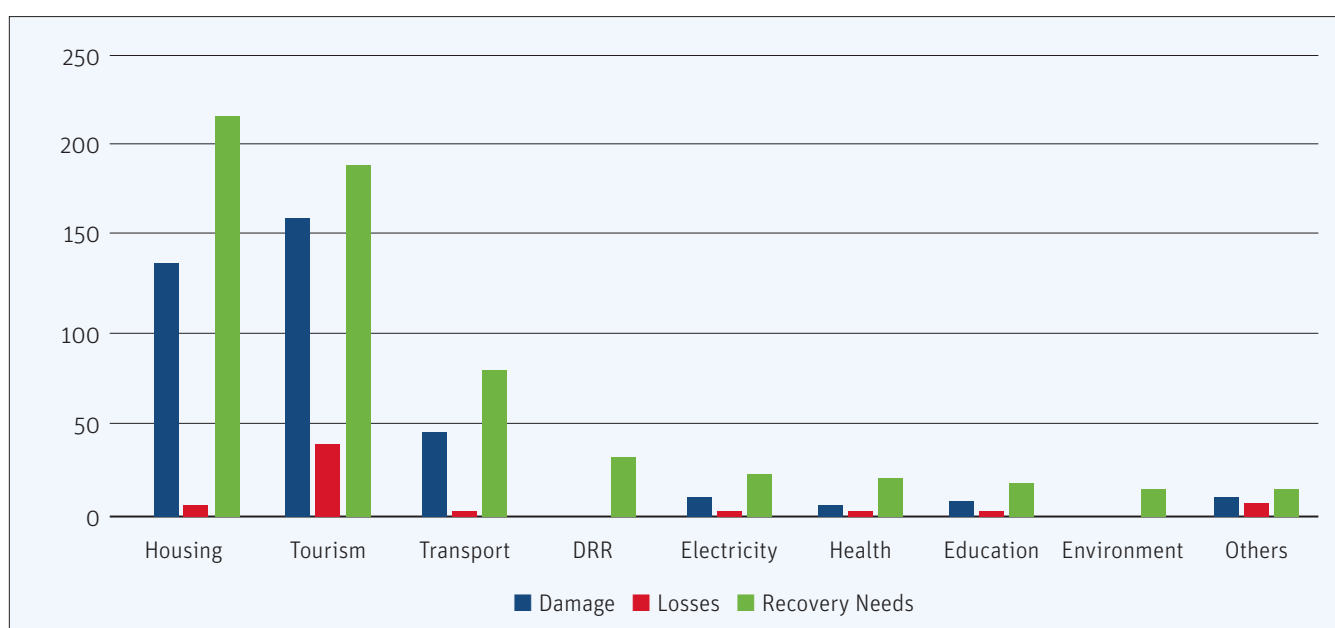
Sector Summaries

Hurricanes Irma and Maria produced the most significant effects on the productive and social sectors. The individual sector that sustained the greatest damage was tourism, accounting for 44 percent of total damage costs, followed by housing which accounted for 37 percent of all damage. The highest level of production losses are also in the tourism sector, owing to the loss of the entire high season in Barbuda, and is estimated at 76 percent of total losses. Consequently, the tourism sector suffered the highest total effects⁴ from hurricanes Irma and Maria (including both damage and losses). The high value of the five affected hotel investments

in Barbuda partly explains the financial importance of the effects in this sector. However, the financial estimation of the recovery needs identifies housing as the sector with the most financial needs, followed by the tourism and transport sectors. Other needs that may be smaller in financial terms are equally critical for the early recovery of the population and its economy, such as the resumption of basic services (utilities, health and education) and reestablishment of livelihoods. Sector summaries highlight are about Barbuda only, except for those sectors where substantial damage and losses were also experienced in Antigua.

⁴ Effects are the combination of both damage and losses (changes in flows)

Figure 2: Damage, Losses and Recovery Needs by sector (M EC\$)



INFRASTRUCTURE

Combined damage and loss estimates for infrastructure were EC\$56.9M (US\$ 21M). Damage and losses in infrastructure were dominated by the transportation (roads) sub-sector (although this sub-sector mostly concerned Antigua). Recovery needs amount to EC\$ 103.5.5M (US\$ 38.3M), including critical basic infrastructure needs in Barbuda.

TRANSPORT

Damage and losses

EC\$ 44.5M (US\$ 16.5M)

Recovery Needs

EC\$78.5M (US\$ 29M)

Roads—Damage related primarily to the crushed limestone road network including 73 miles of roadway in Antigua and 5 miles of the Barbuda network. Vehicle stock in Barbuda is all assumed at least partially damaged. Network rehabilitation includes resurfacing of 36 miles of the damaged critical roadway in Antigua and 5 miles in



Barbuda (over the first year following the disaster). This also includes the rehabilitation of a bridge/seawall structure on Antigua. Barbuda's only gas station was structurally damaged, although a more thorough assessment is needed to determine whether to rebuild or rehabilitate it.

Ports—On Barbuda the main cargo and ferry pier south of Codrington suffered significant damage. Sand sedimentation has decreased the effective channel depth, restricting size of vessels able to use the facility. This will require dredging and a revised bathymetric survey of the port approaches and facilities. The Port of St. John's suffered physical damage along the western end.

Airport—Codrington airport on Barbuda experienced significant damage forcing its closure to commercial traffic. The terminal building requires extensive roof and interior repairs, and the security fence needs replacement. In addition, the runway required rehabilitation (already undertaken at the time this report was written).

ELECTRICITY

Damage and losses

EC\$ 9.6M (US\$ 3.6M)

Recovery Needs

EC\$22.3M (US\$ 8.2M)

The electricity generation and distribution network on Barbuda was heavily damaged. Transmission lines were lost and all generators require replacement. Additionally, supporting infrastructure such as buildings and storage areas require rehabilitation. Build back better estimates include an underground distribution system, new resilient buildings, and a much more resilient renewable energy component.

TELECOMMUNICATIONS

Damage and losses

EC\$ 1.9M (US\$ 0.7M)

Recovery Needs

EC\$ 1.9M (US\$ 0.7M)

Damage to wired phone service on Barbuda represents the majority of costs associated with the telecom sub-sector. Wired service shares the same utility poles used for power distribution. To a lesser extent, microwave services

connecting Barbuda with Antigua will require the replacement of an equipment tower and realignment of microwave antenna hardware to restore communications.

WATER AND SANITATION

Damage and losses

EC\$ 0.79M (US\$ 0.3M)

Recovery Needs

EC\$ 0.9M (US\$ 0.35M)

All water sources on Barbuda were damaged by Hurricane Irma. Groundwater suffered contamination from the infiltration of surface pollutants and saltwater intrusion from storm surge. Rainwater harvesting systems were damaged and cisterns have been contaminated with debris. The public desalination (reverse osmosis) plant was flooded damaging electronic control systems and the plant building. Distribution infrastructure such as pipes, valves and fencing will require repair or replacement. Finally, as important groundwater supplies have been contaminated, a regular water-testing program is required to assess the resource and protect human health.

SOCIAL

The housing sector suffered the biggest damage and losses within the social sectors, and is overall the sector with biggest recovery needs. While education and health services resumption are smaller in financial terms, their resumption is equally critical to a full recovery.

HOUSING

Damage and losses

EC\$ 141M (US\$ 52.2M)

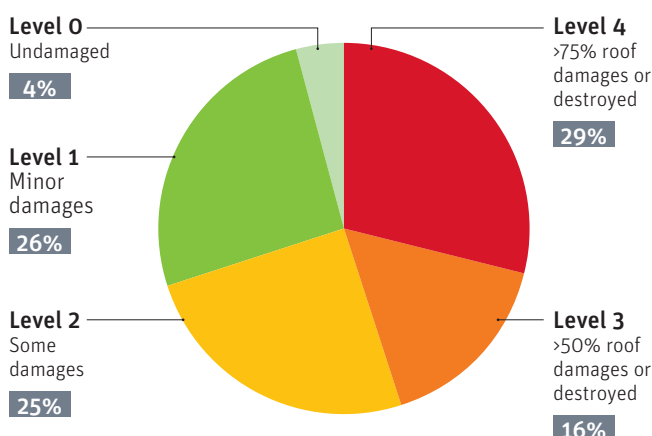
Recovery Needs

EC\$ 215M (US\$ 79.6M)

Major damage was sustained in the housing sector in Barbuda, with 95 percent of the housing stock on the island. Of an estimated 670 houses on Barbuda 642 are estimated to have suffered some degree of damage. While some

damage was reported from Antigua (some degree of roof loss), 45 percent of the housing in Barbuda is estimated to be uninhabitable with 28 percent requiring complete replacement.

Figure 4: Physical damage to the housing sector (%)



The recovery needs are determined assuming the housing stock will not shift from the pre-disaster type of building, but will be reconstructed at higher standards, following more strictly building codes and with a strong capacity-building and supervision component. Transportation of affected Barbudans back and forth between Antigua and Barbuda, while they are rebuilding their houses, will also have an important financial cost. Total recovery needs amount to EC\$ 215M.

EDUCATION

Damage and losses

EC\$ 2.9M (US\$ 1.72M)

Recovery Needs

EC\$ 7.8M (US\$ 2.9M)

On Barbuda, four educational structures suffered damage. Toddlers' Paradise Daycare center was destroyed and will require replacement. The kindergarten (Cody Kelly Pre-school) suffered roof damage and will require renovation and repair. Holy Trinity Primary school lost 6 of 12 buildings on campus, and all roofs were lost. Sir McChesney George Secondary school experienced damage from flying debris and lost three wooden out buildings.

On Antigua, the Antigua State College reported structural

damage to one of the campus buildings. Efforts are currently underway to renovate the facility at Five Islands in order to accommodate displaced students from Barbuda. 178 primary and secondary students are placed in schools in Antigua.

The total cost of recovery including reconstruction in the Education Sector, is estimated at EC\$ 17 million, including rebuilding/retrofitting of affected schools and teachers housing, and other non structural measures.

HEALTH

Damage and losses

EC\$ 5M (US\$ 1.8M)

Recovery Needs

EC\$ 19.8M (US\$ 7.3M)

Following Hurricane Irma, the government of Antigua and Barbuda commissioned an assessment of the Health facility on Barbuda which was conducted by Pan American Health Organization (PAHO)/World Health Organization (WHO). The health facility on Barbuda suffered significant damage and as a result it cannot be used. The facility suffered major roof and associated interior damage but can be repaired as the building remains structurally sound. The water supply was contaminated and the emergency generator was damaged.

Recovery needs were identified following the assessment of the damage and besides the call for a long-needed upgrade to the health facility which included internal bathrooms for patients and improvements in accessibility for the disabled, a number of needs were identified that would increase resilience to future events and improve the delivery of services to the population, including a Health Housing Campus for Doctors, Nurses, Matron, Visiting Health Professionals, and Pharmacists who live and work on the island.

PRODUCTIVE

Damage and losses in productive sectors was largely in the tourism sector. Overall, it is the sector that sustained the greatest damage. Combined damage and loss estimates for tourism were EC\$198.6M (US\$ 73.5M).



TOURISM

Damage and losses

EC\$ 196M (US\$ 72.6M)

Recovery Needs

EC\$ 188.2M (US\$ 69.7M)

All major hotels on Barbuda suffered severe damage. For instance, Coco Point (34 rooms) requires complete reconstruction, while North Beach Resort was destroyed. All hotels are closed representing a total of 54 units. In addition, there will be no daytrippers until the island has recovered. Due to the damage to the hotel stock, island infrastructure and aesthetic attributes, it is estimated that the entire 2017-2018 tourist season will be lost in Barbuda.

AGRICULTURE

Damage and losses

EC\$ 1.4M (US\$ 0.52M)

Recovery Needs

EC\$ 0.7M (US\$ 0.25M)

Agriculture on Barbuda is largely for personal and local consumption. Livestock damage (comprised of goats, sheep, pigs and poultry) are estimated at EC\$257,100 and damage to infrastructure is estimated at EC\$142,900 (including fencing, henhouses, garden beds, irrigation,

etc.). Losses are largely attributed to a temporary loss of home production and the additional costs associated with purchasing agricultural products. Together with the livestock replacement costs, the total agriculture recovery needs amount to about EC\$700,000.

FISHERIES

Damage and losses

EC\$ 1.25M (US\$ 0.46M)

Recovery Needs

EC\$ 1M (US\$ 0.3M)

Damage and losses in the fisheries sector include loss of damaged vessels (55 estimated), lost traps (2,177) and lost revenue from the fisheries sector as recovery progresses. Environmental damage, particularly in Barbuda, may impact lobster production over the near (6 months) future. Additionally, lack of basic infrastructure (water and electric power) and housing damage to local fisherfolk will impede the sectors recovery. The recovery needs are mainly focusing on the reestablishment of the fisheries value chain, especially lobster. In addition to revitalizing the fisheries value chain, some additional improvements could also be considered, not least related to improved storage options for fisheries equipment during storms and hurricanes. Total recovery needs amount to close to EC\$1M.

CROSS CUTTING

GOVERNANCE

Damage and losses

EC\$ 4.2M (US\$ 1.6M)

Recovery Needs

EC\$ 6.1M (US\$ 2.3M)

Governance damage and losses were assessed by evaluating the damage to the local government buildings (8 out of 17 structures were partially damaged or destroyed), as well as the disruption of local government functions after the evacuation of the island. Higher operational costs (including additional staff, transportation to and from Barbuda and temporary facilities in Antigua) as well as the loss of normal sources of revenue (such as tourism taxes, local fishing licenses, rental or leases) will affect the coming financial year, as well as the ability to rebuild and repair important infrastructure. In addition, the costs incurred by the National Office of Disaster Services (NODS) in its capacity as coordinator of the response and relief for Barbuda and Dominica were factored in. The total cost of recovery needs, estimated at EC\$ 6.1M include the restoration of infrastructure and assets, and the overall costs for NODS to sustain the affected communities (different from those linked to housing reconstruction).

CULTURE

Damage and losses

EC\$ 5.2M (US\$ 1.9M)

Recovery Needs

EC\$ 4M (US\$ 1.5M)

Cultural losses and damage are limited to the island of Barbuda and relate to damage to the cultural and research institutions, and historic sites. Storm damage have removed portions of a pre-Columbian archaeological site, culturally important buildings, and historic records and artifacts have been put at risk due to inadequate conservation facilities. Estimates for loss and damage in this sub-sector include costs associated with recovery and protection of historical documents, repair of historic sites and conservation facilities as well as surveys and assessments needed to establish the condition and conservation requirements for those sites.

ENVIRONMENT

Recovery Needs

EC\$ 13.5M (US\$ 5M)

Ecological damage is significant but temporary in nature. 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.

DISASTER RISK MANAGEMENT

Recovery Needs

EC\$ 31M (US\$ 11.5M)

The national disaster risk management framework faced serious challenges in the aftermath of the hurricanes. The needs for improved disaster risk information and communication, for enhanced disaster management capacities and for better access to risk financing options were identified.

The needs for improved disaster risk information and communication include the improvement of Antigua and Barbuda Meteorological Service (ABMS) capacities, with an up to date hydro-meteorological infrastructure and access to modern forecasting and services delivery technologies, strengthened early warning systems including the “last-mile” communication with the exposed and most vulnerable communities.

As CDEMA sub-regional focal point role, Antigua and Barbuda’s NODS would benefit from enhanced institutional and operational capacities to manage disasters of such impact.

Facing a tight fiscal situation, the Government of Antigua and Barbuda may also explore improved access to disaster risk financing options (complementary to the existing policy coverage with the Caribbean Catastrophe Risk Insurance Facility, which provides rapid but limited liquidity following disasters), such as contingent components within investment projects, contingent line of credit with international financial institutions such as the World Bank, and a disaster emergency fund.



LIVELIHOODS

Recovery issues identified include the needs to take stock of the assets on the island, agricultural, environmental and tourism services and strengthen the data bases in the various productive and services sector on Barbuda; strengthening and development of Community Gardens; provision of seedlings and young chicks to support the backyard poultry industry; training and certification in fishing, deep sea diving and other tour operating activities to enable skilled Barbudans to ply their trade at home and in the CARICOM arena; continuing education programmes, particularly in areas such as financial literacy; expansion of sea salt production and marketing for micro entrepreneurial development; and further training in handicraft development and marketing.

GENDER

Recommendations for gender-related recovery identified special housing and rehabilitation measures for households headed by women; reconstruction of the schools in Barbuda to be paired with policy reform regarding truancy and efforts to attract and retain quality teachers on the island; develop culturally relevant, innovative and accessible psycho-social support programmes; council's additional technical support and updated electronic information management system; SOPs, which include case management protocol in disasters, to ensure the continuity of the justice system; need for longer term skills training programmes for women that are both pro-growth and pro-poor; in-depth assessment should be completed to ascertain SGBV risks for women and children.

Summary of Identified Priority Actions for Recovery

Sector by sector, the recommendations identified throughout the assessment can be summarized as follows, with a total estimated cost of EC\$ 600M.

Immediate and short-term actions (one to two years) are identified to facilitate the rapid restoration of infrastructure and re-establish economic activity. Medium-term recommendations (three to five years) relate to activities to strengthen or augment risk reduction, through investments or interventions in infrastructure, institutional

support or policies that may improve resilience during the recovery phase. Long-term recommendations relate primarily to policy and regulatory reforms that, if implemented, may reduce vulnerability to future disasters.

IMMEDIATE ACTIONS RECOMMENDED

Recovery on Barbuda will be a relatively slow process (2–3 years) owing to the level of damage to private and public infrastructure. The island's economy has been disrupted and until infrastructure is restored to a functional condition, Barbudans will not be able to pursue their economic livelihoods. Critical to the recovery is to stabilize damaged infrastructure, restore basic services and create an environment where Barbudans can return to begin the recovery process.

RECOVERY ORGANIZATION AND MANAGEMENT

- ▶ **Establish a Reconstruction Subcommittee** (RSC, under the PM Cabinet, with the participation of the Barbudan Council) and a post-disaster reconstruction and recovery unit comprising specialists in engineering, transportation, health and logistics to support and implement post disaster reconstruction activities. The RSC would also prepare and make publicly available a detailed reconstruction plan and program as a means of communicating reconstruction efforts to communities.
- ▶ **Consider temporary relief from VAT and import duties** as a recovery relief mechanism. This could be managed by tracking imports and requiring an application process from those seeking relief of this nature. For example, a VAT relief card could be used to track individual transactions. Such relief would have a finite lifespan such as 18 months to 2 years to help stimulate reconstruction efforts.
- ▶ **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.

- ▶ **Provide subsidized transportation and logistics support** for Barbudans during the recovery phase. Provide temporary shelter for Barbudans and recovery workers as they return to repair their properties. Review transportation and logistics options for moving goods and supplies to Barbuda, and provide special emergency procedures for clearing (customs) and distributing recovery supplies and services.
- ▶ **Assess and Stabilize the livestock population** providing food and water as needed. Create a comprehensive database of livestock and agricultural production for Barbuda.

INFRASTRUCTURE

- ▶ Critical infrastructure on Barbuda must be restored prior to repatriating citizens that were evacuated. Water, basic sanitation and power must be restored so that Barbudans can return to begin recovery efforts. The desalination plant and its distribution infrastructure must be repaired and made operational and temporary water storage facilities may be required. As the electric grid will require some time to rehabilitate, temporary generators and emergency distribution lines should be provided. Small portable generators will be needed in more remote areas and fuel storage facilities will need to be provided to service generators. Large, container sized portable generator units can be leased or purchased to assist with power requirements during the recovery phase.

SOCIAL

- ▶ **Conduct a detailed building assessment including housing**, in coordination with the Barbudan Council. Based on that assessment, meet with affected families to assess their needs and ability to return to their homes and livelihoods. Develop a resettlement plan and employment assistance program to accommodate those persons that cannot return to Barbuda.
- ▶ **Conduct a detailed livelihoods assessment** in coordination with the Barbudan Council. Meet with employers and evaluate their recovery potential particularly in the tourism and fisheries sectors. Evaluate the impacts to future employment and the Barbudan economy and incorporate these findings in the resettlement plan.

- ▶ **Provide psychological/social counseling services** to affected persons, particularly children. Provide training to educators and health care workers to help manage psychological impacts.

SHORT TERM ACTIONS

INFRASTRUCTURE

- ▶ **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.
- ▶ **Rehabilitate fisheries infrastructure on Barbuda** and provide assistance to fisherfolk for the repair and recovery or purchase of boats and fishing gear. This is needed to reestablish an important sector to the Barbudan economy.
- ▶ **Repair and strengthen public infrastructure** to improve resilience to future events. Consider moving the electric power distribution network underground where possible and retrofit or reconstruct public water systems to improve resilience to future events.
- ▶ **Apply resilient design measures during reconstruction**, promote retrofitting structures with hurricane straps and other improvements, and ensure additional costs associated with engineering supervision are included in the general estimate. Enforce building codes for public and private properties by implementing a system to inspect and certify the process and quality of construction. Provide construction supervision by engineers and architects and provide training and mentoring services for the formal and informal sector in Barbuda. Provide training for all involved in the reconstruction efforts (homeowners, builders, carpenters) in the application of disaster resilient construction techniques, and produce guidance documents illustrating proper construction techniques.



SOCIAL

- ▶ **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.
- ▶ **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. Without support some families may not be able to repair or rebuild. Special assistance may be required to support the recovery of single parent households, particularly those headed by women. Special needs may include child care, income and nutritional support.
- ▶ **Assess and evaluate critical ecosystem impacts** particularly those relating to bay and mangrove systems critical to lobster production. Develop and implement a habitat recovery plan to assist with the recovery of island ecosystems particularly with respect to fisheries and tourism resources.
- ▶ **Take measures to protect culturally important resources** beginning with an inventory of Barbudan museum collections, culturally important buildings and national heritage sites. Survey and assess damage to these for cultural assets. Develop and implement a conservation recovery program to recover important assets and protect them from further degradation. Electronically capture endangered archives to ensure their preservation.

MEDIUM TO LONG TERM RECOMMENDATIONS

DISASTER PREPAREDNESS AND MANAGEMENT

- ▶ **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 NODS institutional and operational capacities and strengthen the Disaster Risk Management Framework at national and local level.

- ▶ **Improve the national disaster risk information framework and the emergency communications network** to ensure communications services during national disaster. This includes the improvement of Antigua and Barbuda Meteorological Service (ABMS) capacities, with an up to date hydro-meteorological infrastructure and access to modern forecasting and services delivery technologies, and strengthened early warning systems including the “last-mile” communication with the exposed and most vulnerable communities
- ▶ **Assess, explore and promote the establishment of risk financing/risk transfer mechanisms** for dealing with future disasters, including public assistance (national insurance), private insurance, an emergency fund, project contingent components, contingent lines of credit such as the World Bank’s CAT-DDO, in addition to the current one (CCRIF parametric insurance).
- ▶ **Undertake risk mapping for land use planning in Barbuda** to help inform evidence-based decision-making and integrate these data in a multi-hazard awareness information system.
- ▶ **Prepare and implement a public disaster awareness campaign** to improve public participation in disaster risk reduction. Include disaster awareness and risk reduction training in the educational curriculum.

INFRASTRUCTURE

- ▶ **Review and strengthen life-line transportation facilities** (port and airport) for Barbuda and Antigua to ensure that transport will not be interrupted after a future disaster.
- ▶ **Retrofit and improve building resilience for schools and public health facilities** in Antigua and Barbuda to ensure that they are able to withstand future events. Review and retrofit public health facilities to ensure continued operation during and after a disaster. on Barbuda, A special Health Housing Campus for doctors, nurses, matron, visiting health professionals, and pharmacists who live and work on the island is also recommended.
- ▶ **Improve and enforce the national building codes for all public and private constructions.** Provide public information, brochures, guidance for code compliant construction. Expand training and certification for local contractors in the construction of code compliant infrastructure. Work with the Barbudan Council to ensure proper enforcement of building code requirements on Barbuda.

