

HURRICANE DORIAN "AT-A-GLANCE"

Assessment of the Effects and Impacts

DALA Visualization
P2RCT CBH BAHAMAS

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INTRODUCTION

Hurricane Dorian was not an isolated occurrence, but the latest example of recurrent extreme climate events that have changed the Bahamian landscape and impacted its economy.

The increase in water temperatures is likely to contribute to a tendency for tropical storms to be, on average, stronger than they have been in the past (Bruyere, Holland, 2014; Balaguru, Foltz 2018; Bathia, Vechia et al, 2019; Trenberg, Cheng et all, 2018). Due to its location in the Atlantic hurricane belt and like other Small Island Developing States (SIDS), **The Bahamas is extremely vulnerable to the effects of disasters and climate change**, as some 80 percent of the landmass is within 5 ft (1.5 m) of mean sea level and coastal areas hold the majority of the population and economic activity.

Disasters are described as a combination of exposure to hazard and conditions of vulnerability. Greater vulnerability is usually linked to socio-economic and territorial aspects, as poorer populations tend to live in at-risk areas disregarded by formal planning systems, all but ensuring a greater exposure to hazards. This exposure of social and economic assets to hazards can be somewhat balanced with measures to mitigate vulnerabilities, such as investments in early warning and preparedness, and addressing pre-existing social issues such as informal settlements.

The Bahamas has made important efforts in mitigating risks and improving resilience through instruments such as hard engineering and a modern building code, along with the enactment of the Disaster Preparedness and Response Act from 2006 (amended in 2011). The subjects dealt with in the Act are also reflected in the Vision 2040, the National Development Plan of The Bahamas, which frames the country's development agenda within the Sustainable Development Goals (SDGs). Nevertheless, the effects of Hurricane Dorian brought to light many areas that still require improvement, not only in terms of physical risk, but in social and economic aspects.

After hurricane Dorian and the provision of initial emergency services, the government of The Bahamas asked the Inter-American Development Bank (IDB) to assess the resulting damage, losses and Additional costs. The IDB requested the United Nations Economic Commission for Latin America and the Caribbean (ECLAC) for technical assistance with the assessment. The report, [Assessment of the Effects and Impacts of HURRICANE DORIAN in THE BAHAMAS](#), published in August 2020 presents the results in detail⁽¹⁾. It also **brings recommendations to guide a resilient reconstruction process that can reduce vulnerabilities and risks for the population and for every sector of the economy**. Since 2015, it is the fourth assessment in this kind conducted by IDB and ECLAC in The Bahamas.

The Bahamas Country Office Preparedness Recovery and Reconstruction Team (P2RCT) has prepared a visual summary of the Assessment of the Effects and Impacts of HURRICANE DORIAN in THE BAHAMAS. This brief will facilitate the dissemination and awareness of key information related to The Bahamas' vulnerability to the effects of natural disasters, as well as emphasize the need to strengthen efforts in policy management and disaster risk management (DRM) to achieve greater levels of resilience and risk mitigation. The HURRICANE DORIAN "AT-A-GLANCE" Assessment of the Effects and Impacts - DALA Visualization document, collects economic data and the most relevant aspects of the work carried out during the field sessions, with IDB and ECLAC experts' analysis and recommendations.

HURRICANE DORIAN "AT-A-GLANCE" Assessment of the Effects and Impacts - This DALA Visualization document is aligned with the IDB's Vision 2025 strategy for supporting the Caribbean community to Build Forward sustainably. The CCB path to the future is partnering with the people of the Caribbean to realize their vision of a smart and resilient region.

(1) <https://publications.iadb.org/publications/english/document/Assessment-of-the-Effects-and-Impacts-of-Hurricane-Dorian-in-the-Bahamas.pdf>

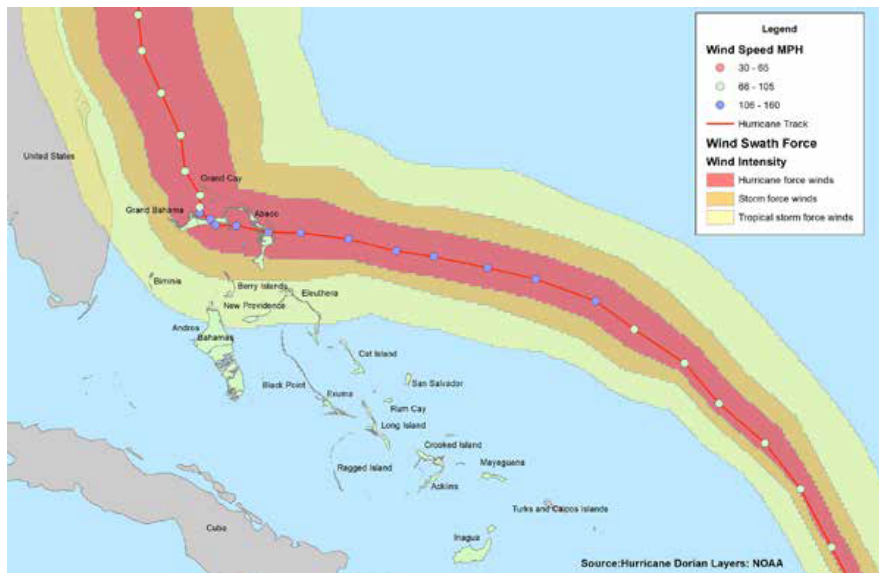
DESCRIPTION OF THE EVENT

Hurricane Dorian in the Bahamas

The effects of Hurricane Dorian in The Bahamas were among the worst experienced for any disaster in the country. Hurricane Dorian hit Abaco as a Category 5 hurricane on 1 September, and a day later hit Grand Bahama at the same category.

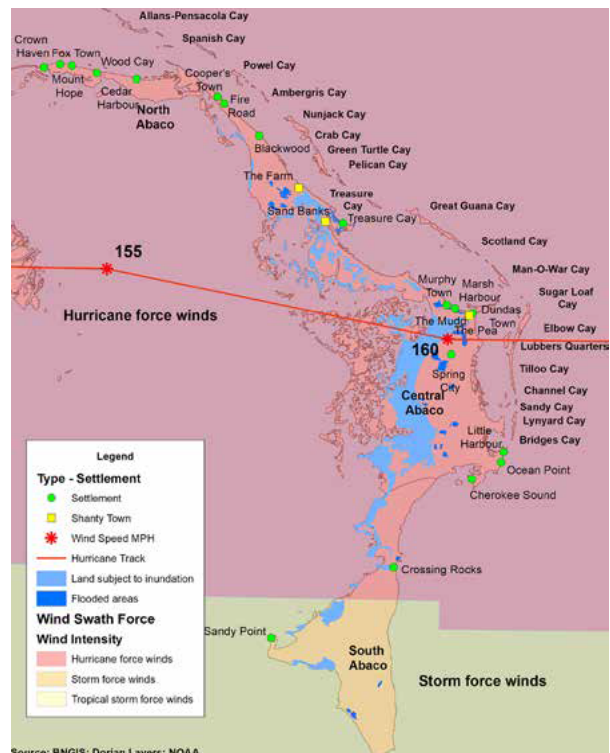
“...Extremely dangerous Hurricane Dorian is closing in on Abaco and Grand Bahama...”

FIGURE 1. PATH OF THE HURRICANE IN THE NORTHERN CARIBBEAN & WESTERN ATLANTIC



On September 1, Hurricane Dorian hit the island of Abaco as a Category 5. According to the trajectory of the hurricane, the central and northern part of island were under the influence of hurricane force winds. All these areas were severely affected not only by winds but also by storm surge and flooding.

FIGURE 2. PATH OF HURRICANE DORIAN THROUGH ABACO ISLANDS AND GRAND BAHAMA



SUMMARY OF ECONOMIC EFFECTS

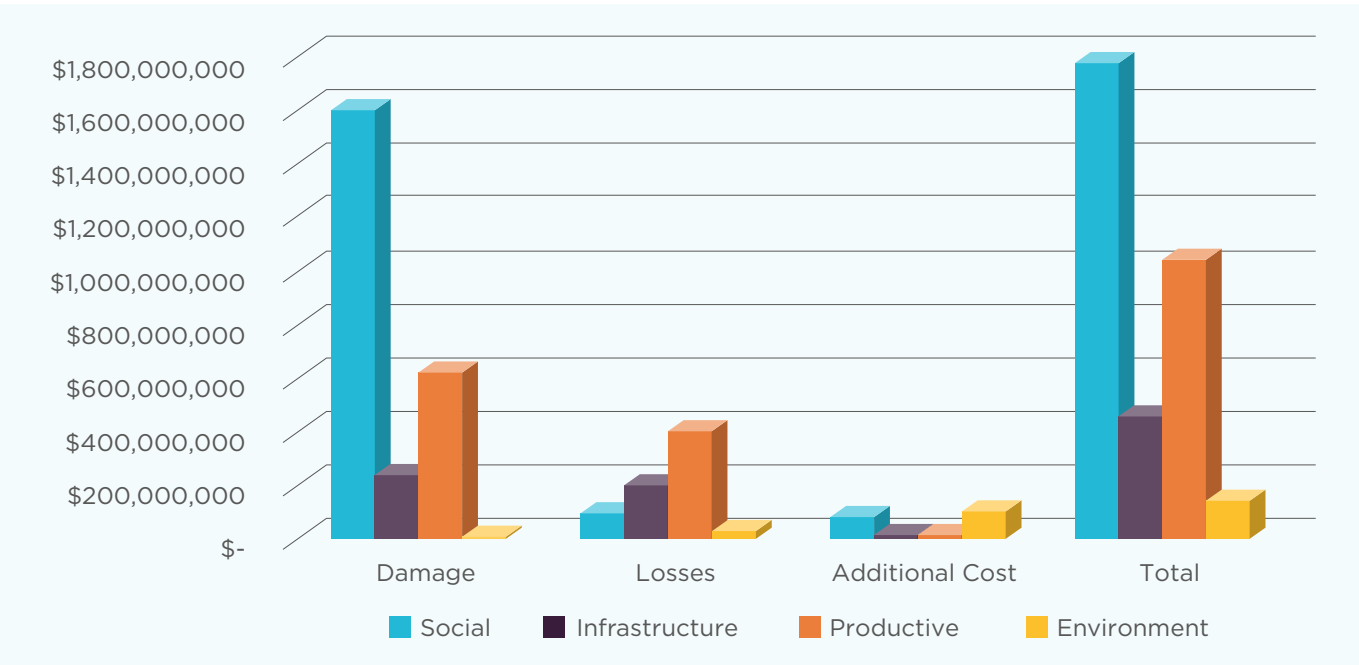
The Bahamas sustained more than \$4 billion in economic losses during this time, with tens of thousands of its population directly affected by these extreme weather events in particular the severe damage occurred during Hurricane Dorian. Table 1.

TABLE 1. SUMMARY OF EFFECTS OF HURRICANE DORIAN

	Damage	Losses	Additional costs
Social	1,597,290,766	93,163,186	82,254,021
Housing	1,487,167,663	65,014,267	57,809,391
Education	72,406,603	6,799,026	19,100,000
Health	37,716,500	21,351,380	5,344,630
Infrastructure	239,135,274	197,136,671	16,236,779
Power	131,355,000	68,924,558	6,335,000
Telecommunications	42,150,000	54,380,149	1,039,960
Water and Sanitation	14,853,000	36,624,014	2,289,200
Transport	50,777,274	37,207,950	6,572,619
Productive	620,650,850	400,285,030	19,954,141
Tourism	529,550,208	325,199,267	15,146,625
Commerce	77,584,545	64,973,002	4,807,516
Fisheries and Agriculture	13,516,097	10,112,761	
Environment	7,146,963	27,435,048	102,473,000
Total	\$2,464,223,852	\$718,019,935	\$220,917,941

Source: Assessment team 2019.

FIGURE 3. ECONOMIC EFFECT BY SECTORS



DALA DORIAN REPORT GENERAL RECOMMENDATIONS

Table 2 summarizes the main recommendations for each pillar. It should be noted that many proposals are repeated throughout previous assessments, as many challenges remain unresolved. Beyond sector-specific recommendations, these issues remain relevant and should be addressed urgently.

TABLE 2. SUMMARY OF RECOMMENDATIONS BY PILLAR

RISK IDENTIFICATION	<ul style="list-style-type: none"> » Establish data management and sharing protocols to optimize access and use of data in times of disaster. » Establish action protocols with clear leadership roles, sectoral activities, and communication and accountability channels.
RISK REDUCTION	<ul style="list-style-type: none"> » Enforce the application of the building code and incorporate revision periods. » Revise and adjust safety standards for essential infrastructure. » Identify adequate materials and construction methods. » Schedule and budget maintenance programs and post-disaster infrastructure revision drives. » Incorporate a DRM in public investments. » Elaborate zoning strategies. » Protect and promote healthy ecosystems as first defense mechanisms.
PREPAREDNESS	<ul style="list-style-type: none"> » Elaborate sectoral preparedness checklists and provide training. » Elaborate evacuation procedures. » Standardize shelter management and safety assessment. » Revise, upgrade and repair infrastructure prior to hurricane season. » Request private operators of public services and utilities to elaborate DRM plans.
FINANCIAL PROTECTION	<ul style="list-style-type: none"> » Elaborate a multi-year reconstruction plan with revision periods. » Consider mandatory insurance of public infrastructure, including utilities and other public services provided by private operators. » Allocate post-disaster sectoral funds for minor repairs. » Revise utilities tariffs to include DRM activities. » Request international financial organizations to include DRM considerations in credit lines and any other assistance provided.
RESILIENT RECOVERY	<ul style="list-style-type: none"> » Ensure that all minor and major reconstruction efforts consider safe location; application of the building code; and use of adequate construction materials. » Avoid disbursement of public funds for works that could reproduce disaster risks, especially in the housing sector. » Empower communities and promote local networks as first action line. » Transition to decentralized utilities and boost the use of renewable energy, especially in the power, telecommunications and water and sanitation sectors. » Recover and promote healthy ecosystems as first defense mechanisms.

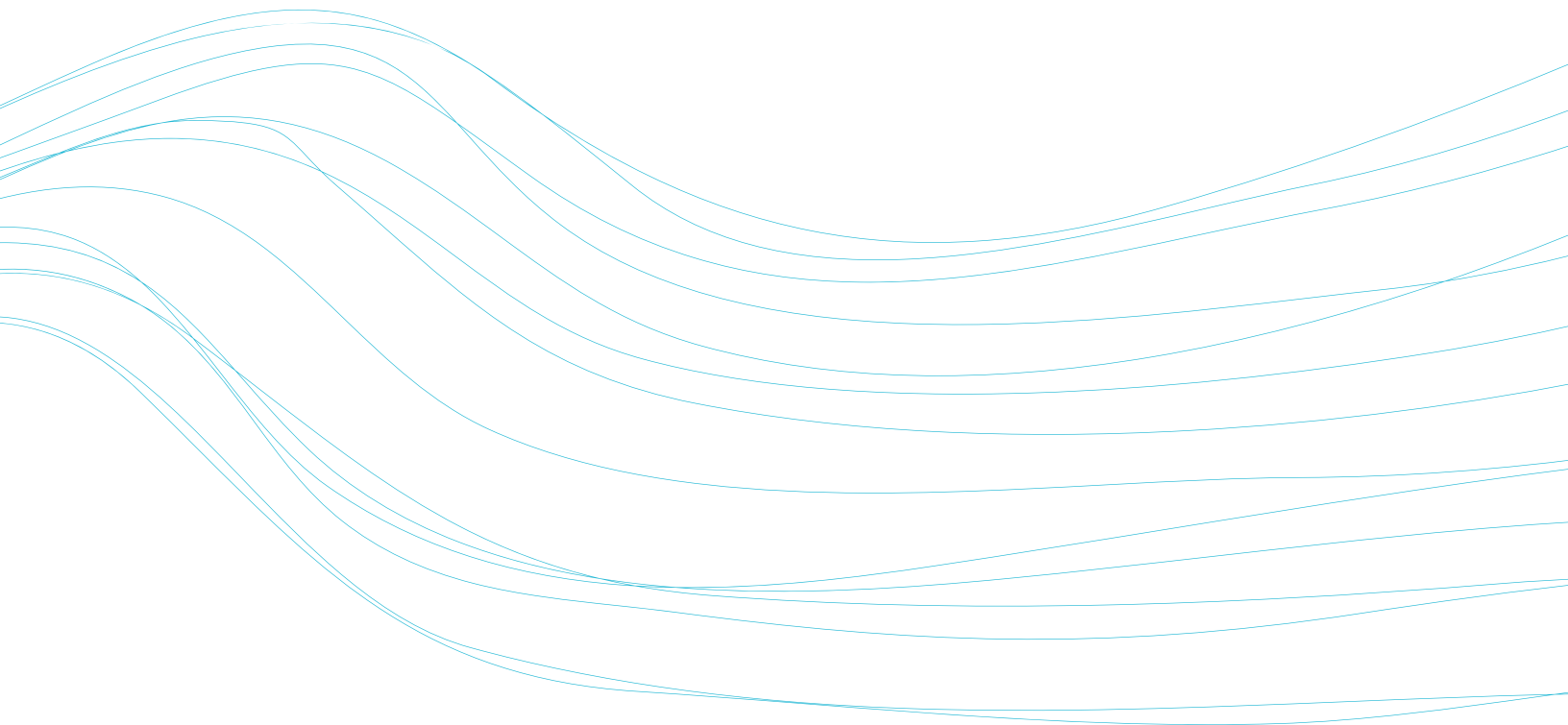
Source: Assessment team, 2019.

The GFDRR has been developed as an instrument that can inform countries about how to address this challenge. It provides a roadmap consisting of five cross-cutting pillars—risk identification, risk reduction, preparedness, financial protection, and resilient recovery—that can be applied in every sector (Table 3).

TABLE 3. PILLARS OF ACTION FOR DISASTER RISK REDUCTION

PILLAR 1: RISK IDENTIFICATION	» Improved identification and understanding of disaster risks through building capacity for assessment and analysis.
PILLAR 2: RISK REDUCTION	» Avoided creation of new risks and reduced risk consideration in policy and investment.
PILLAR 3: PREPAREDNESS	» Improved capacity to manage crises through developing forecasting and disaster management capacities.
PILLAR 4: FINANCIAL PROTECTION	» Increased financial resilience of governments, private sector and households through financial protection strategies.
PILLAR 5: RESILIENT RECOVERY	» Quicker, more resilient recovery through support for reconstruction planning.

Source: GFDRR, 2012.



SOCIAL SECTORS - AFFECTED POPULATION

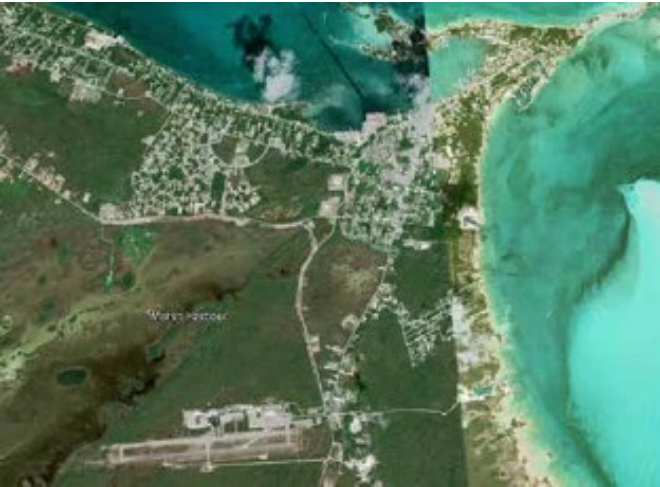
The effects of Hurricane Dorian on the population of The Bahamas were considerable, most notably on Abaco and Grand Bahama. The Assessment team estimates that approximately 29,472 persons (40 percent of the total combined population of Abaco and Grand Bahama).

TABLE 4. AFFECTED POPULATION WITH DAMAGE TO HOMES

Island	Damaged houses	Affected population
Abaco	6,331	20,259
Grand Bahama	2,879	9,213
TOTAL	9,210	29,472

Source: Assessment team, 2019.

Additionally, the quality of life of the population temporarily decreased due to disruptions in telecommunications, electricity and water.



Digital Globe Image: July 13, 2019.



Digital Globe Image: Sept 4, 2019.

Displaced population living in shelters

The damage and destruction of homes caused by Hurricane Dorian on Abaco and Grand Bahama created a massive need for shelter, for those that remained on the impacted islands as well as those who evacuated to New Providence. NEMA activated several shelters: 29 in New Providence, 18 on Grand Bahama and 13 on Abaco. (See Tables 5, 6 and 7).

TABLE 5. NEW PROVIDENCE: POPULATION IN SHELTERS

Shelter	Estimated Number of People												
	8 Sept	9 Sept	10 Sept	11 Sept	12 Sept	13 Sept	14 Sept	15 Sept	17 Sept	19 Sept	21 Sept	23 Sept	30 Sept
All Saints Anglican Auditorium	--	--	--	--	--	--	--	69	63	19	94	94	87
Bahamas Academy Gym	--	--	226	191	191	193	198	198	195	192	192	196	161
Calvary Baptist Church (Haitian)	91	95	85	96	96	86	80	79	80	80	80	80	84
Enoch Backford Shelter	--	--	--	36	36	78	60	DEACTIVATED					
Fox Hill Community Centre	200	202	239	236	236	240	134	135	137	141	134	135	127
Grant's Town Seventh-Day Adventist Church	--	29	DEACTIVATED										
Pilgrim Baptist Church	95	70	64	63	63	69	69	68	64	64	68	105	58
Sir Kendal G. L. Isaacs Gymnasium	520	422	1,357	1,062	1,062	1,078	1,068	1,064	1,064	1,056	845	845	821
Sir Kendal G. L. Isaacs Gymnasium (Tent A)	--	150	150	150	150	130	120	120	120	120	122	122	122
Sir Kendal G. L. Isaacs Gymnasium (Tent B)	--	144	144	145	145	146	146	146	146	146	83	83	87
Sir Kendal G. L. Isaacs Gymnasium (Tent C)	--	--	--	--	--	0	0	0	0	0	0	0	0
The Salvation Army	25	27	27	27	27	27	27	27	26	DEACTIVATED			
TOTAL	931	1,139	2,292	2,006	2,006	2,047	1,902	1,906	1,895	1,818	1,618	1,660	1,547

Source: Shelter Status Reports based on data from PDC, CDEMA, NEMA & BNGI.

Note: Information was not disaggregated by sex, age or nationality to reflect the differential effects of the hurricane on each segment of the population. -- Information unavailable.

TABLE 6. GRAND BAHAMA: POPULATION IN SHELTERS

Shelter	Estimated Number of People			
	5 Sept	12 Sept	21 Sept	23 Sept
Bethel Deliverance Center *	116	--	DEACTIVATED	
Christ the King	--	DEACTIVATED		
Church of the Ascension	--	15	21	28
Grand Lucayan Resort *	800	--	DEACTIVATED	
St. Georges Sr. (Gymnasium only)	--	12	47	47
Total	916	27	68	75

Source: Shelter Status Reports based on data from PDC, CDEMA, NEMA & BNGIS.

Note: Information was not disaggregated by sex, age or nationality to reflect the differential effects of the hurricane on each segment of the population. -- Information unavailable. * Temporary Shelter

TABLE 7. ABACO: POPULATION IN SHELTERS

Shelter	Estimated Number of People			
	2 Sept	4 Sept	5 Sept	6 Sept
Abaco High School	--	--	--	800
Amy Roberts Primary School		35	489	--
Central Abaco Primary School*	--	600	40	--
Faith Walk Church of God Community Center	--	--	100	--
Fox Town Primary (Pre-School)	--	--	60	--
Grand Cay All Age School (Pre-School)	--	30	--	--
Grand Cay All Age (Upper-School)	--	100	--	--
Guana Cay All Age School	--	--	30	--
Marsh Harbour Government Complex**	--	--	1,000	--
Marsh Harbour Healthcare Center**	500	--	1,000	--
Sandy Point Community Center	--	--	300	--
Total	500	765	3,019	600

Source: Shelter Status Reports based on data from PDC, CDEMA, NEMA & BNGIS.

Note: Information was not disaggregated by sex, age or nationality to reflect the differential effects of the hurricane on each segment of the population. -- Information unavailable. * A Special Needs Shelter that was used as a temporary shelter after the hurricane. ** Temporary Shelter.

SOCIAL SECTORS - RELIEF EFFORTS

With regards to relief efforts for the affected population, the Government of The Bahamas has received about \$5 million in monetary donations as of 30 September. In addition to the regional and international partners that provided assistance in the early phases of emergency and relief response, the Government of The Bahamas, through its various institutions, has also allocated around \$7 million for the attention of the emergency and relief efforts. (Tables 8 & 9).

TABLE 8. RED CROSS RELIEF DISTRIBUTIONS TO AFFECTED ISLANDS

Islands	Total Beneficiaries ^a
Abaco	600
Grand Bahama	1,138
New Providence	2,183
TOTAL	3,921

Source: The Bahamas Red Cross Society 2019.
^a Beneficiaries represent single households.

TABLE 9. U.S RELIEF DISTRIBUTIONS TO AFFECTED ISLANDS

Implementing Partner	Activity	Location	Amount
The Bahamas Red Cross Society	Shelter and settlements, WASH	Countrywide	\$200,000
Fairfax County Fire and Rescue Departments	Urban Search and Rescue	Abaco	\$3,639,351
International Federation of Red Cross and Red Crescent Societies	Economic recovery and market systems, health, protection, shelter and settlements, WASH	Countrywide	\$2,340,000
International Medical Corps	Health, Protection, WASH	Grand Bahama	\$2,691,000
International Organization for Migration	Humanitarian coordination and information management, shelter and settlements	Countrywide	\$1,500,000
	In-Kind Relief Commodities	Countrywide	\$219,350
Pan American Health Organization	Health, WASH	Countrywide	\$2,600,000
U.S. Coast Guard	Humanitarian coordination and information management	Grand Bahama, New Providence	\$141,135
UN World Food Program	Logistics Support	Countrywide	\$1,064,186
	In-Kind Relief Commodities	Countrywide	\$324,935
	Logistics support	Countrywide	\$1,157,434
	Program support		\$407,335

Source: The Bahamas Red Cross Society 2019.

SOCIAL SECTORS - HOUSING

Housing was the sector most severely affected by Hurricane Dorian, Houses and residences suffered significant damage to the structural elements, roofs, flood damage, and other components of the buildings. Approximately 9,000 homes and in excess of 11 million square feet of structures have sustained some damage on the two islands. (Effects on the Housing Sector are shown on tables 10 to 14).

TABLE 10. HOUSING SECTOR: DAMAGE

Area	Non-Damaged Houses	Damaged Houses (number)	Structures (million \$)	Furniture and Equipment m.\$	Damage (millions\$)
Abaco	1,871	6,331	1,216.7	96.7	\$1,313.4
Grand Bahama	19,391	2,879	140.1	23.1	\$163.2
Total	21,262	9,210	1,356.8	119.8	\$1,476.6

Source: Assessment team, 2019.

TABLE 11. ABACO: LOSSES

Island	Qty. of Houses	Ave. Monthly Rent \$	Monthly Cost \$	Period (months)	Total Cost
Treasure Cay	480	1,800	224,762	28	6,293,337
Central Abaco	2,757	1,400	1,003,713	28	28,103,971
North Abaco	324	1,000	84,352	28	2,361,844
Hope Town	1,829	1,800	855,952	28	23,966,662
South Abaco	31	1,000	8,004	28	224,121
Total	5,422		2,176,783		\$60,949,937

Source: Assessment team, 2019.

TABLE 12. GRAND BAHAMA: LOSSES

Island	Qty. of Houses	Ave. Monthly Rent (\$)	Monthly Cost (\$)	Period (months)	Total Cost
Grand Bahama	426	1,800	229,873	6	1,379,239
West Grand Bahama	1,228	1,000	368,262	6	2,209,575
East Grand Bahama	264	1,000	79,253	6	475,517
Total	1,917				\$4,064,330

Source: Assessment team, 2019.

TABLE 13. ABACO: ADDITIONAL COSTS

Island	Y3	Truckloads	Cost per Truck/ Demolition (\$)	Estimated Cost (1)
Debris Cleaning	2,145,453	165,035	200	\$33,006,963
Demolition	321,818		40	\$12,872,715
Total	2,467,270			\$45,879,678

(1) Including Labor and Equipment Rental.
Source: Assessment team, 2019.

TABLE 14. GRAND BAHAMA: ADDITIONAL COSTS

Island	Y3	Truckloads	Cost per Truck/ Demolition (\$)	Estimated Cost (1)
Debris Cleaning	510,605	39,277	200	\$7,855,454
Cost of demolition	76,591		40	\$3,063,627
Total	587,195			\$10,919,081

(1) Including Labor and Equipment Rental.
Source: Assessment team, 2019.

Public buildings

Assets associated with government services; public safety such as police and fire stations, postal services, among others. Hurricane Dorian caused different levels of damage to public buildings. (tables 15 & 16).

TABLE 15. PUBLIC BUILDINGS: DAMAGE

Location	Buildings	Buildings	Furniture and Equipment	Vehicles (units)	Vehicles (\$)	Damage (\$)
Abaco	18	5,468,066	2,304,682	12	200,410	\$7,973,159
Grand Bahama	13	1,528,303	764,152	20	302,050	\$2,594,505
Total	31	6,996,370	2,995,600	32	502,460	\$10,567,663

Source: Assessment team, 2019.

TABLE 16. PUBLIC BUILDINGS: ADDITIONAL COSTS

Island	CY	Truckloads	Cost of Trucks	Estimated Cost
Abaco Debris Cleaning	18,096	1,392	200	\$278,396
Abaco Cost of demolition	15,080		30	\$458,426
G. Bahama Debris Cleaning	6,725	517	200	\$103,454
G. Bahama Cost of demolition	5,604		30	\$170,355
Total				\$1,010,632

Source: Assessment team, 2019.

SOCIAL SECTORS - EDUCATION

Education

Across both islands 45 educational facilities experienced varying levels of damage with 10,546 students and 796 teachers affected. Seven Schools were altogether destroyed. On Abaco, there were 23 educational facilities impacted with 3,512 students and 211 teachers affected, while Grand Bahama had 24 educational facilities impacted with 7,034 students and 585 teachers affected.

TABLE 17. EDUCATION SECTOR: DAMAGE, LOSSES AND ADDITIONAL COSTS

	Damages	Losses	Additional costs
Abaco Islands	36,330,052.7	1,240,191.3	9,601,260.5
Grand Bahama	36,076,549.8	3,426,073.1	9,498,739.5
Unaffected facilities	0.0	2,132,762.0	-
Total	\$72,406,602.5	\$6,799,026.4	\$19,100,000.0

Source: Assessment team, 2019.

Note: Undamaged facilities are all remaining educational facilities not damaged but were closed for 4 days in the case of the University of The Bahamas, 5 days for public schools and 6 days for BTVI.

SOCIAL SECTORS - HEALTH

Hurricane Dorian severely affected the Health sector, with significant destruction of infrastructure, equipment, medical supplies and electrical and water supply on Abaco and Grand Bahama. Therefore, the capacity of the healthcare delivery system has been impacted. Access to health services and medical care delivery has been significantly hampered in the most affected areas. (Table 18).

TABLE 18. HEALTH SECTOR: DAMAGE

Description	Public	Private	Total
Health care Infrastructure - Grand Bahama	25,966,500	787,500	26,784,000
Health care Infrastructure - Abaco	2,441,250		2,441,250
Medical equipment, furniture, vehicles, others - Grand Bahama	6,381,750	350,000	6,731,750
Medical equipment, furniture, vehicles, others - Abaco	1,789,500		1,789,500
Total	\$36,579,000	\$1,137,500	\$37,716,500

Source: Assessment team, 2019 based on PHA and MOH information and estimates.

Hurricane Dorian damaged most of the healthcare facilities on both affected islands, with severe damage to the Rand Memorial Hospital (RMH) and four clinics located in the eastern part of Grand Bahama, mainly due to the storm surge and wind gusts that reached 220 mph. The other clinics received lesser damage, mainly roof and external damage, water leakages and medical equipment and furniture damage from flooding, humidity and intense heat. (See Table 19 & 20).

TABLE 19. GRAND BAHAMA: HEALTH CARE INFRASTRUCTURE DAMAGE

Health Care Facility	Description
High Rock Clinic	Destroyed
Rand Memorial Hospital	Damaged over 50%
Mc Lean Clinic	Damaged over 50%
Pelican Point Clinic	Damaged over 50%
Sweeting's Cay	Damaged over 50%
Eight Mile Rock	Partially damaged - 25%
Free Town (rental)	Partially damaged - 25%
Hawksbill Clinic	Partially damaged - 25%
West End	Partially damaged - 25%
Grand Cay	Partially damaged - 25%
Davies House Clinic (private)	Partially damaged - 25%
East Sunrise Medical (private)	Partially damaged - 25%
Treasure Cay Clinic (private)	Partially damaged - 25%

Source: Assessment team, 2019 PHA and MOH information and estimates.

TABLE 20. ABACO: HEALTH CARE INFRASTRUCTURE DAMAGE

Health Care Facility	Description
Moore's Island Clinic	Damaged over 50%
Marsh Harbour Clinic	Partially damaged - 25%
Hope Town Clinic (satellite)	Partially damaged - 25%
Man-o-War Cay (satellite)	Partially damaged - 25%
Fox Town (satellite Clinic)	Partially damaged - 25%
Green Turtle Cay Clinic (satellite)	Partially damaged - 25%
Sandypoint Clinic (satellite)	Partially damaged - 25%
Cooper's Town Clinic	Partially damaged - 25%

Source: Assessment team, 2019 PHA and MOH information and estimates.

This section outlines losses incurred due to disruption in health services including corporate operations at PHA and MOH.

TABLE 21. HEALTH SECTOR: LOSSES

Description	Public	Private	Total
Losses to disruption in Hospitals	20,863,750	N.A.	20,863,750
Losses to disruption in Clinics	487,630	N.A.	487,630
Total	\$21,351,380		\$21,351,380

Source: Assessment team, 2019 based on PHA and MOH information and estimates.

INFRASTRUCTURE SECTORS - TRANSPORTATION

Transportation infrastructure is crucial for The Bahamas' economy since it provides connectivity and mobility between and within islands, and in the context of disasters, it provides an essential role for the reconstruction of other infrastructures and provides access to other critical services such as medical services, power generation facilities, and shelters, among others. The estimated transportation infrastructure impact was approximately \$94.5 million for the whole country (Table 22).

TABLE 22. TRANSPORT SECTOR: DAMAGE, LOSSES AND ADDITIONAL COSTS

Description	Damage	Losses	Additional costs
Roads	8,747,991	-	3,405,794
Bridges	2,862,160	-	58,800
Airports	36,926,085	24,377,244	2,571,316
Ports	2,241,038	12,830,706	536,710
Total	50,777,274	37,207,950	6,572,619

Source: Assessment team 2019.

Among the transportation infrastructure airports were severely damaged by the hurricane and the main causes were storm surge, flooding, and winds of more than 170 miles per hour to which they were subjected (table 23).

TABLE 23. AIRPORTS: DAMAGE

Island	Airport	Damage
Abaco	Marsh Harbour	9,829,616
Abaco	Treasure Cay	2,025,060
Grand Bahama	GB International	25,071,409
Total		\$36,926,085

Source: Assessment team, 2019.

Although the Nassau airport was not directly affected by the hurricane, losses due to temporarily canceled flights are included, as the decrease in the flow of tourists affected Abaco and Grand Bahama as a result. (table 24).

TABLE 24. TRANSPORT SECTOR: LOSSES

Description	2019	2020	2021	Total
Abaco Airports	3,190,731	4,852,570	2,426,285	10,469,586
Abaco Ports	2,024,000	3,036,000	1,518,000	6,578,000
Grand Bahama Airports	2,638,336	3,566,639	1,426,656	7,631,631
Grand Bahama Ports	2,233,109	3,126,353	893,244	6,252,706
Nassau Airport	6,276,027	-	-	6,276,027
Totals	\$16,362,203	\$14,581,562	\$6,264,185	\$37,207,950

Source: Assessment team, 2019.

INFRASTRUCTURE SECTORS - UTILITIES

The Telecommunications sector suffered considerable damage and a long recovery is expected, especially on Abaco. Gale force winds caused damage to aboveground network elements, while flooding caused unexpected damage to various types of ground level telecommunications Equipment. Total damage to the Telecommunications sector was estimated at \$42.1 million. The losses were estimated at \$54.4 million. Additional costs were estimated at approximately one million dollars, mainly reflecting the labor-related costs required to perform repairs and emergency power (tables 25 & 26).

TABLE 25. SUMMARY OF DAMAGE IN THE TELECOMMUNICATIONS SECTOR

Description	Public	Private	Total
Buildings and Equipment			
Abaco		11,000,000	11,000,000
Grand Bahama		2,300,000	2,300,000
Wired Infrastructure			-
Abaco		20,000,000	20,000,000
Grand Bahama		2,250,000	2,250,000
Wireless Infrastructure			-
Abaco		5,600,000	5,600,000
Grand Bahama		1,000,000	1,000,000
Total	-	\$42,150,000	\$42,150,000

Source: Assessment team, 2019.

TABLE 26. SUMMARY OF LOSSES IN THE TELECOMMUNICATIONS SECTOR

Island	Total
Abaco	41,943,917
Grand Bahama	12,436,232
Total	54,380,149

Source: Assessment team, 2019.

TABLE 27. AIRPORTS: DAMAGE

Island	Airport	Damage
Abaco	Marsh Harbour	9,829,616
Abaco	Treasure Cay	2,025,060
Grand Bahama	GB International	25,071,409
Total		\$36,926,085

Source: Assessment team, 2019.

Power and Water & Sanitation Sectors Hurricane Dorian caused extensive damage to the power generation, transmission and distribution systems on the islands of Abaco and Grand Bahama. On Grand Bahama, severe flooding caused damage to the power generation plant located at Pill Street, whilst strong winds destroyed the major transmission line to the eastern end of the island.

TABLE 28. POWER SECTOR: DAMAGE (\$)

Description	Public	Private	Total
Damage to Power Generation			
Abaco	920,000	-	920,000
Grand Bahama	-	21,000,000	21,000,000
Damage to Transmission and Distribution			
Abaco	80,435,000	-	80,435,000
Grand Bahama	-	16,000,000	16,000,000
Buildings and Equipment			
Abaco	3,000,000	-	3,000,000
Grand Bahama	-	10,000,000	10,000,000
Total	\$84,355,000	\$47,000,000	\$131,355,000

Source: Assessment team 2019 and Abaco rebuild and restoration plan 2019.

TABLE 29. POWER SECTOR: LOSSES (\$)

Island	Public	Private	Total
Abaco	24,714,816	-	24,714,816
Grand Bahama	-	44,209,742	44,209,742
Total	\$24,714,816	\$44,209,742	\$68,924,558

Source: Assessment team, 2019.

The Bahamas has serious obstacles related to the availability of water and the capacity to supply water due to its geographical spread, population size, remote locations, topography and climatic conditions. Most of the major damage to the system was observed in the areas of Central Abaco and Treasure Cay. (table 30).

TABLE 30. WATER AND SANITATION DAMAGE, LOSSES AND ADDITIONAL COST

Island	Damage	Losses	Additional Cost
Abaco	14,853,000	36,624,014	24,714,816
Grand Bahama*	-	-	-
Totals	\$14,853,000	\$36,624,014	\$24,714,816

* No data available in Grand Bahama.
Source: Assessment team, 2019.

PRODUCTIVE SECTORS - TOURISM

Hurricane Dorian directly impacted two major tourist destinations of The Bahamas and disrupted the tourist flows in the rest of the Lucayan Archipelago for several days before and after the storm. Hurricane Dorian caused significant damage on Abaco and Grand Bahama, and in some locations the damage was catastrophic. (table 31).

TABLE 31. TOURISM: DAMAGE

	Roof/Ceiling	Rooms	Common areas	Landscape & facilities	Equipment	Others	Total
Abaco Total	21,976,543	140,106,272	132,933,315	187,811,131	21,562,332	7,980,272	512,369,865
North Abaco	6,616,411	42,545,406	39,686,714	52,533,468	6,260,301	2,344,546	149,986,846
Marsh Harbour	2,391,782	14,645,597	18,027,331	27,099,200	2,968,009	1,020,035	66,151,955
Central Abaco	11,462,490	78,459,338	65,401,244	89,769,664	10,564,173	4,064,893	259,721,800
South Abaco	1,505,859	4,455,931	9,818,027	18,408,800	1,769,850	550,798	36,509,264
Grand Bahama Total	1,028,634	4,152,314	7,665,646	1,906,986	1,891,350	535,412	17,180,343
Freeport	581,906	3,067,951	4,427,497	1,726,486	1,361,096	443,175	11,608,111
West Grand Bahama	16,668	35,909	92,786	134,869	48,890	5,181	334,304
East Grand Bahama	430,060	1,048,454	3,145,363	45,632	481,364	87,055	5,237,928
Total	\$23,005,177	\$144,258,586	\$140,598,961	\$189,718,118	\$23,453,682	\$8,515,684	\$529,550,208

Source: Assessment team, 2019.

The losses in the tourism sector have two different fundamental causes. The first one is the disruption in the flow of tourists as a result of the passing storm (Table 31, 32 & 33). These losses can be considerable depending on the amount of traffic affected. The second cause is related to the damage and the direct impact of the storm on the tourist infrastructure and the perception of tourists about the location. (table 32).

TABLE 32. TOURISM: LOSSES BY TYPE OF VISITOR

	Stopover	Cruise	Day	Total
New Providence	23,562,685	4,601,358	27,859	28,191,902
Grand Bahama	10,450,550	8,694,576	115,799	19,260,924
Out islands	277,053,402	664,981	28,057	277,746,440
Abaco	271,090,647			
Rest Out islands	5,962,755			
The Bahamas	311,066,637	13,960,914	171,715	\$325,199,267

Source: Assessment team, 2019.

TABLE 33. TOURISM: LOSSES BY TYPE OF VISITOR AND YEAR

	2019	2020	2021	2022
Stopover	82,934,979	185,578,173	39,405,745	3,147,740
Cruise	11,915,522	2,045,392	0	0
Daily	139,237	32,478	0	0
Total	\$94,989,739	\$187,656,043	\$39,405,745	\$3,147,740

Source: Assessment team, 2019.

TABLE 34. TOURISM: LOSSES BY TYPE OF EXPENDITURE

	Stopover	Cruise	Day	Total
Accommodation	193,248,449	0	0	193,248,449
Meals and Drinks	37,751,660	1,686,859	20,597	39,459,116
Activities	24,721,976	4,753,397	60,514	29,535,887
Shopping	25,069,247	6,458,459	78,554	31,606,260
Transportation	21,421,967	709,595	8,577	22,140,139
Casino	2,384,544	253,075	1,532	2,639,151
Other	6,468,795	99,531	1,940	6,570,265
Total	\$311,066,637	\$13,960,914	\$171,715	\$325,199,267

Source: Assessment team, 2019.

The cost of demolition, debris removal and salvage of sunken ships are all considered in the Additional costs Table 35.

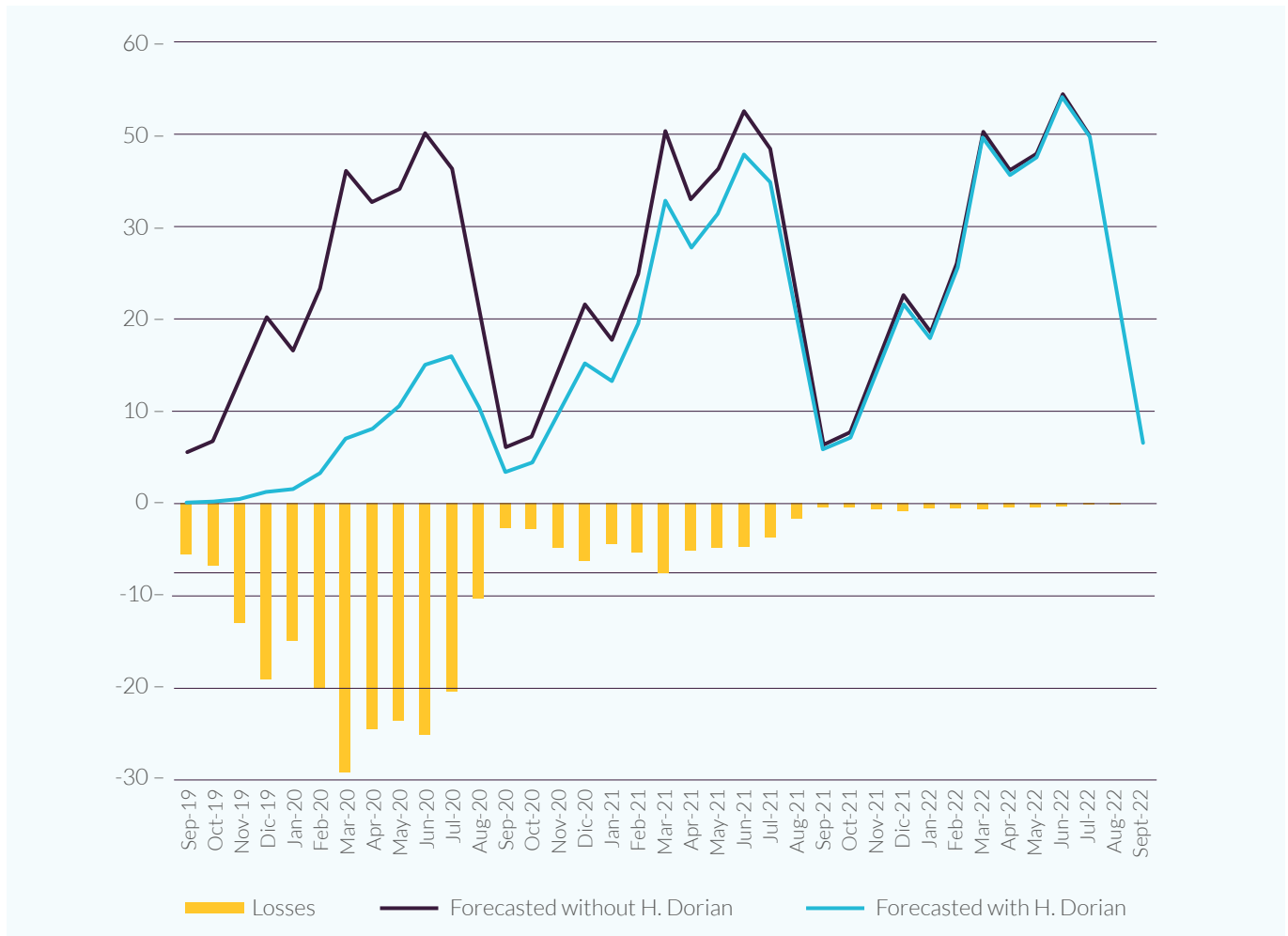
TABLE 35. TOURISM: ADDITIONAL COSTS

	Cost
Demolition	8,088,943
Debris removal	2,410,182
Salvage	4,647,500
Total	\$15,146,625

Source: Assessment team, 2019.

The losses for Abaco in tourism income (stopovers) are considerable, both in magnitude and in time, as we can see in Figure 4.

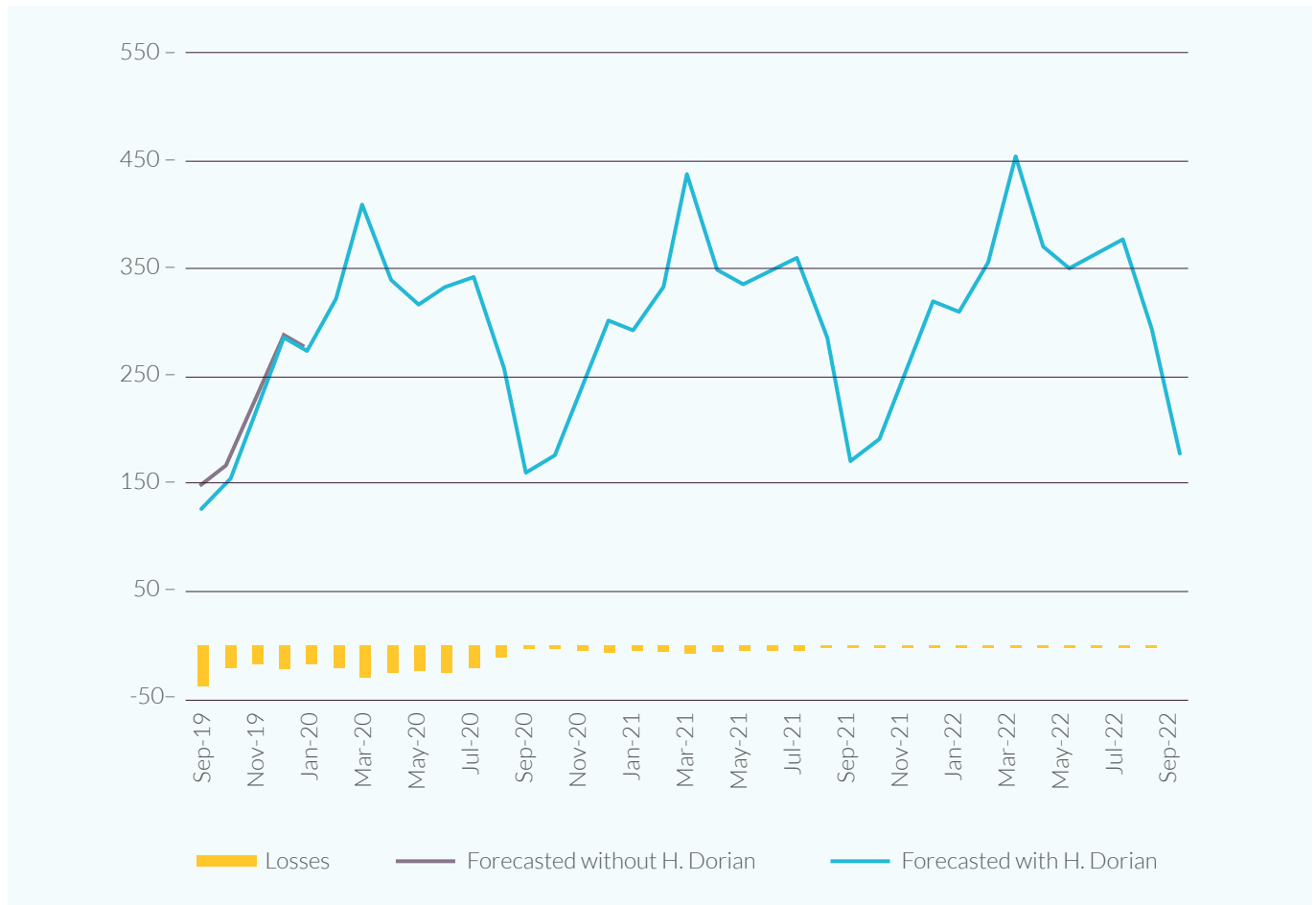
FIGURE 4. ABACO: FORECASTED STOPOVER INCOME AND LOSSES (MILLIONS)



Source: Assessment team, 2019.

The monthly forecast of the three-year expenditure for the recovery is displayed in Figure 5. This is the baseline scenario for estimating the losses, and then we adjust that forecast using our assumptions. The monthly losses are the differences between these two series. Full recovery is assumed to occur by September 2022.

FIGURE 5. BAHAMAS: FORECASTED STOPOVER INCOME AND LOSSES (MILLIONS)



Source: Assessment team, 2019.

PRODUCTIVE SECTORS - FISHERIES & AGRICULTURE

The impact of Hurricane Dorian on the Fisheries and Agriculture sector of Abaco and Grand Bahama was significant and generalized. Every fishing processing facility was affected, either by wind damage or storm surge. In the agricultural sector, several green houses were devastated, and many perennial crops were damaged by the wind and salt-water intrusion. A poultry processing facility was devastated on Abaco. (Table 36).

TABLE 36. FISHERIES: DAMAGE

Assets	Value
Processing facilities	4,744,500
Inventory	1,645,150
Vessels	1,841,100
Outboard engines	359,032
Fishing gear	2,047,631
Total	\$10,637,413

Source: Ministry of Agriculture and Marine Resources.

The damage in the Agriculture sector totaled just under \$3 million. Most of the damage is associated to the poultry facility located on Abaco.

TABLE 37. AGRICULTURE: DAMAGE

Assets	Value
Green houses	187,382
Other facilities	800,000
Animals	1,037,951
Plants	655,874
Equipment	197,476
Total	\$2,878,684

Source: Assessment team, 2019.

To estimate the Losses to fisheries, the yearly total catch was broken down to a monthly amount for Abaco and Grand Bahama. A full recovery should occur in eight months, with such relative quickness due to the important nature of this activity.

TABLE 38. FISHERIES AND AGRICULTURE: LOSSES

Sector	Losses
Fishing	6,570,623
Agriculture	1,985,212
Poultry	1,556,926
Total	\$10,112,761

Source: Assessment team, 2019.

PRODUCTIVE SECTORS - COMMERCE

The Commerce sector, as defined in national accounts as activity such as “wholesale and retail trade, motor vehicle repairs”, accounted for 12.0 percent of the Bahamas’ GDP on average from 2012 to 2018. It was the second largest sector in The Bahamas’ economy, behind real estate at 15.6 percent. This number almost certainly includes a high degree of tourist activity. (table 39 and Fig. 6).

TABLE 39. COMMERCE: DAMAGE

Description	Abaco	Grand Bahama	Total
Structures	44,565,125.7	3,637,502.1	48,202,627.8
Roof	9,131,339.0	762,059.3	9,893,398.3
Furniture	5,853,942.8	436,655.6	6,290,598.4
Equipment	11,835,803.3	1,362,116.9	13,197,920.3
Total	71,386,210.8	6,198,334.0	77,584,544.8

Source: Assessment team, 2019.

The losses resulting from the hurricane varies by island. Business activity will be limited by damage to properties both owned and rented, and by loss of inventory. The cleanup process on Abaco is ongoing and will be extensive, and many buildings will require significant repairs and even demolition.

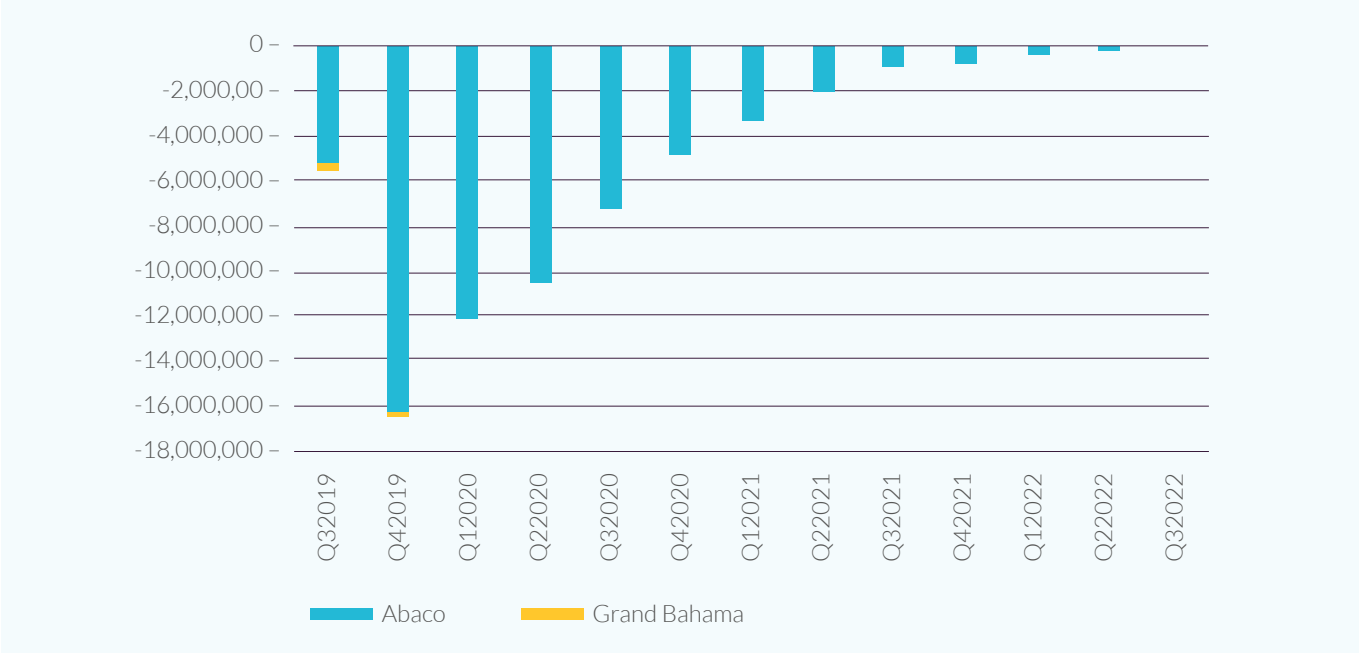
TABLE 40. COMMERCE: LOSSES

Description	Abaco	Grand Bahama	Total
Food and non-alcoholic beverages	53,295,751.3	787,715.9	54,083,467.2
Alcohol beverages, tobacco and narcotics	2,703,444.5	47,640.2	2,751,084.7
Clothing and footwear	3,884,187.8	106,937.5	3,991,125.3
Furnishing, household equipment and routine household maintenance	-71,574.8	-589,911.7	-661,486.5
Recreation and culture	4,713,087.7	95,723.6	4,808,811.3
Total	\$64,524,896.4	\$448,105.5	\$64,973,001.9

Source: Assessment team, 2019.

The figure below depicts the quarterly losses from Q3 2019, up until Q3 2022. As the event occurred in the last month of Q3 2019, the losses in this quarter are much smaller. In Q4 2019, the losses are much greater, and they gradually decrease in size over the next three years as the recovery continues and more businesses begin to re-open and activity normalizes.

FIGURE 6. LOSSES BY QUARTER IN THE COMMERCE SECTOR

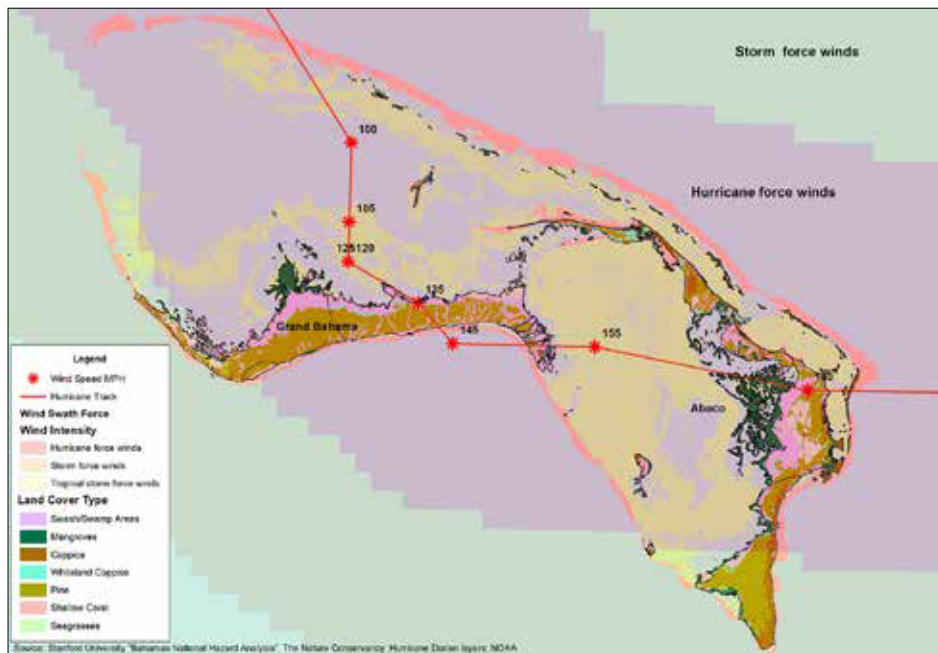


Source: Assessment team, 2019.

ENVIRONMENTAL SECTOR

This section evaluates Hurricane Dorian’s effects on natural resources. The type and temporal extent of impact varies according to the storm’s speed, size, intensity, and amount of precipitation in each area and will be classified into minimal, moderate or significant impact. Although previous assessments indicate that ecosystems in the Bahamas have adapted over time to become resilient to tropical weather, the intensity and duration of Hurricane Dorian caused moderate to significant impacts on several ecosystems (Figure 7).

FIGURE 7. ECOSYSTEMS ON ABACO AND GRAND BAHAMA AND HURRICANE DORIAN TRAJECTORY



Source: Assessment team, 2019.

Oil spill management

The oil spill in the oil terminal on Grand Bahama is an issue of great concern (Figure 8). A National Oil Spill Contingency Advisory Committee, consisting of a cross-section of industry stakeholders, has been appointed to address the issue. The committee is supposed to conduct site visits and convey meetings every fortnight to closely monitor the area.

FIGURE 8. GRAND BAHAMA - OIL SPILL AT EQUINOR SOUTH RIDING OIL TERMINAL



Source: Assessment team, 2019.

TABLE 41. ENVIRONMENTAL: DAMAGE, LOSSES, ADDITIONAL COSTS

	Damage	Losses	Additional costs
Grand Bahama	1,160,781	2,182,688	99,795,000 ¹
Abaco	945,483	3,275,130	2,678,000
Marine transboundary areas	5,040,699	21,977,230	
Total	\$7,146,963	\$27,435,048	\$102,473,000

Source: Assessment team, 2019.

¹\$94.9 million in Additional costs are private costs.

Considering that the national reserves comprise terrestrial and maritime areas that have been not fully accessed yet, the estimation of the damaged area is based on a conservative percent of the extended area affected by hurricane winds according to satellite imagery and the hurricane path. Impact has been graded as severe, moderate and minimal.

TABLE 42. GRAND BAHAMA: PROJECTED DAMAGE TO THE NATIONAL RESERVES (SQUARE METERS)

Reserves	Extension	Estimated damaged area
Rand Nature Centre	397,943	37,805
Peterson Cay National Park	4,412,479	419,185
East Grand Bahama National Park	487,436,716	60,929,590
Northshore/ The gap National Park	946,637,452	118,329,681
Lucayan National Park	7,838,031	979,754
Total	1,446,722,620	180,696,014

Source: Assessment team, 2019.

TABLE 43. ABACO: PROJECTED EXTENSION OF DAMAGE TO THE NATIONAL RESERVES

Reserves	Extension	Estimated damaged area
Abaco national park	85,093,545	4,254,677
Walkers' Cay National Park	18,732,200	1,779,559
Pelican Cay Land and Sea Park	8,725,992	828,969
Fowls Cay National Park	4,997,897	474,800
Tilloo Cay Reserve	40,264	3,825
Cross Harbour National Park	61,438,980	3,071,949
Marls of Abaco National Park	866,421,102	108,302,638
East Abaco Creeks - The Bight	16,437,706	1,561,582
East Abaco Creeks - Cherokee	23,882,833	2,268,869
East Abaco Creeks - Snake Cays	13,277,886	1,659,736
South Abaco Blue Holes National Park	128,822,879	12,238,174
Black Sound Cay National Reserve	5,721	543
Total	1,227,877,004	136,445,321

Source: Assessment team, 2019.

The environmental assessment is based on information and interviews provided by the Ministry of Environment and Housing, BEST Commission, the port authority, the Bahamas National Trust (BNT), site visits and through interviews of members of these organization that have visited the affected areas (Table 44).

TABLE 44. OBSERVED AND EXPECTED QUALITATIVE IMPACTS OF HURRICANE DORIAN

RESOURCES	QUALITATIVE OBSERVED IMPACTS
National reserves and non-protected areas	<ul style="list-style-type: none"> » Severe defoliation of areas of pine forests on Grand Bahama and Abaco, with moderate to severe tree uprooting and tree breakage in certain areas. » Destroyed trees that may act as a fueling agent to fires. » Storm surge and wind transported saltwater, sediment, and other organic matter inland. » Severe destruction of national reserves infrastructure, especially in the recently constructed facilities at Lucayan National Park. » Expected lost eco-tourism revenue resulting from closure and damage of protected areas, especially Lucayan park, which is one of the main attractions on Grand Bahama. » Losses in non-timber forest products. » Soil and forest contamination due to oil spill on Grand Bahama. » Increased risk of invasive species.
Coastal ecosystems	<ul style="list-style-type: none"> » Partial/total destruction of portions of seagrass meadows. » Partial/total destruction of the mangrove forests. » Expected reductions in the ecosystem services that seagrasses/mangroves provide, such as habitat for commercial and non-commercial fish and shellfish species, and improving water clarity. » Beach erosion/dune destruction observed in several areas, most severe impact reported in Gold Rock Beach in Lucayan National reserve.
Wildlife (non-commercial species)	<ul style="list-style-type: none"> » Destruction of forest canopy causing changes in the light, temperature, and humidity levels with expected implications for birds, lizards, and other animals, especially with regards to food availability and predation. » Potential impact to sea turtle nesting sites. » Expected high nutrient loading and subsequent periods of hypoxia (low oxygen levels) with alterations in the distribution, abundance, and movement of mobile aquatic species. » Flooding of unusual areas and stranding of fish and other aquatic animals observed in some areas after water levels recede. » Expected impact over oyster reefs through physical disturbance (waves pounding into the reefs cause breakage), sedimentation, and extreme salinity changes. » Possible extinction of the subspecies of the Bahamian nuthatch.
Marine ecosystems	<ul style="list-style-type: none"> » Physical damage to coral reefs. » Accumulation of sediment and rubble, which is unstable and less suitable for coral settlement.
Water resources	<ul style="list-style-type: none"> » Potential long-term impact to access to clean water because of damaged forests and greenspaces. » Expected contamination of fresh-ground water resources by residuals (testing still on-going).
Others	<ul style="list-style-type: none"> » Economic losses in coastal properties from damage to mangroves, seagrass and beaches. » Expected loss of eco-tourism revenue resulting from damage to dive shops and boats, coral reefs, commercial and recreational fish habitat, forest habitat for birds and endangered species, etc.

Source: Assessment team, 2019 observations and information from preliminary assessments and interviews.

