Rapid assessment of acute environmental risks after Hurricane Dorian

The Bahamas

September 2019

UN environment programme | OCHA | JOINT ENVIRONMENT UNIT | 25 YEARS

Published in Switzerland, 2019 by the UNEP/OCHA Joint Environment Unit, Response Support Branch, OCHA

This report is based on the information received and gathered during the mission and therefore cannot be seen as exhaustive, but can be considered as representative of the existing situation. All information has been compiled by the experts on mission based upon best available knowledge when drafted.

UNEP/OCHA Joint Environment Unit
Response Support Branch, Office for the Coordination of Humanitarian Affairs (OCHA)
Palais des Nations
CH-1211 Geneva 10
Switzerland
ochaunep@un.org

Report Editor: Margherita Fanchiotti, UNEP/OCHA Joint Environment Unit
Cover photo: Drone view of Marsh Harbour, Abaco Islands, The Bahamas after Hurricane Dorian (© Samaritan's Purse)

Table of Contents

*The **UNEP/OCHA Joint Environment Unit (JEU)** responds **as one UN to the environmental dimensions of emergencies**. The Unit pairs UN Environment Programme's environmental expertise with the OCHA-coordinated humanitarian network. By coordinating international efforts and mobilizing partners, the JEU assists countries affected by disasters and crisis and works to enhance the environmental sustainability of humanitarian action. The JEU provides independent, impartial advice and practical solutions, while working with organizations dedicated to medium- and long-term rehabilitation to ensure a seamless transition from emergency response to recovery. The team manages the **EHA Connect digital tool**, as well as the **Environmental Emergencies Centre**.*

*The **United Nations Disaster Assessment and Coordination (UNDAC)** is part of the international emergency response system for sudden-onset emergencies. UNDAC is designed to help the United Nations and governments of disaster-affected countries during the first phase of a sudden-onset emergency.*

Executive summary

On 1 September 2019, Hurricane Dorian made landfall as a Category 5 hurricane on Abaco Islands, The Bahamas, before moving over Grand Bahama Island, The Bahamas. As of 29 October, the official death toll stood at 67, and is expected to rise given that over 200 people were still missing. The hurricane left a trail of devastation, with destroyed buildings, uprooted trees and significant disruptions to basic services on both islands.

Key environmental concerns in the aftermath of Dorian included: i) the management of large quantities of disaster waste generated by the hurricane; ii) the confirmed inland spill of crude oil and any potential spills at sea from Equinor's oil storage facility on Grand Bahama Island; and iii) any potential secondary and cascading impacts resulting from damages to the numerous hazardous operation facilities located on Abaco and Grand Bahama Islands.

To support the government-led response to Hurricane Dorian, a United Nations Disaster Assessment and Coordination (UNDAC) team was deployed to The Bahamas from 8 to 28 September. The team embedded an environmental expert from the UNEP/OCHA Joint Environment Unit (JEU). The expert moved across New Providence, Abaco and Grand Bahama Islands to equally support efforts in Nassau, Marsh Harbour and Freeport. In Grand Bahama, the expert was joined by one representative of the Ministry of the Environment, two oil spill experts mobilized by the JEU through the European Union Civil Protection Mechanism (UCPM) and a UCPM liaison officer to specifically address oil spill concerns, in liaison with the United States Coast Guard.

The main objective of the overall mission was to provide technical advice to national and local authorities to rapidly identify, assess and mitigate any negative environmental impacts following the event, with an emphasis on those that posed immediate life-threatening risks to humans (both local communities and responders); advise on required follow-up actions; promote the early integration of environmental considerations in assessments and overall response efforts; facilitate knowledge sharing and information exchange among national and international counterparts on environmental matters; and deliver recommendations accordingly.

The mission outcomes showed that special considerations on hazardous waste should be incorporated in a comprehensive disaster waste management strategy and any ongoing clean-up efforts should be linked to this strategy. Acute environmental risks on Abaco Islands deriving from some of the worst impacted hazardous operation facilities have been rapidly mitigated to prevent cascading negative humanitarian and environmental impacts, but timely follow-up by the operators at all sites of concern is required to restore safety. There is no evidence of the presence of crude oil at sea resulting from the damage on Equinor's oil storage facility. Response to the inland spill will require an agreement between national authorities and the operator on the endpoints of clean-up efforts. This should aim at minimizing the generation of waste by promoting reusing and recycling to the extent possible, while ensuring adequate removal of contaminated products. The incident further highlighted the opportunity to strengthen existing capacities and enhance readiness for any similar events in the future.

List of abbreviations, acronyms and glossary of terms

BEST	Bahamas Environment, Science and Technology
BPL	Bahamas Power and Light (Company Limited)
CARPHA	Caribbean Public Health Agency
CCA	The Clean Caribbean & Americas
CDC	Centers for Disease Control and Prevention
CDEMA	Caribbean Disaster Emergency Management Agency
DEHS	Department of Environmental Health Services
ECHO	European Commission's Directorate-General for Civil Protection and Humanitarian Aid
FEAT	Flash Environmental Assessment Tool
HNS	Hazardous Noxious Substance
IFRC	International Federation of Red Cross and Red Crescent Societies
IMDG	International Maritime Dangerous Goods
IMO	International Maritime Organization
IOM	International Organization for Migration
IPIECA	International Petroleum Industry Environmental Conservation Association
ITOPF	International Tanker Owners Pollution Federation Limited
JEU	UNEP/OCHA Joint Environment Unit
MSB	Swedish Civil Contingencies Agency
NCP	National Oil Spill Contingency Plan of the Commonwealth of The Bahamas
NEMA	National Emergency Management Agency
NGO	Non-Governmental Organization
NOSCAT	National Maritime Policy Steering Committee
OCHA	(UN) Office for the Coordination of Humanitarian Affairs
OPRC	Oil Pollution Preparedness and Response Code
OSRL	Oil Spill Response Limited
PAHO	Pan American Health Organization
PMAC	Port Managers Association of the Caribbean
POSOW	Preparedness for Oil-polluted Shoreline cleanup and Oiled Wildlife interventions
PPE	Personal Protective Equipment
RNAT	Rapid Needs Assessment Team
UCPM	(European) Union Civil Protection Mechanism
UN	United Nations
UNDAC	United Nations Disaster Assessment and Coordination
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
WFP	World Food Programme
WHO	World Health Organization

1. Mission background and scope

On 1 September 2019 at 12:45 PM EST, Hurricane Dorian made landfall as a Category 5 hurricane at Elbow Cay, Abaco Islands, The Bahamas, with wind speeds of 185 mph. Starting on 2 September at 2:00 PM EST, Dorian moved over Grand Bahama Island, The Bahamas. An all-clear was issued on 4 September.

As of 29 October, the official death count stood at 67, expected to rise given that over 200 people were still missing. The hurricane left a trail of devastation, with destroyed buildings, uprooted trees and significant disruptions to basic services on Abaco and Grand Bahama Islands. Environmental concerns arose quickly in the aftermath of the event, notably in relation to disaster waste management, crude oil contamination - as a result of damage to Equinor's oil storage facility on Grand Bahama Island - and other impacts on hazardous operation facilities on both islands.

The National Emergency Management Agency (NEMA) is in charge of overall emergency management and established an Emergency Operations Centre (EOC) in Nassau, with satellite EOC's on Abaco and Grand Bahama Islands led by the local government representation[1]. Coordination is channeled through a set of Emergency Support Functions (ESFs) representing key sectors. Among these, the Ministry of the Environment is leading work on environmental and hazmat risks under the related ESF.

To complement national efforts, two Regional Needs Assessment Teams (RNATs) led by the Caribbean Disaster Emergency Management Agency (CDEMA) were pre-positioned in Nassau as of 31 August. The teams consisted of 18 members from CDEMA Participating States, the Caribbean Public Health Agency (CARPHA), Global Affairs Canada, the Pan American Health Organization (PAHO), the Port Managers Association of the Caribbean (PMAC), the private sector, the World Food Programme (WFP) and the United Nations Office for the Coordination of Humanitarian Affairs (OCHA).

Surge staff from OCHA Regional Office as well as a United Nations Disaster Assessment and Coordination (UNDAC) team was subsequently dispatched in the immediate aftermath of the event to support the government-led response. The UNDAC team embedded an environmental expert from the United Nations Environment Programme (UNEP)/OCHA Joint Environment Unit (JEU). The role of the expert, deployed from 8 to 28 September, was to rapidly identify and advise on acute environmental risks on Abaco and Grand Bahama Islands.

At the request of the Ministry of the Environment through the Bahamas Environment, Science and Technology (BEST) Commission, an environment team comprising one representative from the BEST Commission, the UNDAC environment lead, two oil spill experts mobilized by the JEU through the European Union Civil Protection Mechanism (UCPM) and a UCPM liaison officer was subsequently deployed to Grand Bahama Island between 21 and 29 September to provide technical advice on the environmental impacts of the oil spill, in close collaboration with local authorities and the United States Coast Guard.

[1] MapAction. The Bahamas: Hurricane Dorian. Coordination sites. https://maps.mapaction.org/dataset/13275a57-719b-4c7f-bebf-bd5d0858d3e6/resource/33a13f7a-bbbc-4e3a-8266-36d28e07d1f1/download/ma058_coordination_sites-300dpi.pdf

1.1 Context

Environmental concerns were flagged as a key priority by national and local authorities in the immediate aftermath of the hurricane. This was reflected in the emergency response coordination structure, with a dedicated ESF led by the Ministry of the Environment.

In particular, the hurricane generated large quantities of disaster waste. Aerial footage of the affected areas as well as site surveys show widespread disaster waste (Figures 1 and 2), including hazardous waste that requires adequate disposal. Disaster waste threatens human health, hinders recovery and reconstruction efforts and can significantly impact the environment.

Figures 1 (left) and 2 (right): disaster waste generated by Hurricane Dorian on Abaco Islands

The International Federation of Red Cross and Red Crescent Societies (IFRC) preliminarily estimated that there could be as many as 13,000 houses damaged or destroyed. Assessments result later found that an estimated 7,235 households were damaged in Central and East Grand Bahama only.

Disaster waste hampered access to key humanitarian routes after the hurricane. While debris clearance was initiated in the immediate response phase to restore access, no considerations on waste segregation and handling hazardous materials were applied in practice, posing challenges for post-disaster management. Landfill capacities on both islands are limited compared to the amount of waste produced, requiring the identification of temporary disposal sites.

The Ministry of Public Works and the Ministry of the Environment have been co-leading work on debris and overall disaster waste management. The Department of Environmental Health Services (DEHS) of the Ministry of the Environment, in particular, has been working on the development of a disaster waste

management plan to address all types of waste, moving beyond debris removal to systematically look at hazardous waste too.

Several hazardous operation facilities are located on Abaco and Grand Bahama Islands, many of which were severely impacted by Dorian (Figures 3 and 4), leading to the generation of hazardous waste and with potential for additional negative impacts to human health, livelihoods and the environment.

Figures 3 (left) and 4 (right): damaged gas station in Cooper's Town, Abaco Islands (left); diesel fuel leak at Marsh Harbour power sub-station (right)

Dorian significantly impacted one of two oil storage facilities located on Grand Bahama Island, with a confirmed inland spill of crude oil from Equinor's South Riding Point terminal. Operations at the terminal were shut down on 31 August as a precautionary measure in view of the hurricane warning. On 5 September, Equinor reported[2] that the facility had sustained damage based on findings from preliminary aerial assessment. An inland spill of crude oil towards the northeast was confirmed and noticeable from photo evidence made available by PAHO after an aerial assessment conducted on 4 September, further to the all-clear (see Figure 5 below). The operator subsequently engaged oil spill response resources to respond to the event and initiate the clean-up.

Several unconfirmed reports of oil spills at sea were circulating on international media prior to the mission, with the operator maintaining that no oil was leaking from the terminal based on results of their assessments[3].

[2] https://equinor.com/en/news/2019-09-05-bahamas.html

[3] https://www.equinor.com/en/news/2019-09-12-oil-spill-recovery-bahamas.html

Figure 5: Inland spill of crude oil from Equinor oil storage facility as of 4 September 2019 (© PAHO)

1.2 Mission objective

The objective of the environmental mission was to provide technical advice to national and local authorities to:

- Rapidly identify, assess and mitigate any negative environmental impacts following the event, with an emphasis on those that pose immediate life-threatening risks to humans (both local communities and responders);
- Advise on short-, medium- and long-term follow-up measures to address and mitigate those hazards;
- Promote the early consideration of environmental risks and any potential cascading impacts in disaster response coordination and assessments;
- Facilitate knowledge sharing and information management on environmental matters;
- Identify needs for additional specialized expertise and/or equipment as required.

The mission took place from 8 to 29 September 2019 as part of the UNDAC support to government-led response efforts in The Bahamas. It was conducted in close collaboration with relevant local, national and regional authorities, as well as other international emergency responders.

2. Timeline

The overall mission timeline, including key events, is provided in Figure 6 on the following page.

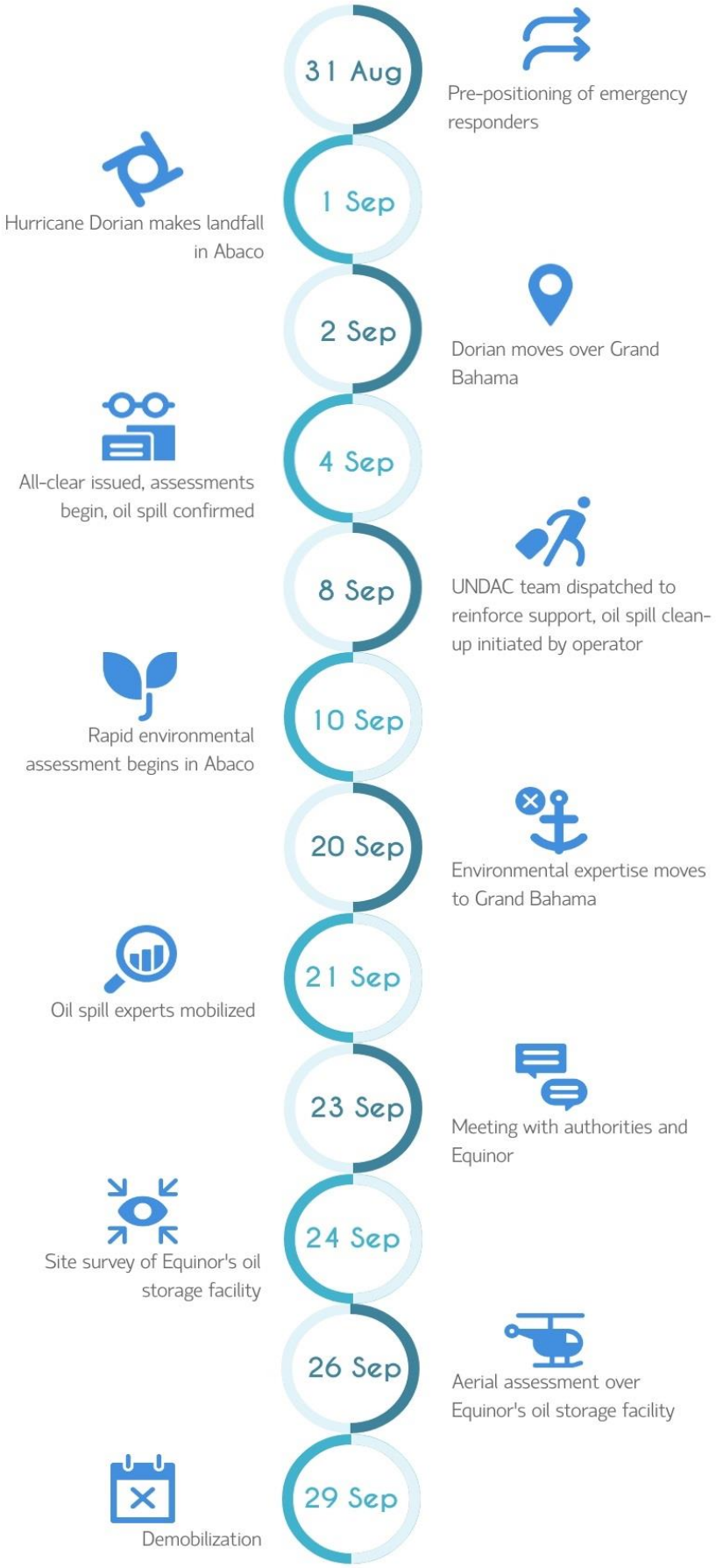

Figure 6: Timeline

3. Key activities and outputs

3.1 Key activities

An overview of the main activities completed during the mission is provided below.

Overall

- Technical advice to national authorities for the development of a comprehensive disaster waste management plan to deal with accumulated debris, including special considerations for hazardous waste, in liaison with other international responders working in the area (namely, the United Nations Development Programme (UNDP), the International Organization for Migration (IOM) and Swiss Agency for Development and Cooperation).
- Sharing of international guidance materials for disaster waste management, including for asbestos.

Abaco Islands

- Mapping of hazardous operation facilities on the islands.
- Determination of maximum extent of potential adverse impact zones for human health, soil and water contamination. This was done using the Flash Environmental Assessment Tool (FEAT)[4], developed by the Joint Environment Unit to rapidly assess potential risks in terms of human health, livelihoods and the environment as a result of spilling of chemical substances during emergencies.
- Rapid assessment of mapped hazardous operation facilities across the islands, with support from the Dutch Military Forces.
- Rapid intervention at sites of concern, in liaison with the operators and the Royal Defence Force, with support from the Dutch Military Forces.

Grand Bahama Island

- Mapping of hazardous operation facilities on the islands.
- Determination of maximum extent of potential adverse impact zones for human health, soil and water contamination. This was also done using the Flash Environmental Assessment Tool (FEAT), which allowed for a quick assessment of the possible risks to human health, livelihoods and the environment.
- Technical advice provided to the Ministry of the Environment to understand the impacts at sea of the oil spill resulting from the impact of Hurricane Dorian on Equinor's oil storage facility, to develop a plan for assessing the environmental impacts of the spill inland and to support oversight on the response actions undertaken by the operator.

[4] https://www.eecentre.org/resources/feat/

3.2 Key outputs

The following information products were delivered to showcase findings from implementation of the above-mentioned activities, with support from MapAction and Copernicus Emergency Management Service.

- Reference map of hazardous operation facilities:
  - Abaco Islands: https://maps.mapaction.org/dataset/bhs-2019-09-ma047-v2
  - Grand Bahama Island: https://maps.mapaction.org/event/bhs-2019-09
- Map showing maximum extent of potential impacts to human health deriving from mapped hazardous operation facilities:
  - Abaco Islands: https://maps.mapaction.org/dataset/bhs-2019-09-ma081-v2
  - Grand Bahama Island: https://maps.mapaction.org/event/bhs-2019-09
- Map showing maximum extent of potential impacts in terms of soil contamination deriving from mapped hazardous operation facilities:
  - Abaco Islands: https://maps.mapaction.org/dataset/bhs-2019-09-ma082-v2
  - Grand Bahama Island: https://maps.mapaction.org/event/bhs-2019-09
- Map showing maximum extent of potential impacts in terms of water contamination deriving from mapped hazardous operation facilities:
  - Abaco Islands: https://maps.mapaction.org/dataset/bhs-2019-09-ma083-v2
  - Grand Bahama Island: https://maps.mapaction.org/event/bhs-2019-09
- Map showing the flood trace around Equinor's oil storage facility: https://emergency.copernicus.eu/mapping/ems-product-component/EMSR385_AOI12_GRA_PRODUCT_r1_RTP01/3

4. Structure of the report

The report comprises three chapters to cover the work completed during the mission. This introductory chapter provides a summary of the overall activities and outputs of the mission. It is followed by two chapters outlining the support provided in Abaco and Grand Bahama respectively.

As such, the report can be appreciated in full as an overall compilation of findings and recommendations from the mission at the national scale, of which the individual chapters on Abaco and Grand Bahama form a core component.

The individual chapters on Abaco and Grand Bahama, however, can also be read as standalone reports offering insights into the work done in the corresponding geographic area only.

References

Rapid assessment of hazardous material risks

- Flash Environmental Assessment Tool (FEAT): https://www.eecentre.org/resources/feat/. The FEAT helps to identify existing or potential acute environmental impacts that pose risks for humans, human life-support functions and ecosystems, following sudden-onset natural disasters. FEAT focuses primarily on immediate and acute impacts arising from released hazardous chemicals.
- E-learning module on the FEAT: https://www.eecentre.org/training/

Disaster waste management

- Disaster Waste Management Guidelines: https://www.eecentre.org/resources/dwm/
- E-learning module on the Disaster Waste Management Guidelines: https://www.eecentre.org/training/
- Guidance materials on asbestos management in emergency situations:
    - Case study after Cyclone Idai in Mozambique: https://ehaconnect.org/?s=asbestos
    - Asbestos in Emergencies, Brief Guide: https://postconflict.unep.ch/humanitarianaction/documents/02_05-08.pdf
    - Asbestos clean-up practices post-earthquake: https://www.who.int/hac/crises/chn/asbestos/en/
    - WHO page on asbestos: https://www.who.int/ipcs/assessment/public_health/asbestos/en/
    - CDC fact sheet on asbestos: https://www.cdc.gov/niosh/topics/asbestos/

Other useful links

Environmental Emergencies Centre, www.eecentre.org

Environment and Humanitarian Action Connect, www.ehaconnect.org