Environmental Expert Support Mission

United Nations Disaster Assessment and Coordination

Water contamination

Technical Report

Hurricane Matthew, Haiti – October 2016

UNEP

Joint UNEP/OCHA Environment Unit
Prepare. Respond. Protect.

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EUROPEAN COMMISSION
Humanitarian Aid and Civil Protection

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Cover photo: Nathan, Haiti ©Eva Andersson (EUCP/UNDAC)

The Joint UNEP/OCHA Environment Unit (JEU) assists Member States in preparing for and responding to environmental emergencies by coordinating international efforts and mobilizing partners to aid affected countries requesting assistance. By pairing the environmental expertise of the United Nations Environment Programme (UNEP) and the humanitarian response network coordinated by the United Nations Office for the Coordination of Humanitarian Affairs (OCHA), the JEU ensures an integrated approach in responding to environmental emergencies. The Environmental Emergencies Centre (EEC) (www.eecentre.org) is an online tool designed to build the capacity of national responders to environmental emergencies developed by the JEU.

The Union Civil Protection Mechanism (UCPM) facilitates co-operation in disaster response, preparedness, and prevention among 32 European states (EU-28 and the Former Yugoslav Republic of Macedonia, Iceland, Liechtenstein and Norway). With the support of the European Commission, Participating States pool resources and experts that can be made available to disaster-stricken countries all over the world as well as for prevention and preparedness operations. When activated, the Mechanism coordinates the provision of assistance from its Participating states. The European Commission manages the Mechanism through the Emergency Response Coordination Centre (ERCC). Operating 24/7, the ERCC monitors risks and emergencies around the world and serves as an information and coordination hub during emergencies. Among other tasks, the ERCC also ensures that Participating States are fully aware of the situation on-site and can make informed decisions for providing financial and in-kind assistance. Since its creation in 2001, the Union Civil Protection Mechanism has been activated more than 180 times for disasters in Member States and worldwide, including recent activations in response to Typhoon Haiyan in the Philippines, forest fires in southern Europe and Syrian refugee crisis in neighbouring countries. For more information, please refer to the ECHO website and/or ERCC Portal. The Union Civil Protection mechanism closely cooperates with the United Nations and it participated in several joint missions.

1. Context

Hurricane Matthew struck southwestern Haiti on October 3rd, 2016, leaving widespread damages in the nation. This hurricane was reportedly the strongest to hit the nation since 1964. In addition to causing a high number of casualties, the environmental impacts were disastrous, as the hurricane wrecked a number of infrastructure facilities all over the Tiburon peninsula.

An associate environmental expert deployed as part of the UN Disaster Assessment and Coordination (UNDAC) team, mobilized at the request of the Joint UNEP/OCHA Environment Unit through the (European) Union Civil Protection Mechanism (UCPM). The associate environmental expert, Ms. Eva Andersson of Sweden, was deployed from 15th to 24nd October. The expert worked in close collaboration with the UNEP office in Port Salut, mainly with waste and water expert Mr. Francis Dube. Together the two experts conducted environmental emergency assessment with a focus on water contamination. All activities were undertaken in close coordination with the UNDAC team and the WASH cluster. The two experts were based in Port-Salut and visited several locations affected by the hurricane, including Roche-a Bateau, Carrefour-Joute, Chardonniere, Les Coteaux, and Saint Jean du Syd. All documents and findings were shared with the UNDAC team, UNEP and the National Directorate of Drinking Water and Sanitation (Direction Nationale de l'Eau Potable et de l'Assannissement – DINEPA) during and at the end of the mission. Documents and findings were also handed over to the European Union Civil Protection (EUCP) team in Port au Prince.

As part of their assessments the experts visited several water catchments and water systems, as shown in Picture 1, in order to understand and verify the damages. Subsequently, they sampled water in almost all of the visited localities to find out if there was water contamination, which would impact people's health.

Picture 1. Water catchment area, Port-Salut, Haiti @Eva Andersson

2. Mission outcomes

The two longest and most detailed assessments took place at the Cascade catchment in Port-Salut, on October 16th, and at the Rosier catchment in Roche-a-Bateau, on October 17th.

The findings regarding the first water system exposed that, despite the hurricane passage, the structure was still intact. However, Picture 2 shows that the pipes linked to the water system were buried under the vegetation that dropped and accumulated during the storm. Because of this, it was difficult to assess if the water was coming from under the debris. Moreover, as the exposed pipes were in risk of degradation the water, leaking from the damaged pipes, could easily be contaminated.

Picture 2. Broken pipes after Hurricane Matthew, Cascade, Port-Salut, Haiti @Eva Andersson

The second basin analysis showed that the flow of water was interrupted in six out of eight water fountains linked to the catchment, while the water flow had decreased in two fountains near the catchment. Conducted examinations showed that the catchment was filled up with silt and supposedly the conveyance pipe was obstructed (Picture 3), limiting the flow and the pressure of the water. However, the catchment was in good condition as the three access hatches were locked. Interviews with local representatives revealed that the community wants to develop a project to rearrange a reservoir and increase the pressure and the redistribution of water.

Picture 3. Broken and obstructed pipes at the Rosier water catchment, Roche-a-Bateau, Haiti @Eva Andersson

The assessments in the Chardonniere area took place on October 18th. These showed no particular damage to the water systems and no worrying water contamination, despite the passage of the storm. The organization ACTED had developed a program to provide chlorine tablets and to build a water treatment system in the Labei area. In this area water samples showed the level of e-coli to be 20 with too many coliforms to count.

The assessment at Carrefour-Joute, on October 19th, showed that three out of five pre-hurricance water collecting places were working. The organization Water Mission worked together with the mission experts to test the water. Subsequently it was decided to install a water treatment system and to also train a person to follow up the project. The water sampling showed no e-coli and the level of coliforms was found to be 65.

The most concerning results were found in the area of Nathan, Roche-a-Bateau, where the water system was completely broken because of Hurricane Matthew, as shown in Picture 4. Water sampling in this area showed the level of e-coli being superior to 100 as well as the level of coliforms. Similar levels were registered in Port-a-Piment, where only two out of six pumps were working. In Saint Jean du Syd, the water system was not working at all due to fallen trees blocking the source. For this reason, the experts were unable to sample water in that area.

Picture 4. Broken water system following Hurricane Matthew, Nathan, Haiti @Eva Andersson

3. Recommendations

Based on the site visits and analysis, the experts developed recommendations which are similar for each of the visited sites. The mission concludes that water must be boiled and chlorinated before being consumed. The population must be informed on the risk of contaminated water in the catchments. Moreover, debris around the catchments should be immediately removed. The damaged pipes can then be repaired, limiting the risk of contaminated water to the population.

In the silt filled catchment in Rosier, it is recommended to remove silt from the inside of the basin and the pipes as soon as possible.

Even if the water systems are restored pre-Matthew conditions the issue of safe and clean drinking water is unlikely to be solved. This is due to a lack of water treatment systems. Water analysis show presence of bacteria and e-coli in most places. The question of how communities plan to protect their water sources also needs to be considered – for example, where do people build houses. In the future, a geohydrological study would be useful in order to better understand the natural water system and for steps to be taken to better protect the water resources.

All water sources tested positive for coliform bacteria. Almost every water source tested positive for e-coli. Most urgent recommendations in the latter cases are to inform the people to boil the water or use chlorination tablets before drinking.

Annex I – XIII: Detailed site visit assessments

Annex XIV – Assessment Table

Municipality/ Community	Source	Date of visit	Source affected by Matthew	Number of families/people source is serving	Short term actions	Long term actions	Identified actors (NGO etc)	Field observations	Water test (100 ml) E-coli	Coliforms
St Jean du Syd		19/10/2016	Source is not functioning. Trees are blocking the source. The generator for the pump can not be installed because of fallen trees.	300 families	Removing the trees to install the pump.	None	Mission du Haiti	Before Matthew the source was working. The committee was selling water from the source in kiosks. The money is used to manage the water system (pump, generator). Some families have own sources and organisations are distributing water to the village. No water test because not possible to reach the source 2016/10/19.	-	-
Port Salut	Cascade, Truillac	16/10/2016	System not functioning, the pipes are broken.	20.000 people	Partial. Bomberos has installed a small bladder outside a house.	Padi is going to repair the system. Funding from Norway.	Padi, Bomberos	The people are gathering water from the broken pipes probably assuming that it is clean water which is not the case. There are two parallell system. One older with galvanized pipe and one more recent with PVC pipe. The pipes are to a certain extent above ground exposed to the elements, people and animals. If there is a landslide in the slope the pipes will disappear with the landslide. Se assessment report Cascade, Trouillac.	2	tmtc (too much to count)
Port Salut	Carpentier	No visit	System is broken	40.000 people	Switzerland is installing a bladder at 18.12933, 073.94667	The system is being repaired	Switzerland humanitarian aid	Switzerland is installing a bladder at 18.12933, 073.94667.Switzerland has taken water sample.	>100	>100

Port Salut	Macabee/ Mancion	20/10/2016	Source is functioning	1 500 people	None	None	None	The source is frequently used even before Matthew.	0	26
Port Salut	Favette	No visit	Solar panel for the pump is broken					Switzerland has visited Favette. Solar panel for the pump is broken. Could easily be restored.		
Roche a Bateau	La Source/Becillon	17/10/2016	The source is functioning	400 families	Bladder will be installed by Switzerland	None	Switzerland humanitarian aid	The source is protected to some extent. It is surrounded by a concrete fundament but the hatch on top of the fundament is not locked. There seem to be a good flow of water from the source. Se assessment report.	>100ctu	tmtc
Roche a Bateau	Bambo	No visit possible 2016/10/17	Source was not working before Matthew.	600 families	None	None	None	The source Bambo is 25 kilometers from La Source/Becillon. Not possible to go there 2016/10/17	-	-
Roche a Bateau	Rosier, Captage	17/10/2016	The pressure is low after Matthew and are now serving only two fontains instead of eight.	300 families	None	None	Terre les Hommes	The captage is full with sediment. No one has opened the source after Matthew. The source is protected with concrete and the hatches has locks. According to information from TEPAC the pipes are only 4 inches. The community want to install a water tower to increase the water pressure. Se assessment report Rosier Captage.	9	90
	Rosier, first fountain after Rosier source	17/10/2016	There is much lower water pressure after Matthew.	Se above	Se above	Se above	Se above	Se above	18	80

Roche a Bateau	Nathan	22/10/2016	Source is not functioning.	150 families	None	None	None	The road to Nathan is destroyed after Matthew. The water system is broken after Matthew. After walking for 1,5 hour the reservoir was reached. People are going to the reservoir to collect water from a broken pipe from the source. The source was not visited. It was unclear how far away the source is situated from the reservoir. The water from the source cannot reach the reservoir and the water system because the pipes are broken. The flow from the broken pipe leading to the source is low which could indicate that the system is blocked for example by sediment. There is a woman in Nathan, former vice mayor in Roche a Bateau, who could be a possible contact in the work of restoring the water system	>100	>100
Roche a Bateau	Balanyen	No visit	Source is not functioning.	150 families	None	None	None	-	-	-
Les Coteaux	Cocmal	18/10/2016	Source is not functioning.	5000 people	Yes. Water is being delivered every second day by different organisations.	Part of the water system is being restored by Red Cross Netherlands.	Switzerland humanitarian aid, Terre les hommes, Red Cross Netherlands	NGO's are delivering water every two days. Switzerland humanitarian aid and Terre les hommes have been to Les Coteaux. Red Cross Netherlands is planning to rebuild part of the water system. Are osmosis being installed? Training of people to run the treatment system?	-	-
Les Coteaux	Guichard	18/10/2016	Source is functioning	2300 people			Switzerland humanitarian aid	Red Cross have done evaluation but decided not to take action because the problems are too big. Switzerland has taken water sample.	-	-
Les Coteaux	Tiniko, Private source, used to sell water before Matthew.	18/10/2016	Source is not functioning.	-	None	None	None	Some kind of water treatment system. Private source that sold water to the village before Matthew. Now it is saltwater in the source.	0	5
Port a Piment	Tete Source	No visit	The main system was not working before Matthew	800 people	None	None	None	No organisations are working with the main system of Port a Piment.	-	-

Port a Piment	Figuier	18/10/2016	Source is functioning	800 people				Switzerland has taken water samples.	66	>100
Chardonniere	Labei	18/10/2016	Source is functioning	Chardonniere the whole system is serving 3 500 people	ACTED has staff at the source between 6 am to 6 pm to put chloride tablets in peoples containers when they collect water.	ACTED is building a water treatment system.	ACTED, many organisations	Water source (pump) is open 24 hours. ACTED chlorinates the water between 6 am to 6 pm.	20	tmtc
Chardonniere	Bousquette	18/10/2016	Source is functioning	Chardonniere the whole system is serving 3 500 people	ACTED has staff at the source between 6 am to 6 pm to put chloride tablets in peoples containers when they collect water.		ACTED, many organisations	Water source (pump) is open 24 hours. ACTED chlorinates the water between 6 am to 6 pm.	0	1
Chardonniere	Hilaire	18/10/2016	Source is functioning	Chardonniere the whole system is serving 3 500 people	None	None	None	Water source is not affected by Matthew. They have some problems but the source is ok. It is the only source in the village.	0	8
	=Information missing									

Random sampling										
Torbeck		19/10/2016	System is not working but the source is working.	400 families	None	None	None	There is a water tower at the source. Nothing has been done with the system for 20 years. System was built in 1986.	3	22
Carrefour-Joute		19/10/2016	Only three out of five water collecting points are working.	100 families	None	Partial. Water mission has installed water treatment system with filter and chlorination. A local person is trained how to handle the system.	Water mission	Water sampling was done at a water collecting point with no chlorination.	0	65
Moreau	Moreau/Labiche	20/10/2016	The system is functioning	12.000 people				The source is well protected and it was locked during the visit. A water sample was instead taken inside the nearest house from the source. A sample was also taken from the first water collecting point after the source.		
Moreau	Moreau/	21/10/2016	Se above	Se above				Sample from the first water collecting point after the source Moreau/Labiche	28	tmtc