

HAITI: Re-Establishment of Warning Services After the January 2010 Earthquake



Aftermath of the January 2010 earthquake in Haiti. Photo by World Food Programme

This case study:

- Corresponds well to the WMO 8-Step Capacity Development Model
- Highlights the role of WMO as facilitator and coordinator in the activities of restoring early warning services to Haiti after the earthquake of January 2010
- Includes efforts to make implemented capacities sustainable
- Highlights achievements in international and regional cooperation
- Shows how the Haiti DRR priorities are embedded in RA-IV and WMO priorities
- Highlights the critical issue of national commitment and ownership for long-term sustainability of the CNM and SNRE in Haiti.



Haiti January 2010 earthquake devastation

Background

The WMO 16th Congress recommended that the successes achieved by the coalition of Members that re-established warning services in Haiti in time for the 2010 hurricane season, be analyzed as a case study for the development of the WMO Capacity Development Strategy (CDS).

The devastation caused by the January 2010 earthquake aggravated the existing vulnerability of Haiti to natural hazards. In addition to earthquakes, the country experiences recurrent hydro-meteorological hazards such as hurricanes, floods, landslides and drought that impacts significantly on lives, livelihoods of the population and the economy of the country. The already fragile infrastructure of the Haiti National Meteorological Service (CNM) and the National Water Resources Service (SNRE) were severely impacted by the January 2010 earthquake. The loss was total and included office facilities, equipment and one person from the staff.

WMO's response to Haiti was immediate with support from a coalition of WMO Members (Canada, Cuba, Dominican Republic, France Japan, United Kingdom, United States of America) and proved to be a success story in international cooperation. WMO's immediate objective was to restore warning services in time for the anticipated hurricane season just a few months away. Below is a tropical storm warning/alert and tracking of Hurricane Irene posing serious threat to Haiti:



Tropical Storm gathering strength to Hurricane Irene with projected path to threaten all the Greater Antilles, Haiti, Dominican Republic, Cuba and Puerto Rico. Warning by the National Meteorological Center at Port-au-Prince in Haiti. August 21, 2011

This case study examines the activities taken to restore warning services in Haiti and determines the sustainability of the CNM and SNRE by mapping activities to the WMO 8-Step CDS Model.

Activities

STEP 1 - Requirements for the restoration of warning services to Haiti were clearly defined by the WMO mission in collaboration with the Haitian government and in compliance with WMO Technical Regulations

WMO led the first assessment mission to Haiti between 4 and 10 April 2010. The main purpose of the mission was to diagnose the present situation of the hydrological and meteorological services in Haiti, in particular regarding the generation and dissemination of warning advisories to national, international organizations and the Haiti public to enable preventive measures associated with hydro-meteorological hazards and mitigate their effects on property and lives.

The following are capacity requirements for the provision of basic hydro-meteorological services:

- Well maintained and operational national observatories.
- Systematic taking of national observations from national observatories and transmittal to a central collecting platform (NMC).
- WMO GTS connectivity for real time hydrometeorological data from other services.
- Sufficient information (data coverage) for systematic processing and forecast product generation.
- Timely dissemination of products to users.
- Infrastructure and skills for receiving and interpreting critical warning advisories of extreme weather/climate events with lead time for preparedness.
- Skilled personnel to undertake operational tasks.

Prior to the earthquake, Haiti's CNM and SNRE capabilities to provide effective meteorological and hydrological services were severely inadequate as outlined below:

- Lack of adequate government support (political and financial) to the effective functioning of Haiti's National Meteorological Service.
- Inadequate operational staff at the CNM located at Port-au-Prince airport, operating with 22 staff members most of whom were observers, and only two were weather forecasters to cover daily operations.
- Inability to produce and issue local forecasts with no connectivity to the WMO GTS and hence no incoming real-time meteorological data for operations.
- Lack of operational equipment in terms of computers and specialized tools severely limiting CNM's ability to produce forecasts beyond 24 hours.
- Lack of reliable telecommunications and informatics and inability to disseminate data and products to users.

STEP 2 - Haiti's CNM and SNRE capabilities were evaluated by the WMO Assessment Mission Team against the requirements for the provision of warning services and a baseline was established in the four areas of capacity: Human resources, institutional, infrastructure, and procedural for the provision of meteorological early warning services.

Capacity was lacking in all four areas: human Resources, Institutional, infrastructure and procedural. Even more serious was the disconnect of the CNM and SNRE with the Haitian Government exposing the lack of national ownership and commitment critical for the sustainable and mandates of the CNM and SNRE. The earthquake wiped out everything. For the immediate response to the situation, the WMO mission recommended urgent short-term solutions to restore warning services in time for the upcoming 2010 hurricane season outlined in the table below:

<u>Governance</u>	
1.	Prepare a strategic plan that would position the CNM and SNRE in the administration of the Haiti government
2.	Strengthen cooperation between the two services and get the present (or future) supervisory authority to draw up clear, logical and effective documents on the missions, task-sharing and responsibilities of each body, based on a quality-management type approach. In other words, set up institutional arrangements and legal framework for the mandates of CNM and SNRE.
3.	The CNM and SNRE must participate in all projects affecting their respective missions.
<u>Infrastructure</u>	
1.	Urgent arrangement of premises for CNM and SNRE

2.	Rapid installation of an internet connection from the temporary offices.
3.	Liaisons with the French Embassy to monitor the political, logistical and financial feasibility of the project to equip the operational centre of the Ministry of the Interior.
4.	Provide official vehicle for the CNM
<u>Human Resources</u>	
1.	A training programme should be conducted in the first instance for the minimum human resources needed for a national meteorology service capable of ensuring the safety of persons and property.
2.	Two forecasters to attend the Workshop organized by WMO and RSMC Miami on cyclone forecasting in French.
3.	equip the Haiti service with a basic synoptic network of automatic weather stations.
4.	Information should start to be transmitted to the CNM as soon as possible
<u>Tech/ Observations</u>	
	The commencement of work in the short term on the sharing of the tasks and missions of each CNM and SNRE body, especially as regards the policy for observed data, their storage, database management, needs for studies, archive retrieval, etc. For the SNRE, launch of the national inventory of measurement networks to recreate reliable hydroclimatology, hydrogeology (national inventory of water points) and agrometeorology databases
Tech / Forecasting	
1.	The setting-up of a dedicated extranet in Haiti for forecasters' expertise, decided at the Region IV Hurricane Committee, should go ahead and be improved as new information arrives.
2.	Develop a Flash Flood Guidance System applicable for Haiti..
3.	Arrange for a very short and simple training course of 2 or 3 days so that forecasters, and any observers present, can make use of this tool and the data it contains.
4.	Set up a backup forecasting team to be based in Martinique between 1 June and the end of November.
Tech /Production	
	Ensure that the CNM have a system that can produce graphics and text, semi-automated where possible. It would also be useful for the system to be able to interface with the expertise tool and the tool be connected to all possible dissemination systems especially e-mail, ftp file transfer.
Dissemination Communication	
	Complete the CNM public website, under construction in Canada,.

There was a need to restore services that required training for its professional staff, upgrading communications facilities for the reception of real-time observations and modeling products, computer workstations and many other upgrade activities, which, together, would amount to an integrated programme for modernization of the Service.

STEP 3: Identification and evaluation of deficiencies from STEP 2 in terms of capabilities of CNM and SNRE to meet requirements and a baseline was established.

Activities carried out by the mission were coordinated with the PR of Haiti and also head of SNRE and Director of CNM, who arranged meetings with different national agencies and ministries and participated with the team in various meetings. The mission evaluated institutional and operational capacities, identified gaps and needs of CNM and SNRE with respect to the provision of hydro-meteorological services to support disaster risk reduction and early warning systems as well as sectoral needs not only for the short-term 2010 hurricane season, but also for the medium- and long-term reconstruction plan of the country.

Consideration was given to the gaps in medium- and long-term capabilities as well. The following gaps were identified covering infrastructure, personnel, institutional mandates and procedures for the CNM and SNRE as a result of the WMO Assessment Mission:

- No physical premises even temporary ones to house the CNM and SNRE
- Very limited observing systems and IT infrastructure
- Neither CNM nor SNRE had a budget in the last three years
 - Their respective mandates are not clearly defined (Haiti government did not seem able to demonstrate any responsibility for both SNRE and CNM.) questioning their sustainability
- No 24/7 shifts due to staff limitations
 - Demoralized ageing staff in the SNRE which covers climatology, hydrology, hydro-climatology and hydro-geology.
- Limited products and service delivery of forecasts was very limited

STEP 4 – A strategic plan to address identified gaps was developed for the short-term. However, there is some evidence of a strategic plan (NAPA) that proposes to address the strengthening of meteorological observatories that will boost early warning capabilities at the national level prior to the 2010 earthquake.

The Assessment team performed an exhaustive gap analysis and outcomes were input to the development of a strategic plan to close the gaps and ensure the capacities of CNM and SNRE were strengthened to meet the service requirements for 2010-2011.

¹A project proposal by FAO entitled: *Haiti: Strengthening Climate Resilience and Reducing Disaster Risk in Agriculture to Improve Food Security in Haiti Post Earthquake*, for funding under the Least Developed Countries Fund (LDCF) has been listed as a national priority from the submitted NAPA in 2006 prior to the earthquake. Although the project emphasizes on accruing resilience to climate variability and change in the agriculture and food security sectors, there is no mention of building capacities of the CNM and SNRE and strengthening climate early warning systems which would be central in building resilience to climate variability and change. Another project by UNDP for LDCF by the GEF in 2008 titled: *Strengthening adaptive capacities to address climate change threats on sustainable development strategies for coastal communities in Haiti*, has incorporated the enhancement of capacity for the national environmental observatories of Haiti including meteorological observatories. The project will build on and complement activities of a previous project.

The assessment revealed a critical need to build an effective National Meteorological and Hydrological Service to support a multi-hazard early warning system, disaster risk management and socio-economic development in Haiti. Furthermore, with increasing risks associated with climate change, development of

¹ GEF Projects for Haiti. http://www.thegef.org/gef/gef_country_prg/HT

these services are critical to support medium- and long-term planning in sectors such as agriculture, water resource management, health, tourism, infrastructure and the environment.

STEP 5: National ownership process was initiated but stalled awaiting the creation of a new government. The mission which involved the participation of Haitian Government authorities facilitated national ownership for the short-term. However, national ownership for the long-term remains elusive

In addition, the visibility of the CNM and SNRE services to the government was significantly raised following the earthquake. The mission also highlighted the economic contribution of their services to Haiti. A national budget was not established, however, the mission offered suggested mandates and estimated a national budget for service operations. Still necessary but as yet unclear was the commitment by the Haitian Government, a critical CDS element for long-term sustainability of the CNM and SNRE.

Institutional issues were identified by the Assessment Mission as one of the most serious issues which were a threat for the long-term sustainability of the CNM and SNRE. The CNM and SNRE were not firmly established in the national administration of the Haiti Government and there had been no budget allocation for the last three years. This is not conducive to long-term capacity development. Haiti's lack of the necessary enabling policy, legal and institutional frameworks remains a barrier in achieving capacity development goals.

STEP 6: Resources were mobilized mostly from external sources to meet the identified needs of CNM and SNRE.

To mobilize resources to meet the identified needs of CNM and SNRE, WMO participated in the 2 June 2010 'World Summit for the Future of Haiti' hosted by the Dominican Republic as a follow-up to the New York event and discussed the CNM and SNRE needs with donors, assistance agencies and members of the Interim Commission established to manage the trust fund set up as a result of the pledging event on March 31, 2010, held in New York with UN Secretary-General Ban Ki-moon and the UN Special Envoy for Haiti (Former President Clinton). In the event, about USD 10 billion were pledged and subsequently a multi-donor trust fund called "the Haiti Reconstruction Fund (HRF)" was established. However, funding for CNM through this mechanism has not materialized due to delays pending the election and installation of a new government in 2010-2011. Cooperation with other UN agencies and with national aid agencies was also stalled. There was a growing urgency for the installation of a new government to enable implementation of stalled plans.

WMO Members' contributions: To meet urgent needs for assistance in Haiti, a number of Members as part of a Region IV Haiti Task Team including Canada, Cuba, Dominican Republic, France, UK, and USA, offered and subsequently provided, assistance as summarized below in Table 1. Coordinated WMO Member contributions and the RA IV Task Team to date totaled over 700,000 USD. In addition, WMO received specific offers of assistance from equipment manufacturers and Canada was in the process of seeking funding for longer-term assistance.



The National Meteorological Center (CNM) office of Haiti (Left) consists of two shipping containers behind the civil aviation office, a few kilometres down the road from the airport. Inside (right) are unopened boxes containing automatic weather station equipment sent by Environment Canada after the earthquake. Pictures by WMO MeteoWorld News Letter, June 2011.

Summary of Members' Contributions		
<i>Purpose of the contribution</i>	<i>Amount (USD)</i>	<i>Source/Donor</i>
Interim operations facilities for CNM staff and telecommunications (EMWIN system, and Internet and GTS connections)	60,000	Martinique France, USA
Computer equipment	20,000	Canada
Observing network (7 synoptic stations)	215,000	WMO VCP
Development of Extranet and meteorological products	45,000	Météo-France
Development of public Website	35,000	Canada
Team of forecasters based in Martinique	110,000	Canada, France and WMO
Radar data		Cuba
Site survey and Installation of AWS	25,000	WMO, Dominican Republic
Flash Flood Guidance products	90,000	USA, France
11-month Fellowship for 5 CNM staff	100,000	WMO

STEP 7: A Capacity Development Response was implemented to address the short-term requirements, with oversight established through an identified lead for each element as outlined in the WMO-coordinated activities with stakeholders shown below:

The immediate implementation of the plan provided the following items:

Infrastructure

- Installation of a satellite ground station linking Haiti to WMO's GTS and participation in exchange of real-time meteorological data and products.
- Link to the Emergency Managers Weather Information Network
- Enhanced network of observatories through the installation of 7 automatic weather stations improving data coverage and increasing accuracy and reliability of forecasts.

- Meteo-France operated Extranet providing specialized numerical model-based products as well as map-based Flash Flood guidance to improve the accuracy and lead times of forecasts and warnings.
- The U.S. National Hurricane Center in Miami warning advisories could be received in Haiti in a timely manner as a result of the installation of the satellite ground station.
- Pre-paid Internet access for three years as well as the set up of the public website www.meteo-haiti.gov.ht courtesy of Canada and Meteo-France.



(Left): The Météo France forecast office in Martinique. (Right): Forecaster from the Meteorological Service of Canada at the Haiti forecast desk. Pictures by WMO MeteoWorld News Letter, June 2011

Human Resources

- Establishment of a “Visiting Forecaster Program” with 6 skilled meteorological personnel to augment forecasting staff at the Haiti NMC from WMO Members: Canada, UK Met Office, Meteo-France, during the hurricane season. One forecaster from the UK Met Office has remained in Martinique dedicated in supporting forecasting and warnings for Haiti.
- Hands-on training for Haiti forecasters for the operation of the Flash Flood Guidance System was provided by the U.S. NOAA/NWS, the Hydrology Research Center, and Meteo-France.
- Provision of WMO fellowships with funding support from Meteo-France to train five Haitian forecasters for one year in Toulouse France.

Institutional and Procedural

- There exists an inter-agency body for coordination of DRR within the Haitian Government which initiated procedures and clarified the roles of various agencies. The Director for CNM participated in this group identified prior to the earthquake. These procedures, however are extra-organizational. Needs still remain for more extensive procedures within the government and the agencies responsible for a sustained and coordinated response to disasters and maintenance of the systems on which the coordination depends, including CNM.
- Safe and secure office facilities with power, computing equipment, and telecommunications for their daily operations;
- A surface observational network for real-time meteorological data;
- Telecommunications for collecting real-time data, accessing forecasting guidance, and disseminating forecasts and urgent warnings;
- Specialized forecasting tools and products to support weather and flash flood guidance;
- Forecasting expertise to train and help Haitian forecasters to use forecasting tools including flash flood guidance products;
- Improved dissemination of forecasts and warnings to communities and to numerous humanitarian relief organizations in Haiti;
- Organization of at least one year training for 4 or 5 observers to become forecasters before the next hurricane season.

Partnerships were formed with relevant international organizations for shared resources as shown below. With support from the WMO Secretariat, the team established connection with key UN and other

international and development agencies working in Haiti to explore opportunities for improved coordination for the provision of support to the country.

<u>Activity</u>	<u>Lead Oversight</u>
1. Establishment of HQ of CNM and SNRE a. Two temporary buildings donated by private entity in Martique b. Internet access under CAN contract for three hurricane seasons c. Furniture (USAID), computers and office support systems (Canada)	UNDP coordinating USAID Canada
2. Strengthening observations network, forecasting/warning capabilities a. Installation of VSAT for GTS link and EMWIN installation b. Installation of 7 AWS and cellular data transmission by CAN contract c. Specialized numerical model-based products & Flash Flood Guidance d. Visiting Forecaster program providing skilled staff for 24/7 operations	USA Meteo-France, USA UK, Canada, France
3. Strengthening of Telecommunications & dissemination of products a. Set up of public website www.meteo-haiti.gov.ht b. Emails from CNM & Martinique to over 200 addresses c. Short Messages System (SMS) & Weather Radio System at CNM d. Exploring opportunities to include the Radio and Internet (RANET)	Canada hosting Meteo-France USA.



Haitian children line up for aid provisions at a refugee camp in Port-au-Prince. Photo by ABC News USA

STEP 8 - An effort was made to have an M&E plan in place to evaluate the short-term operational capacities installed to measure progress. There was significant effort to link the process to continuous improvement of the CNM and SNRE to medium-term capacity development plans.

Operational Capacities and Medium-Term Development of the CNM and SNRE

During this period there were efforts made to ensure that short-term operational capacities which have been developed for the 2010 rainy and hurricane season are evaluated, adjusted and maintained, and further secured into the future, as well as linked with the beginning of the implementation of the medium-term capacity development activities.

The team that carried out the assessment mission to Haiti (April 2010) developed a project proposal to address medium-term capacity development needs with an estimated cost of US \$9,704,600. The overall objective of the project is to put in place an operational environment adapted institutionally and logistically to CNM and SNRE.

WMO worked with the UNDP-BCPR and the Haiti UN country team as well as the World Bank to determine protocols and procedures for submissions of proposals for medium term-reconstruction of CNM and SNRE.

The Way Forward for the sustainability of Capacity Developed at the CNM and SNRE

1. Capacity development efforts for long-term sustainable systems including training and long-term educational opportunities are needed. Efforts should begin now to increase qualified staff, provide more permanent facilities, and to establish a modern sustainable observing system including, for example, radar technology.
2. Leveraging techniques will be useful. If properly identified and managed, cooperation using systems from various sources will be helpful, but lack of coordination will further confuse what is now an already fractured network and limit the usefulness of any observing system.
3. Even more urgent and imperative is for concerted efforts to secure national ownership and institutional positioning of the CNM and SNRE within the Administration of the Haitian government for sustainability. They both will require the following:
 - Stable institutional positioning within the government of Haiti and reflection of the role and mandates of CNM and SNRE within the national planning and legislative and legal frameworks;
 - National partnerships across CNM and SNRE and with other ministries and institutions;
 - Regular national budget and resources;
 - A clear plan for the development of human and operational capacities;
 - A strong government support with a clear legal mandate for the roles of CNM and SNRE in the rebuilding of operational capacities for weather, water and climate services.

Haiti's solution for this structural concern should consider the needs of all users, should be addressed at high-levels of government, and should be included in national development plans.



Haiti's National Palace before and after the earthquake

4. Development and sustainability for CNM and SNRE also depend on opportunities for leveraging resources, know-how, data exchange and forecasting capacities through a regional cooperation framework. A Caribbean regional cooperation programme in MH \square EWS with national development components is being developed under the crosscutting framework of DRR Programme, engaging NMHSs, Disaster Risk Management agencies, RA IV, regional centres, agencies and coordination mechanisms, WMO Technical Programmes and Commissions, international partners and funding agencies. Opportunities should be identified and developed for the sustainability of CNM and SNRE.