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# THE IMPACTS OF THE HAITI 2010 EARTHQUAKE ON WATER AND SANITATION IN PORT-AU- PRINCE: A CASE STUDY

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Author: Pierre Charles Denis



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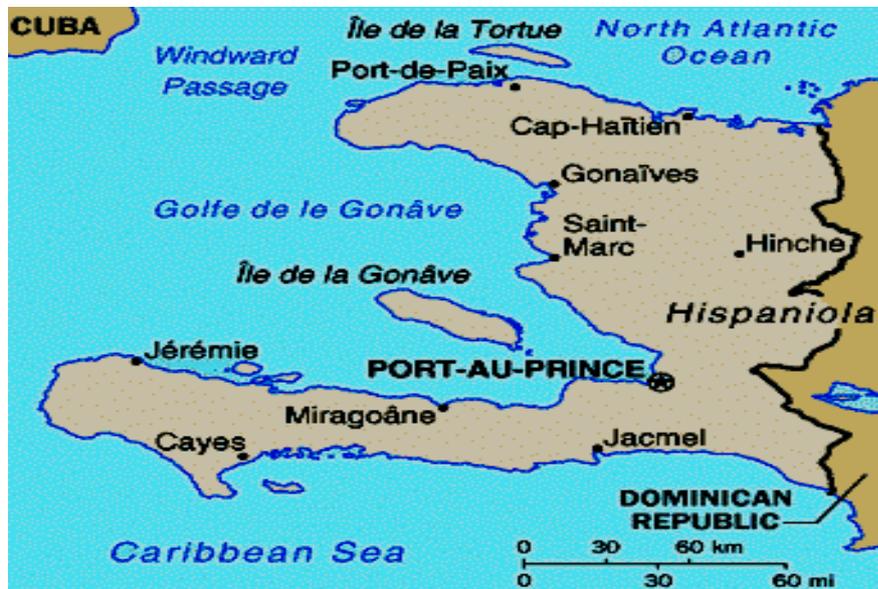
## Abbreviations

DINEPA	Haitian Water and Sanitation National Directorate
IDB	Inter-American Development Bank
MSPP	Haitian Ministry of Public Health and Population
NGOs	Non-governmental Organizations
PAHO	Pan American Health Organization
SMCRS	Haitian Department of Solid Waste Management
SWANA	Solid Waste Association of North America
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNICEF	United Nations Children's Fund
USGS	United States Geological Survey
WASH	Water, Sanitation and Hygiene
WHO	World Health Organization

## 1. Introduction

### 1.1 Background

Haiti is located in the Caribbean. It occupies the western part of the island of Hispaniola which it shares with Dominican Republic. It is 27, 750 square km in size and its capital city is Port-au-Prince.



Map of Haiti (howtoenjoy.co.uk)

January 12<sup>th</sup>, 2010 is an indelible day in the memory of all Haitians. It is the day when a 7.0 magnitude earthquake hit a point 15 km southwest of Port-au-Prince (USGS, 2010). In 2010, the total population of the country was 9.8 million with 3.7 million living in the affected areas (UN, 2010). The damages engendered by the earthquake were colossal, both in terms of loss of life and physical destruction. The cataclysm led to more than 230 000 deaths, 300 000 injured and 1 million people left homeless (CHF International, 2010). Both, rural and urban areas were affected by the quake, but the devastation was more severe in Port-au-Prince where the epicenter of the seism was located. Losses were also considerable in nearby cities such as Leogane, Jacmel, and Petit Goâve where more than 40% of the buildings have been annihilated.

Port-au-Prince is situated on the Gulf of Gonâve. Thanks to its position, it serves as a natural harbor and has sustained economic activities since the civilization of the Arawaks. It was covered under France colonial rule in 1749 and has been the biggest city of Haiti since then. Commercial areas are located near the waters, while residential areas are on the hills above. During the second half of the 20<sup>th</sup> century Port-au-Prince has undergone significant urbanization growth which resulted in phenomenal growth of slums in the hillsides above the city. According to recent estimates of the UN, the metropolitan area of Port-au-Prince has a population of 2.7 million inhabitants, almost one third of the country's overall population and a population density of about 15000 per square km. Port-au-Prince has a tropical wet and dry climate and relatively constant temperatures throughout the year. The wet season runs from March through

November and usually leads to hot and humid conditions. The dry season includes the remaining months and leads to warm and humid conditions.

According to Patrick J., (2011) Haiti was not affected by earthquake in almost 200 years. As a consequence there was no guideline to govern what to do in response to an event of such magnitude. This absence of guidance led to a lack of coordination among institutions working in Port-au-Prince to provide water and sanitation services to the earthquake survivors. The national government who would normally be expected to lead the response actions, was also victim of the quake. Important government buildings were ruined and many civil servants died, injured or taking care of their own families. In this context Non-Governmental Organizations (NGOs) and other international institutions literally replaced the government in decision-making process.

## 1.2 Water challenges in Haiti

### 1.2.1 Infrastructure

The construction of drinking water supply and sanitation infrastructure in Haiti before the earthquake favored cheap technologies which can be out of services after only few months. The water and sanitation sector had no consolidation and maintenance programmes, which significantly limited emergency response to the earthquake (government of Haiti, 2010).

According to Richard G. et al., (2013) 89% of the urban population of Haiti has access to improved water sources, but less than one quarter has access to improved sanitation facilities prior to the earthquake. This makes the country one of the most underserved in terms of water and sanitation in the western hemisphere. Richard G. et al., (2013) have also observed a decrease around 9% in water and sanitation services from 1990 to 2008, due to increase in population and lack of infrastructure.

Underlying vulnerabilities that existed in the country before the event such as poor governance, corruption, poor sanitary infrastructure, lack of technical capacities and the constant threat of tropical storms provided the baseline for the earthquake to aggravate the situation of water and sanitation in the country. This significantly contributed to the cholera outbreak that began in October the same year.

Japan was hit by a powerful 9.0 earthquake in 2011 followed by a tsunami and a nuclear meltdown. These events led to 15854 deaths, 26992 injured people and 125000 collapsed buildings (Zaré and Ghaychi Afrouz, 2012). Due to the fact that Japan is a well-organized country with solid infrastructure and effective disaster management programmes, its population suffered less than the Haitian population did in 2010. Haiti is very vulnerable to natural disasters, therefore, unpreparedness was more responsible for the problems than the occurrence of the event itself.

Port-au-Prince was the most affected area by the 2010 monster earthquake. The number of structures destroyed or seriously damaged was astronomic. The most

important administrative and commercial buildings were destroyed and the largest public hospitals were seriously affected. The seaport and airport of the city were partly collapsed, therefore they limited the shipment of international aid.

### 1.2.2 Management

Water and Sanitation were already being poorly managed before the catastrophe. A proper sewage collection and treatment system was quasi-inexistent, solid waste collection and disposal were chaotic. Moreover, deforestation - cause of soil erosion which ruins fertile land and pollutes water sources - and rapid and uncontrolled urbanization exacerbated those problems.

The construction management system in Haiti is very poor, there is no proper application of building code, no insurance of any kind. This situation led to rapid growth of slums in the vicinity of Port-au-Prince. Many of those slums along with thousands of dirty and anarchistic constructions were completely ruined leading to high level of debris in water bodies. Deforestation and erosion have already created the baseline for landslides and floods. As Haiti is a rain-filled country, the earthquake increased the risk of those hydro-meteorological hazards and worsened the condition of sanitation and drinking water supply within the country, consequently, water-borne diseases have drastically increased (Norwegian Peace Building Centre, 2010).

In the area around Port-au-Prince, most fertile lands are often used for slums while hillsides and steep surfaces are used for agriculture, which creates serious water pollution problems. The earthquake exacerbated those problems; clogging of drainage systems, beaches filled with trash, huge amount of floating debris, and stinky water bodies.

## 2. Post-disaster decisions and actions

### 2.1 Water delivery

Providing water and sanitation services was perceived as priority response to the cataclysm by many NGOs who immediately worked with the Water and Sanitation National Directorate (DINEPA) to re-establish water distribution. Many engineering companies have been engaged to repair the water supply network.

To provide water to the earthquake survivors, DINEPA conjointly with some NGOs conducted raw water analysis and monitoring for main chemicals, followed by chlorination. Then, water was delivered to affected communities through water trucks (Humanitarian Practice network, 2010). A considerable amount of bladder tanks were installed in the camps throughout Port-au-Prince. However, many of the camp occupiers were anxious about drinking the tankered water. Having second thought about its quality, they therefore favored water in small plastic bags. This practice significantly increased the quantity of waste produced in the camps.

### 2.2 Solid and hazardous waste management

The situation of solid waste management in Port-au-Prince is critical, due to the fact that the Haitian Department of Solid Waste Management (SMCRS) is suffering from insufficient capital investment, lack of technical capacities, and poor management. According to the Solid Waste Association of North America (SWANA, 2010), approximately 1,400- 1600 metric tons of solid waste are produced every day in the metropolitan area of Port-au-Prince, with 80% from households, 10 % from markets and 10% from industries. Only 20% of the waste generated is collected by SMCRS. There is a need for an efficient collection system of residue to meaningfully improve the conditions of drinking water, sanitation and public health in the country.

Moreover, improper management of about 10 million cubic meters of debris (United Nations Development Programme (UNDP), 2010) contributed in damaging the environment, livelihoods and recovery efforts. The practice of waste burning to reduce volume and control mosquitoes without proper ventilation was observed. The medical facilities generated significant amount of hazardous waste across the country including amputated limbs, bandages and other biohazard waste. In addition to that, hazardous substances from households, commercial and industrial sites were concentrated and waited for ever to be processed.

According to the United Nations Environment Programme (2010), 40 to 50 % of buildings in Port-au-Prince and surroundings fell. It was an arduous task to deal with about half of the buildings in a city and nearby which all of a sudden become debris. To deal with this issue, UNEP supported SMCRS to collect materials from collapsed buildings and to promote the reuse of these materials in reconstruction projects. This was considered as a good practice, because Haiti is already suffering from deforestation, so cutting huge amount of trees for construction would certainly aggravate the problem of soil erosion and floods during hurricanes. Even though the recycling effort was challenged by lack of technical capacity, most of the individual's tents were built from those materials. However, a significant amount of debris was dumped in water bodies and roadsides.



**Photo: Collapsed building in Port-au-Prince (Top-img.com, 2010)**

A huge amount of medical wastes were also generated by emergency response. This type of waste is generally considered to be hazardous and therefore posed serious environmental risks. In order to avoid accumulation in hospitals and treatment centers, World Health Organization (WHO) along with the Haitian government determined appropriate handling procedures and suitable locations for the disposal of these wastes in Port-au-Prince area, which was fundamental to controlling the spread of diseases transmitted by rodents and mosquitoes.

### **2.3 Sanitation**

Hundreds of camps have been installed in the peri-urban and urban areas of Port-au-Prince and occupied by thousands of earthquake survivors (Global Migration, 2015). As a result of poor infrastructure coupled with the absence of coordination among decision-makers, the environmental conditions in camp sites were worsened and infectious diseases such as skin infections, malaria, flu, fever, and diarrhea increased.

Dealing with sanitation issues in sites occupied by dozen of thousands of earthquake survivors was beyond challenging. For instance, the camp in Petion-Ville Golf Club accommodated 60 000 people, making it one of the biggest in the country. Several NGOs including Save the Children and Oxfam America dug pit latrines and constructed raised latrines sites over plastic containers, which required de-sludging trucks to suck the slurry out (Oxfam America, 2011). However, the residents, not well-informed of the process, often threw other kind of waste in the pit latrines which made them more difficult to be de-slugged. Water, Sanitation and Hygiene (WASH) cluster intervened to

tackle the sanitation issues by installing portable toilets. As de-sludging of these toilets cost 20 USD per toilet, it quickly became economically unaffordable. In many NGOs, the decision-makers did not speak Creole or French, but they worked independently and spent a lot of time to collect information and further design their priorities about where to dispose human waste while information provided by the locals was disregarded. Running out of time, this led to excreta accumulation in the camps, and finally disposal in open holes at dump sites instead of into waste stabilization ponds.



**Photo: Petion-Ville Golf Club Camp (Canadian Medical Assistance Team, 2010)**

A new sanitary approach was later on introduced by Oxfam; the use of composting toilets. After fulfilling their needs, the residents were encouraged to add a small amount of bagasse. The mixture was then put into a drum, removed on a weekly basis and then taken to a composting site. Another practice was defecating in plastic bags which they then deposited into a plastic drum, which were emptied daily and the contents were transferred to a composting site. Many of the residents, considering defecating in plastic bags humiliating, were not happy with this practice. As a consequence, some of them did not follow the process as such, they often accumulated the waste and deposited them around, which made it more difficult to collect and transfer the waste to composting site.

Red Cross international has adopted a different approach engaging community volunteers. It provided training to hundreds of volunteers to be able to reach and deliver community-based sanitation services by considering local values and priorities. This increased awareness of the Red Cross decisions-makers on the local context and subsequently integrate local norms and values in their actions. It also developed a series of activities to strengthen the capacity of DINEPA with the provision of technical, material and financial support. Many activities have been completed by the Red Cross Red Crescent team to repair and extend the water network in Port-au-Prince, which

was then placed under the control of DINEPA for maintenance (Red Cross International, 2014).

## 2.4 Health

To deal with the cholera outbreak 9 months later, a change of priority was required. NGOs and national government agencies in the WASH sector increased chlorination of municipal water supplies, rehabilitated water distribution networks, distributed household water treatment products and promoted hygiene campaigns. Those activities were coordinated by the Ministry of Health and Population (MSPP). Operations to build capacity within DINEPA have been conducted to assist the agency in managing urban water system, with the technical assistance of Inter-American Development Bank (IDB) and Spanish International Development Agency (IDB, 2013). In January 2012, the Haitian and the Dominican governments with the support of United Nations Children's Fund (UNICEF), designed a 2013-2022 plan to eradicate cholera from the Island. The plan consists of carrying extensive awareness and educational activities to encourage people to adopt safe hygiene practices, renovating or constructing water and sanitation facilities in public places like markets and schools (MSPP and DINEPA, 2013). Furthermore, to enhance infection prevention, Pan American Health Organization (PAHO) and WHO have intervened to improve water and sanitation in selected hospitals. Those operations consisted of supplying water on a 24h non-stop basis, ameliorating water quality via water chlorination, implementing a surveillance system of water quality, improving onsite sewage disposal, segregating hospital waste into infectious and common waste and improving internal transportation routes and inside storage (PAHO, 2011). A disease surveillance program was also launched by PAHO that applied lessons learned during previous disasters.

## 3. Disaster risk reduction management- case of Haiti

Before the earthquake there were several disaster risk reduction programmes encompassing awareness-raising, building physical infrastructure to improve evacuation, training for local community group members, search and rescue, shelter management, drain cleaning, and the formation of several neighborhood civil protection committees (Oxfam GB, 2011). As a result of the weakness of the national government in designing disaster management programmes, NGOs like Oxfam GB acted as main implementing agent. Haiti had suffered from 9 serious hurricanes over the past 2 decades (Patrick J., 2011) and was not affected by earthquake in almost 200 years, therefore all of these measures mentioned above were designed to reduce the vulnerability of communities at risk from hurricanes and floods, but the level of preparedness in the context of earthquake was insignificant.

After the occurrence of a natural disaster in Haiti, management approach often focused primarily on emergency response. There was never emphasis on "building back better" to strengthen the resilience of communities at risk from natural disasters, due to this underlying vulnerability, it was challenging to mitigate the impacts of the earthquake.

#### 4. Outcomes and lessons learnt

##### **Outcomes**

It is to be acknowledged that responding to the earthquake was challenging because of the intrinsic vulnerabilities that existed in the country prior to the event. However, little coordinated actions have been conjointly taken by MSPP, DINEPA, Red Cross, and PAHO to eradicate cholera in the Country have succeeded to some extent. As 2013, 300 000 families have received safe water, food, and improved sanitation services (Red Cross International, 2014). Furthermore, the incidence of cholera has been decreased to a manageable degree, but still poses significant threats to the metropolitan area of Port-au-Prince.

The lack of coordination between the decision-makers coupled with limited involvement of local capacities led to failures to identify priority investments in the water and sanitation sector. As a result, the operation network was not under control, the water quality in the area of Port-au-Prince was deteriorated, which then led to the spread of water-borne diseases.

Several months after the quake the efforts to remove debris have known insignificant success because of the absence of a common strategy to determine priority areas. As a result, the debris were just transferred from an area to another and waited to be transferred again for final disposal. However, the isolated actions of individuals recycling materials to build their own tents made a significant difference because most of them collected their materials from locations near waterways, which lessened the potential of floods under heavy rainfall events.

The disposal of excreta from the camp sites by certain NGOs in unsound environmental manner - human waste was disposed in open holes in place of stabilization ponds - led to the formation of breeding sites for vector diseases. The approaches of Red Cross international were successful to some extent. As they integrated local values in their actions, a larger degree of community involvement has been achieved.

Disaster risk management in Haiti before the 2010 earthquake did not aim attention at preparedness, mitigation and adaptation strategies through integrated approaches. The focus was on emergency response to hurricanes and floods on an event-by-event basis, which led to severe consequences in term of economic, environmental and social terms.

##### **Lessons learnt**

The 2010 Haiti earthquake is an evidence that weak governance coupled with poor infrastructure can result in catastrophic scenarios on almost every angle one chooses to look at it. It changed the life of millions of people forever. The responding approaches to disasters should integrate local context and capacities in decision-making process. Local people, even if

severely devastated, still retain some capacities. Among an infinity of reasons, they hold important norms and values that are crucial for the success of interventions in their own context. Otherwise the engagement of the communities will be meaningless. Assuming that there is no local capacity can be misleading, this conception has the potential to lead to inescapable mistakes and misjudgments, and unequivocally fails the whole planning process. When people work in a context which they are completely ignorant of, they can be working outside of it and the responses can be irrelevant.

Waiting to have complete information may not be useful if it comes too late, so it may be better to take initiatives when fairly reliable information is available because this practice is definitely time consuming.

It is important for stakeholders to use a common strategies when working together to achieve good results. It is good to agree on priorities and clearly communicate the way to follow. Although some NGOs included a small portion of local capacities in their evaluation process, their contribution was not significant because they were not familiar with the adopted strategies.

The situation of Haiti also showed that integrated approaches to improve access to water and sanitation are the most powerful ways to control and prevent water-borne diseases. Tackling the challenges requires coordinated initiatives by the actors involving in the WASH and water resources management sector.

Following such a disaster, the planning approaches should aim attention at building on local resilience at the earliest stage of response actions. The actions should focus on empowering locals themselves, to be able to systematically evaluate and solve their own problems. Those initiatives should not be short-sighted, they should look further than the immediate noticeable and target the population as a whole. After all, the positives outcomes of the actions taken need to be strengthened and sustained.

## 5. References

CHF International (2010): Haiti 2010 Earthquake, Rapid Environmental Impact Assessment.

Global Migration (2015): Durable Solutions for the Internally Displaced persons in Haiti Following the 2010 Earthquake.

Government of Haiti (2010): Post-Disaster Needs Assessment.

Humanitarian Practice Network (2010): Haiti earthquake - Humanitarian exchange.

Inter-American development Bank (2013): Port-au-Prince Water and Sanitation Project II.

Ministère de la santé publique et de la population (MSPP) – Direction Nationale de l’Eau Potable et de l’Assainissement (DINEPA) (2013): PLAN D’ELIMINATION DU CHOLERA 2012-2022.

Norwegian Peace Building Centre (2010): Haiti's Earthquake: From Disaster to Environmental Opportunities.

Oxfam America (2011): In Need of a Better Wash: Water, Sanitation and Hygiene Policy Issues in Post-Earthquake Haiti.

Oxfam GB (2011): Urban Governance and Risk Reduction in the Caribbean: The Experience of Oxfam GB.

Pan American Health Organization (2011): Earthquake in Haiti - One year later.

Patrick J., (2011): Haiti Earthquake Evaluation Insights, Department of International Development.

Red Cross International (2014): Haiti Earthquake: Four-year Progress Report.

Richard G. et al., (2013): Water, Sanitation and Hygiene in Haiti: Past, Present, and Future, Am. J. Trop. Med. Hyg. 89, 665-670.

United Nations (2010): Haiti Situation, Challenges and Outlook.

United Nations Development Programme (2013): Haiti, Un Nouveau Regard.

United Nations Environment Programme (2010): Haiti Mission Report.

United States Geological Survey (2010): Special Report on Haiti Earthquake.

Zaré and Ghaychi Afrouz (2012): Crisis Management of Tohoku; Japan Earthquake and Tsunami, 11 March 2011.

## 6. Author and contact

Pierre Charles Denis

Email: [dpierrec@yahoo.fr](mailto:dpierrec@yahoo.fr)

This study was developed for GWP Toolbox to contribute to tools regarding risk assessment and risk management and a newly developed tool on disaster risk management.