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STUDIES ON THE IMPACTS OF FLOODS IN HAITI AND THEIR ADAPTATION STRATEGIES

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ABSTRACT

Haiti is one of the Caribbean countries most vulnerable to flooding, and its resilience to natural hazards is considerably reduced over time. This situation appears to be aggravated by human activities that accelerate the process of environmental degradation. In methodological terms, we first analyzed the process of environmental degradation at the level of the 10 Haitian departments using Google Earth images, processed by the National Center for Geospatial Information (CNIGS). Software such as Word and Flood Map were used for data collection and analysis. The results clearly show that Haiti is at high risk of flooding. In the context of this study, 90% of the population lives in an area of less than 1 ha. The lack of a public policy for land use planning and demographic pressure has largely contributed to the degradation of the environment that causes flooding.

Keywords: Flooding. Vulnerable. Environmental.

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INTRODUCTION

Climate change refers to all variations in climate parameters observed in a given location over time (IPCC, 2015; RABOURDIN, 2005; SMIT et al., 2002; PATUREL et al., 1995). These variations will have a series of consequences on the oceans, the water cycle, temperature, glaciers, clouds and rainfall (CAQUET, 2014).

The process appears to be accelerated by human activities that rapidly transform the environment through the erosion of biological biodiversity, fragmentation, and misuse of natural resources (BROWN and CRAWFORD, 2008). This phenomenon constitutes a serious threat to development and generates much more poverty throughout the world (BOKO et al., 2007; MERTZ et al., 2009). Changes in climate elements modify physical environments with hotter and drier areas or wetter and marshy ones (AGOSSOU et al., 2012). This has therefore contributed to the increased risk of flooding (CEA, 2009). Haiti has an area of 27,750 km2. This small island state is extremely vulnerable to climate change. According to the Germanwatch climate risk index, Haiti ranks third among the countries most affected by climate risks during the period 1998-2017 (AMILCAR HELLIOT, 2004). Seventy-seven (77) major climate events have been recorded, causing flooding, numerous losses of human life, and considerable agricultural losses (GEORGES, 2008). By 2030, forecasts indicate a change in the seasonality of rainfall, an increase in temperature of 0.8 to 10°C, and a rise in the average sea level ranging from 0.5 to 0.7 meters in 2031 and from 0.8 to 1.1 meters in 2071 (UNDP, 2008). In Haiti, the agricultural sector plays an important role in the national economy and employs more than 50% of the rural population (MDE, 2015). One million peasant families practice subsistence farming on land measuring less than one hectare. However, despite its importance, the fragility of agricultural infrastructure in the face of climate risks makes this sector highly vulnerable to cyclones and increasingly frequent floods on a national scale (BANCO, 2013). The Republic of Haiti has an area of 27,750 km² and extends over a distance of 230 km from north to south and 290 km from east to west. Its population is estimated at 11.9 million with a density of 416 people/km2. Compared to Belgium, the total area is 30,688 km2, for a population of 11,584,008 inhabitants, with a density of 375 inhabitants/km². (MDE, 2015).

Figure 1: Location map of Haiti



Source: CNIGS

PROBLEMATIC

Floods continue to be the most widespread natural hazard today, causing many victims and damages worldwide (KOUMASSI, 2014). They are responsible for devastation and economic damage worldwide, causing more than 31 million disaster victims and causing an average of more than 60,000 deaths per year (NGO, 2014). According to the report of the United Nations Office for Disaster Risk Reduction (UNISDR, 2015), floods alone caused almost 47% of climate-related disasters and affected more than 2.3 billion people between 1995 and 2015. In addition, these floods have had very negative impacts on the health of the population, agricultural production, and the biotic and abiotic environment in general (LUONG, 2012). Haiti is among the countries most vulnerable to natural disasters (KREFT et al., 2017). Its fragility is directly linked to its geographical position. Floods, droughts, hurricanes, cyclones, and tropical storms are very common. Between 1990 and 2008, Haiti was the Caribbean country most affected by natural disasters: three (3) droughts, twenty-two (22) floods, twenty-three (23) storms and hurricanes (ECLAC, 2009). This situation appears to be favored by the geographical and socio-economic context which contributes to making the environment much more dependent on hydro-meteorological risks and with a very limited capacity for adaptation. The country's relief does not fail to have consequences on its level of vulnerability. Seventy-five (75%) of the territory is occupied by mountain ranges with slopes greater than forty (40%) %. This promotes torrential flows, especially in the narrow coastal strips where the country's largest cities are located (GRACIUS, 2016; CLERVIL, 2017). The risk of erosion is

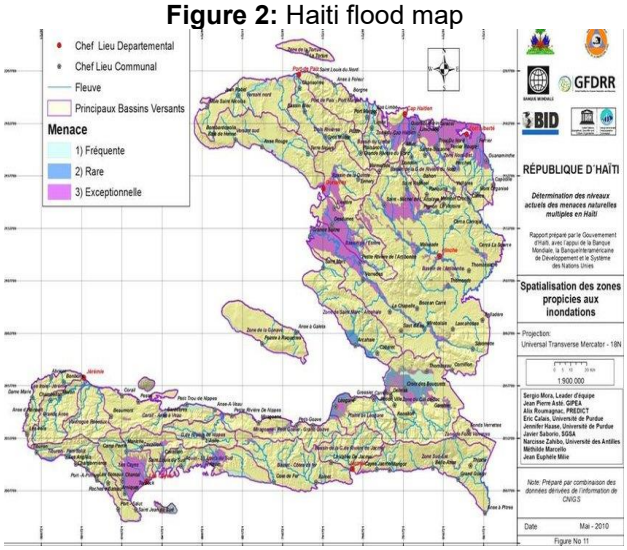
very high in over 30% of the national territory and approximately 36 million cubic meters of soil are lost each year (GEORGES, 2008). Erosion increases the risk of flooding by reducing the capacity of river basins and obstructing drainage channels. The leaching of sediments into coastal waters increases turbidity (SAFFACHE, 2006). The accumulation of sand in rivers thus causes a reduction in their capacity to regulate flows (UNDP, 2008).

It should also be mentioned that deforestation is a very complex phenomenon in Haiti. It dates back to the colonial period, with the clearing of land for the installation of export crops, and continued until the 20th century with the export of timber and its use as a source of energy, so that the country's forest cover is less than 2% today (GEO HAITI, 2010).

In Haiti, several episodes of flooding have been recorded in recent decades in the country's various departments. Heavy rains caused major rivers to overflow and flood most localities. According to officials from the Civil Protection Directorate, around a thousand families were affected in Haiti following the floods that occurred on the night of April 12-13, 2016, due to Hurricane Matthew. Rapid urbanization has worsened the situation and weakened the population's ability to respond. Building in areas at high risk of flooding makes it more difficult to manage natural disasters (SYLVESTRE, 2011).

Aware of the serious economic, social, and environmental consequences that often accompany flooding, is it not imperative to seek to better understand the fundamental reasons for such a phenomenon? How are they preparing for this phenomenon? What is the level of community involvement? Have state institutions fulfilled their role? Such is the importance of this study, which consists of understanding the impacts related to flood risks on Haitian society and making appropriate recommendations to strengthen the level of resilience in Haiti in terms of risk and disaster management.

Figure 2: Haiti flood map



Source: CNIGS

METHODOLOGY AND MATERIAL USED

To study the impacts of flooding in Haiti and its adaptation strategies, I used a structured methodology that begins with a review of the existing literature on the topic, establishing clear objectives for the research, such as identifying the main impacts and evaluating adaptation strategies.

Data collection should include qualitative approaches, such as interviews and focus groups with affected communities, as well as quantitative data collection through statistical surveys on the frequency and intensity of flooding. Qualitative data analysis can be done through thematic analysis methods, while quantitative data should be analyzed statistically to understand the relationships between floods and their impacts. Case studies in specific areas of Haiti can provide a detailed view of local responses and adaptation strategies. Finally, based on the results, it is important to develop recommendations for policies that improve community resilience and disseminate these results to stakeholders, including local communities and non-governmental organizations. I used materials such as Word to write the text, Google Earth, and a laptop to edit the document.

RESULTS AND DISCUSSION

In the context of this study, 90% of the population lives in an area of less than 1 ha. From that point on, there are therefore many more actors intervening in a very small area.

Demographic pressure is increasing. There is a tendency to move from a natural land use class to a land use class for construction, in a kind of anarchic urban development, without any planning. However, with the development of urban ecosystems, less water will be infiltrated to enrich the water table and much more water will flow into the sea, destroying everything in its path through floods (MARC, 2015; HIRTZEL et al., 2010; GRIMM et al., 2005; BOGAERT, 2018; HESS et al., 2001; HEYWOOD, 1995).

The combined effect of floods and previous factors (fragmentation, deforestation) caused a reduction in the number of livestock. The streets in the city center suffered extensive damage after being covered by rainwater, along with plant debris and pebbles from upstream. Not even the cemetery was spared. Homes were damaged and many families were left homeless after major hurricanes hit Haiti..

Figure 3: Flood zone in Haiti



Source: advertising spot, published on 06/05/2023 at 23:48 hours

To adapt, some people develop a whole set of strategies directly on their plots or plots near the riverbanks. To be more sustainable and efficient, these strategies are often associated with vegetation. They are one of the most widely used means of retaining organic matter and reducing the speed of the water. Among the most developed adaptation strategies, we can mention: one group practices silting, another group carries out reforestation, another group builds contour canals, one group uses dry stone cordons, another group uses sack-of-earth dams, another group uses gabion sills, and another group installs bamboo.

CONCLUSIONS AND RECOMMENDATIONS

In Haiti, the hurricane season occurs annually from June 1 to November 30, when several cyclones and adverse weather conditions cause severe flooding in some departments of the country. This situation considerably worsens the living conditions of the population, which is repeatedly affected. Many people are forced to abandon their homes, and in rural areas, farmers have progressively abandoned agricultural activities, opting for other occupations that are less vulnerable to climate events.

In view of this, this study aims to analyze the impact of flood risks, with the aim of strengthening adaptation strategies that contribute to greater resilience in the face of natural disasters. Methodologically, an analysis of environmental degradation was carried out between 1998 and 2014, using very high spatial resolution images from Google Earth.

The results confirmed the vulnerability of Haitian territory to the risk of flooding. The main causes identified were: drainage problems, lack of cleaning of riverbeds, human activities that contribute to the worsening of floods, deforestation and, finally, disorderly construction.

Based on this study, it was possible to obtain a clearer understanding of Haiti's level of vulnerability to flooding, and to promote a sustainable improvement of the situation, strengthening the resilience of communities, we propose the following recommendations:

- Develop early warning systems and hydrometeorological information distribution systems to alert the population to possible cyclones and severe weather at the commune level;
- Carry out riverbank protection works and reforestation campaigns at the river basin level;
- Integrate risk management as a pillar in community development policies;
- Develop legal texts that protect peasants who are in indirect possession. These laws can give them a kind of guarantee of ownership of the trees they have planted, which would motivate them to make sustainable investments in the cultivated plots.
- Develop legal texts on development plans.

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